

SCHATTENWURFPROGNOSE NR. 214192-03.02

über die optischen Immissionen in der Umgebung von sieben geplanten Windenergieanlagen des Typs Vestas V150-4.2 im Windpark Lauchhammer bei 01998 Klettwitz

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1.) Zusammenfassung

Die vorliegende Untersuchung bezieht sich auf den Betrieb von sieben neu geplanten Windenergieanlagen (WEA) vom Typ Vestas V150-4.2 im Windpark Lauchhammer. Es wird die Schattenausbreitung der astronomisch maximal möglichen Beschattungsdauer nach LAI [1] im Rahmen der Gesamtbelastung an den ermittelten Immissionsorten untersucht. Am Standort befinden sich 57 existierende WEA, die als Vorbelastung zu berücksichtigen sind.

Bei Normalbetrieb der WEA ergeben die Berechnungen keine unzulässigen Überschreitungen der Immissionsrichtwerte durch den kumulativen periodischen Schattenwurf (Gesamtbelastung mit Einfluss der Zusatzbelastung). Im Rahmen dieser Berechnung werden insgesamt drei Immissionsorte untersucht.

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.

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

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

Rheine, 09.11.2018 TS/BS

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2.) Situation und Aufgabenstellung

Die Lauchhammer Green Energy GmbH & Co. KG plant die Errichtung von sieben Windenergieanlagen (WEA) vom Typ Vestas V150-4.2 mit einer jeweiligen Nabenhöhe von $h_N = 166,0$ m und einer elektrischen Leistung von $P_{el} = 4.200$ kW am Standort 01998 Klettwitz, Kreis Oberspreewald-Lausitz in Brandenburg. 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 Windenergieanlagen nach dem Länderausschuss für Immissionsschutz (LAI) [1] angewendet.

In der Umgebung des Standortes befinden sich 57 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, Normen und Unterlagen herangezogen:

- [1] Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise), verabschiedet auf der 103. Sitzung des Länderausschusses für Immissionsschutz (LAI), 06.-08.05.2002
- [2] Bundes-Immissionsschutzgesetz in der Fassung der Bekanntmachung vom 17. Mai 2013 (BGBl. S. 1274), das durch Artikel 1 des Gesetzes vom 20. November 2014 (BGBl. S. 1740) geändert worden ist
- [3] WindPRO 3.2.712 SP2, Herausgeber EMD International A/S (DK)
- [4] Ausschnitt aus der Deutschen Grundkarte Maßstab 1:10.000 in digitaler Form (UTM, Zone 33: untere linke Ecke: RW = 416.000, HW = 5.705.000; obere rechte Ecke: RW = 425.500, HW = 5.715.800). Herausgeber: Landesvermessung und Geobasisinformation Brandenburg (LGB) © 2018

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 Windenergieanlagen des Länderausschusses für 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 Sonneneinstrahlungsrichtung.
- Minimale relevante Sonnenhöhe über Horizont mit 3° .
- Es werden keine Hindernisse angenommen, die eine abschirmende Wirkung besitzen.
- An den Gebäuden mit schutzwürdigen Räumen 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 3.2.712 SP2 [3]. Als Immissionspunkte wird ein Schattenrezeptor (SR) an der kritischen Fensterseite der Gebäude mit schutzwürdigen Räumen 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 57 weitere Windenergieanlagen, die als Vorbelastung zu berücksichtigen sind. Die Informationen über die anzusetzende Vorbelastung am Standort sind vom Auftraggeber vorgegeben. Die UTM/ETRS89-Koordinaten (Zone 32) befinden sich im SHADOW-Hauptergebnis in Anlage A2.

| Typ | V112 | V117 |
|-------------------------|---|---|
| Bezeichnung | WEA I-01 bis WEA I-19, WEA I-24 bis WEA I-31, WEA II-04 bis WEA II-08 | WEA II-01 bis WEA II-03, WEA II-09 bis WEA II-14, WEA II-16 |
| Hersteller | Vestas | Vestas |
| Nabenhöhe h_N [m] | 140,0 | 141,5 |
| Rotordurchmesser [m] | 112,0 | 117,0 |
| Nennleistung [kW] | 3.300 | 3.300 |
| Maximale Blatttiefe [m] | 4,00 [3] | 4,00 [3] |
| Schattenbereich [m] | 1.708 [3] | 1.732 [3] |

(Teil 1 von Tabelle 1)

| Typ | V80 | V90 |
|-------------------------|----------------------|---------------------|
| Bezeichnung | WEA S01 bis WEA S13, | VEA S18 und WEA S8ä |
| Hersteller | Vestas | Vestas |
| Nabenhöhe h_N [m] | 100,0 | 105,0 |
| Rotordurchmesser [m] | 80,0 | 90,0 |
| Nennleistung [kW] | 2.000 | 2.000 |
| Maximale Blatttiefe [m] | 3,52 [3] | 3,51 [3] |
| Schattenbereich [m] | 1.581 [3] | 1.506 [3] |

(Teil 2 von Tabelle 1)

Tabelle 1: Anlagendaten der vorhandenen Windenergieanlagen der Vorbelastung im Windpark Lauchhammer.

4.4. Windenergieanlagen der Zusatzbelastung

Die relevante Zusatzbelastung besteht im Windpark Lauchhammer aus sieben neu geplanten WEA vom Typ Vestas V150-4.2 mit einer jeweiligen Nabenhöhe von $h_N = 166,0$ m und einem Rotordurchmesser von 150,0 m. Die Nabenhöhe ist vom Auftraggeber vorgegeben. Die UTM/ETRS89-Koordinaten (Zone 33) befinden sich im SHADOW-Hauptergebnis in Anlage A2.

| Typ | Vestas V150-4.2 |
|-------------------------|-------------------------|
| Bezeichnung | WEA II-20 bis WEA II-26 |
| Hersteller | Vestas |
| Nabenhöhe h_N [m] | 166,0 |
| Rotordurchmesser [m] | 150,0 |
| Nennleistung [kW] | 4.200 |
| Maximale Blatttiefe [m] | 4,20 [3] |
| Schattenbereich [m] | 1.901 [3] |

Tabelle 2: Anlagendaten der Windenergieanlagen der Zusatzbelastung im Windpark Lauchhammer.

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 drei maßgebliche Schattenrezeptoren aufgenommen worden. Die Tabelle 3 zeigt die Schattenrezeptoren mit deren Adressen und den UTM/ETRS89-Koordinaten (Zone 33) auf.

| Bezeichnung | Adresse | UTM-Koordinaten | |
|-------------|---|-----------------|-----------|
| | | Ost | Nord |
| SR-01 | August-Bebel-Straße 10, 01979 Lauchhammer | 419.230 | 5.709.424 |
| SR-02 | Gartenweg 1, 01979 Kostebrau | 418.913 | 5.709.421 |
| SR-03 | Römerkeller Straße 3, 01979 Kostebrau | 419.035 | 5.709.243 |

Tabelle 3: Immissionsorte am Standort Klettwitz.

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

| Bezeichnung | Abstand [m] | | |
|-------------|-------------|-------|-------|
| | SR-01 | SR-02 | SR-03 |
| WEA II-20 | 1.975 | 2.015 | 2.172 |
| WEA II-21 | 1.748 | 1.839 | 1.969 |
| WEA II-22 | 1.371 | 1.418 | 1.569 |
| WEA II-23 | 1.626 | 1.798 | 1.879 |
| WEA II-24 | 1.806 | 2.040 | 2.071 |
| WEA II-25 | 1.037 | 1.108 | 1.245 |
| WEA II-26 | 1.582 | 1.852 | 1.846 |

Tabelle 4: Horizontale Abstände der Zusatzbelastung im Windpark Lauchhammer 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 einer WEA dargestellt:

| Immissionsorte | Maximal mögliche Schatten-dauer jährlich VB [h/a] | Grenzwertüber-schreitung 30 h/a VB [h/a] | Maximal mögliche Schatten-dauer täglich VB [min/d] | Grenzwertüber-schreitung 30 min/d VB [min/d] |
|----------------|---|--|--|--|
| SR-01 | 00:00:00 | -- | 00:00 | -- |
| SR-02 | 00:00:00 | -- | 00:00 | -- |
| SR-03 | 00:00:00 | -- | 00:00 | -- |

Tabelle 5: Schattenwurfzeiten der Vorbelastung; Überschreitung der Grenzwerte an den Immissionsorten.

Im Rahmen der Schattenwurfzeiten führen die WEA der Vorbelastung an keinen seitens der Zusatzbelastung relevanten Schattenrezeptoren zu unzulässigen Überschreitungen der Grenzwerte.

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 mit sieben Vestas V150-4.2 dargestellt:

| Immissionsorte | Maximal mögliche Schatten-dauer jährlich ZB [h/a] | Grenzwertüber-schreitung 30 h/a ZB [h/a] | Maximal mögliche Schatten-dauer täglich ZB [min/d] | Grenzwertüber-schreitung 30 min/d ZB [min/d] |
|----------------|---|--|--|--|
| SR-01 | 03:07:00 | -- | 00:09 | -- |
| SR-02 | 15:52:00 | -- | 00:20 | -- |
| SR-03 | 00:07:00 | -- | 00:01 | -- |

Tabelle 6: Schattenwurfzeiten der Zusatzbelastung; Überschreitung der Grenzwerte an den Immissionsorten.

Im Rahmen der Schattenwurfzeiten führen die sieben WEA der Zusatzbelastung an keinem Schattenrezeptoren zu unzulässigen Überschreitungen eines Grenzwertes.

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 Schatten-dauer jährlich GB [h/a] | Grenzwertüber-schreitung 30 h/a GB [h/a] | Maximal mögliche Schatten-dauer täglich GB [min/d] | Grenzwertüber-schreitung 30 min/d GB [min/d] |
|----------------|---|--|--|--|
| SR-01 | 03:07:00 | -- | 00:09 | -- |
| SR-02 | 15:52:00 | -- | 00:20 | -- |
| SR-03 | 00:07:00 | -- | 00:01 | -- |

Tabelle 7: Schattenwurfzeiten der Gesamtbelastung; Überschreitung der Grenzwerte an den Immissionsorten.

Die Berechnung zeigt an keinem Schattenrezeptoren unzulässige Überschreitungen durch periodischen Schattenwurf der Gesamtbelastung bei einem zu berücksichtigenden Grenzwert auf.

6.) Bewertung

Im Zuge der Bewertung weist die Zusatzbelastung eine Relevanz auf, sofern die neu 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 Immissionsorten zu erwarten sind.

6.1. Maximal mögliche jährliche Schattendauer

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

| IO | Maximal mögliche Schattendauer jährlich VB [h/a] | Maximal mögliche Schattendauer jährlich GB [h/a] | Grenzwertüberschreitung 30 h/a GB [h/a] | Erhöhung durch ZB [h/a] | Relevanz |
|-------|--|--|---|-------------------------|----------|
| SR-01 | 00:00:00 | 03:07:00 | -- | 03:07:00 | nein |
| SR-02 | 00:00:00 | 15:52:00 | -- | 15:52:00 | nein |
| SR-03 | 00:00:00 | 00:07:00 | -- | 00:07:00 | nein |

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

An keinem der Immissionsorte kommt es zu einer Überschreitung des Grenzwertes der Gesamtbelastung durch die mögliche jährliche Schattendauer.

6.2. Maximal mögliche tägliche Schattendauer

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

| IO | Maximal mögliche Schattendauer täglich VB [min/d] | Maximal mögliche Schattendauer täglich GB [min/d] | Grenzwertüberschreitung 30 min/d GB [min/d] | Erhöhung durch ZB [min/d] | Relevanz |
|-------|---|---|---|---------------------------|----------|
| SR-01 | 00:00 | 00:09 | -- | 00:09 | nein |
| SR-02 | 00:00 | 00:20 | -- | 00:20 | nein |
| SR-03 | 00:00 | 00:01 | -- | 00:01 | nein |

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

An keinem der Immissionsorte führt die Gesamtbelastung zu einer Überschreitung der Schattenwurfdauer bzw. des Grenzwertes durch die mögliche tägliche Schattendauer.

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-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage A3: SHADOW-Kalender mit Darstellung der Schattenzeiten je Immissionsort SR-01 bis SR-03 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-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage B2: SHADOW-Hauptergebnis mit Darstellung der Zusatzbelastung, Immissionsorte SR-01 bis SR-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Anlage B3: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Zusatzbelastung unterteilt in Minuten / Tag und Stunden / Jahr

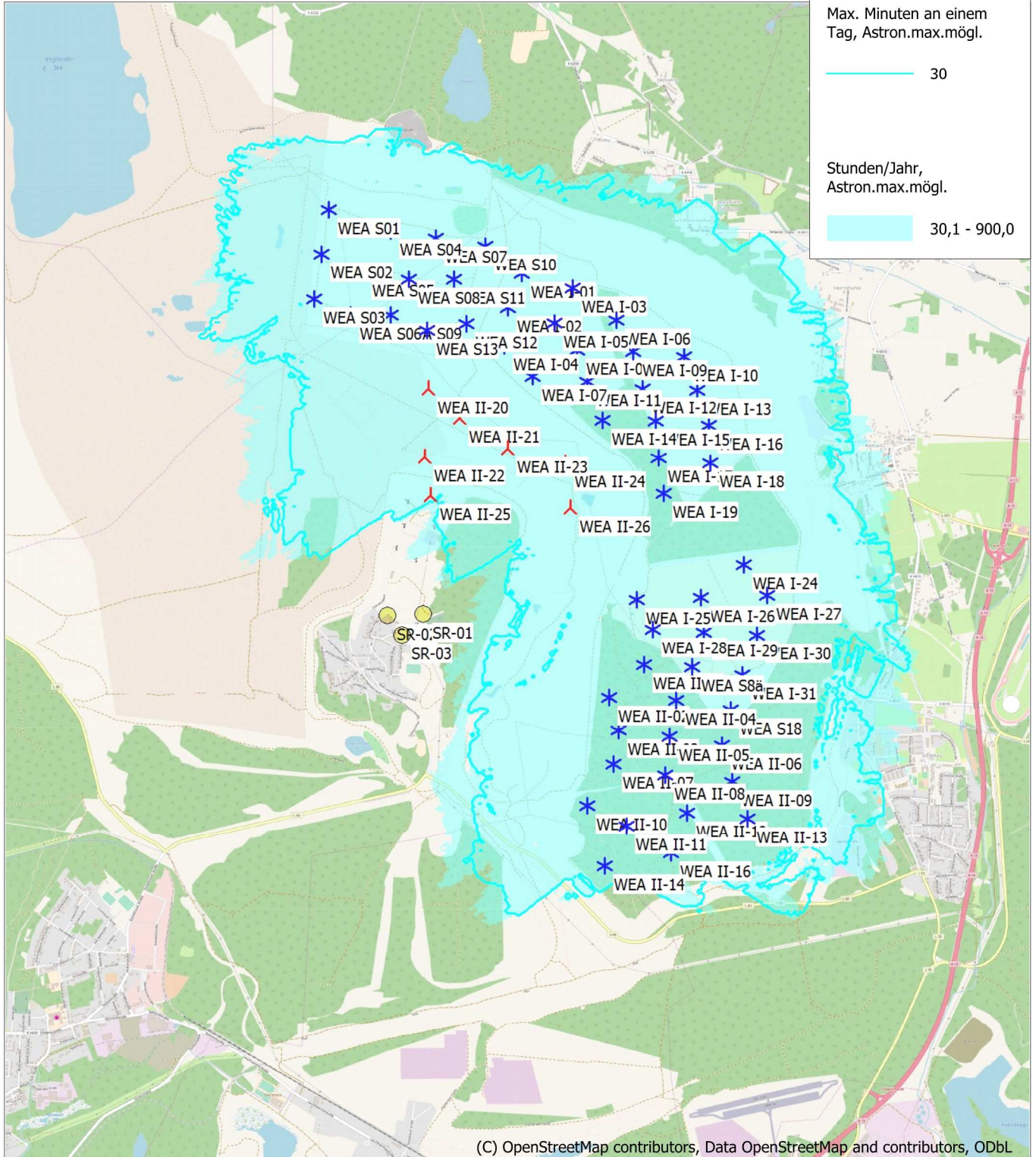
Anlage C: Bilder der untersuchten Immissionsorte

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

SHADOW - Karte

Berechnung: Gesamtbelastung



(C) OpenStreetMap contributors, Data OpenStreetMap and contributors, ODbL

0 500 1000 1500 2000 m

Karte: EMD OpenStreetMap , Maßstab 1:50.000, Mitte: UTM (north)-ETRS89 Zone: 33 Ost: 420.120 Nord: 5.709.780

▲ Neue WEA

* Existierende WEA

● Schattenrezeptor

Höhe der Schattenkarte: Höhenraster-Objekt: 214192-03 WP Klettwitz_EMDGrid_0.wpg (1)

Anlage A2: SHADOW-Hauptergebnis mit Darstellung der Gesamtbelastung, Immissionsorte SR-01 bis SR-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
214192-03 WP Lauchhammer

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07.11.2018 07:49/3.2.712

SHADOW - Hauptergebnis

Berechnung: Gesamtbelastung Voraussetzungen für Berechnung des Schattenwurfs

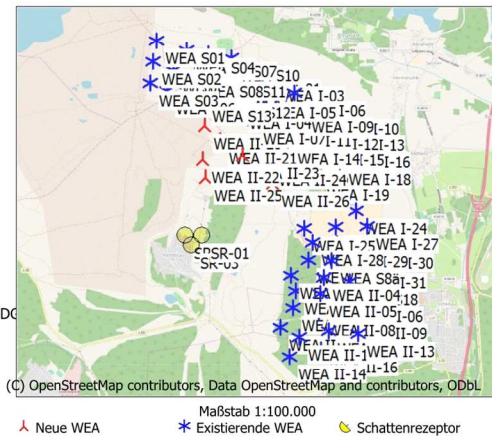
Beschattungsbereich der WEA
Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt
Siehe WEA-Tabelle

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

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

Verwendete Höhenlinien: Höhenraster-Objekt: 214192-03 WP Klettwitz_EMD
Hindernisse in Berechnung verwendet
Berechnungshöhe ü.Gr. für Karte: 1,5 m
Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:
UTM (north)-ETRS89 Zone: 33



WEA

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | | Nennleistung | Rotordurchmesser | Nabenhöhe | Schattendaten | | |
|-----------|---------|-----------|-------|---------------|---------|------------|----------|-------------------|------------------|-----------|-------------------|---------|------|
| | | | | | Aktuell | Hersteller | Typ | | | | Beschatt.-Bereich | U/min | |
| | | | [m] | | | | | | | | [m] | [U/min] | |
| WEA I-01 | 420.133 | 5.712.388 | 133,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-02 | 420.005 | 5.712.088 | 131,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-03 | 420.573 | 5.712.249 | 131,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-04 | 419.968 | 5.711.758 | 132,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-05 | 420.408 | 5.711.947 | 132,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-06 | 420.952 | 5.711.965 | 155,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-07 | 420.213 | 5.711.486 | 132,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-08 | 420.601 | 5.711.706 | 132,4 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-09 | 421.096 | 5.711.687 | 154,8 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-10 | 421.544 | 5.711.640 | 153,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-11 | 420.688 | 5.711.433 | 132,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-12 | 421.175 | 5.711.366 | 155,7 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-13 | 421.650 | 5.711.340 | 153,4 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-14 | 420.821 | 5.711.091 | 152,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-15 | 421.283 | 5.711.079 | 154,7 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-16 | 421.750 | 5.711.035 | 154,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-17 | 421.303 | 5.710.760 | 153,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-18 | 421.757 | 5.710.705 | 151,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-19 | 421.346 | 5.710.445 | 150,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-24 | 422.038 | 5.709.811 | 149,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-25 | 421.090 | 5.709.518 | 156,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-26 | 421.656 | 5.709.530 | 151,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-27 | 422.234 | 5.709.543 | 148,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-28 | 421.232 | 5.709.259 | 158,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-29 | 421.675 | 5.709.225 | 153,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-30 | 422.144 | 5.709.194 | 148,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-31 | 422.009 | 5.708.845 | 151,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-01 | 421.147 | 5.708.948 | 158,3 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-02 | 420.839 | 5.708.667 | 152,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-03 | 420.916 | 5.708.385 | 151,0 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-04 | 421.426 | 5.708.630 | 151,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-05 | 421.362 | 5.708.325 | 149,1 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-06 | 421.826 | 5.708.237 | 152,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-07 | 420.866 | 5.708.085 | 146,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-08 | 421.321 | 5.707.983 | 137,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-09 | 421.903 | 5.707.924 | 150,4 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-10 | 420.629 | 5.707.730 | 146,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |

(Fortsetzung nächste Seite)...

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Hauptergebnis

Berechnung: Gesamtbelastung

...(Fortsetzung von letzter Seite)

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | Hersteller | Typ | Nennleistung | Rotor-durchmesser | Nabenhöhe | Schattendaten | |
|-----------|---------|-----------|-------|----------------|---------|--------|-----------------|--------------------|--------------|-------------------|-----------|-------------------|---------|
| | | | | | Aktuell | | | | | | | Beschatt.-Bereich | U/min |
| | | | [m] | | | | | | [kW] | [m] | [m] | [m] | [U/min] |
| WEA II-11 | 420.975 | 5.707.547 | 149,7 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-12 | 421.503 | 5.707.650 | 150,4 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-13 | 422.036 | 5.707.592 | 150,1 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-14 | 420.779 | 5.707.199 | 148,7 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-16 | 421.364 | 5.707.304 | 150,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-20 | 419.303 | 5.711.398 | 121,9 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-21 | 419.571 | 5.711.138 | 122,0 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-22 | 419.263 | 5.710.795 | 121,2 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-23 | 419.990 | 5.710.861 | 121,9 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-24 | 420.484 | 5.710.723 | 122,7 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-25 | 419.301 | 5.710.459 | 162,2 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-26 | 420.526 | 5.710.332 | 122,5 | VESTAS V15... | Ja | VESTAS | V150-4.2-4.200 | | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA S01 | 418.450 | 5.712.973 | 155,8 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S02 | 418.384 | 5.712.584 | 157,8 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S03 | 418.316 | 5.712.191 | 155,2 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S04 | 418.992 | 5.712.780 | 153,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S05 | 418.748 | 5.712.420 | 155,7 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S06 | 418.627 | 5.712.048 | 153,2 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S07 | 419.385 | 5.712.709 | 152,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S08 | 419.142 | 5.712.348 | 151,9 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S09 | 418.976 | 5.712.041 | 154,1 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S10 | 419.818 | 5.712.628 | 150,9 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S11 | 419.542 | 5.712.339 | 152,5 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S12 | 419.641 | 5.711.952 | 147,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S13 | 419.295 | 5.711.898 | 153,1 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW-2.000 | | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 |
| WEA S18 | 421.901 | 5.708.538 | 152,3 | VESTAS V90-... | Nein | VESTAS | V90-2.0 | GridStreamer-2.000 | 2.000 | 90,0 | 105,0 | 1.506 | 15,2 |
| WEA S88 | 421.573 | 5.708.923 | 153,0 | VESTAS V90-... | Nein | VESTAS | V90-2.0 | GridStreamer-2.000 | 2.000 | 90,0 | 105,0 | 1.506 | 15,2 |

Schattenrezeptor-Eingabe

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Azimutwinkel (von Süd) | Neigung des Fensters [°] | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. [m] |
|-------|--|---------|-----------|-------|--------|------|------------|------------------------|--------------------------|---------------------|---------------------------|
| SR-01 | SR-01, August-Bebel-Straße 10, 01979 Lauchhammer | 419.230 | 5.709.424 | 157,2 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 418.913 | 5.709.421 | 158,5 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 419.035 | 5.709.243 | 161,3 | 0,1 | 0,1 | 2,0 | 0,0 | 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, August-Bebel-Straße 10, 01979 Lauchhammer | 3:07 | 28 | 0:09 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 15:52 | 68 | 0:20 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 0:07 | 7 | 0:01 |

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

| Nr. | Name | Maximal [h/a] |
|----------|---|---------------|
| WEA I-01 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (2) | 0:00 |
| WEA I-02 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (3) | 0:00 |
| WEA I-03 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (4) | 0:00 |
| WEA I-04 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (5) | 0:00 |
| WEA I-05 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (6) | 0:00 |
| WEA I-06 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (7) | 0:00 |
| WEA I-07 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (8) | 0:00 |
| WEA I-08 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (9) | 0:00 |
| WEA I-09 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (10) | 0:00 |
| WEA I-10 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (11) | 0:00 |
| WEA I-11 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (12) | 0:00 |

(Fortsetzung nächste Seite)...

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Hauptergebnis

Berechnung: Gesamtbelastung

...(Fortsetzung von letzter Seite)

| Nr. | Name | Maximal [h/a] |
|-----------|---|---------------|
| WEA I-12 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (13) | 0:00 |
| WEA I-13 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (14) | 0:00 |
| WEA I-14 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (15) | 0:00 |
| WEA I-15 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (16) | 0:00 |
| WEA I-16 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (17) | 0:00 |
| WEA I-17 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (18) | 0:00 |
| WEA I-18 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (19) | 0:00 |
| WEA I-19 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (20) | 0:00 |
| WEA I-20 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (21) | 0:00 |
| WEA I-25 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (22) | 0:00 |
| WEA I-26 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (23) | 0:00 |
| WEA I-27 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (24) | 0:00 |
| WEA I-28 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (25) | 0:00 |
| WEA I-29 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (26) | 0:00 |
| WEA I-30 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (27) | 0:00 |
| WEA I-31 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (28) | 0:00 |
| WEA II-01 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (29) | 0:00 |
| WEA II-02 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (30) | 0:00 |
| WEA II-03 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (31) | 0:00 |
| WEA II-04 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (32) | 0:00 |
| WEA II-05 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (33) | 0:00 |
| WEA II-06 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (34) | 0:00 |
| WEA II-07 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (35) | 0:00 |
| WEA II-08 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (36) | 0:00 |
| WEA II-09 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (37) | 0:00 |
| WEA II-10 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (38) | 0:00 |
| WEA II-11 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (39) | 0:00 |
| WEA II-12 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (40) | 0:00 |
| WEA II-13 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (41) | 0:00 |
| WEA II-14 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (42) | 0:00 |
| WEA II-16 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (43) | 0:00 |
| WEA II-20 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (3) | 0:00 |
| WEA II-21 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (4) | 0:00 |
| WEA II-22 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (5) | 0:00 |
| WEA II-23 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (6) | 0:00 |
| WEA II-24 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (7) | 0:00 |
| WEA II-25 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (8) | 0:00 |
| WEA II-26 | VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (9) | 18:59 |
| WEA S01 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (48) | 0:00 |
| WEA S02 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (49) | 0:00 |
| WEA S03 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (50) | 0:00 |
| WEA S04 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (51) | 0:00 |
| WEA S05 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (52) | 0:00 |
| WEA S06 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (53) | 0:00 |
| WEA S07 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (54) | 0:00 |
| WEA S08 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (55) | 0:00 |
| WEA S09 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (56) | 0:00 |
| WEA S10 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (57) | 0:00 |
| WEA S11 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (58) | 0:00 |
| WEA S12 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (59) | 0:00 |
| WEA S13 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (60) | 0:00 |
| WEA S18 | VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:150,0 m) (61) | 0:00 |
| WEA S8ä | VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:150,0 m) (62) | 0:00 |

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-03 über das ganze Jahr

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender

Berechnung: Gesamtbelastung **Schattenrezeptor:** SR-01 - SR-01, August-Bebel-Straße 10, 01979 Lauchhammer
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|---------------------------|--------|---------|-------|-------|-------|-------|-------------------|-------------------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 06:39 | 04:54 | 04:51 | | | | | |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 05:28 (WEA II-26) | 05:27 | 06:16 | 07:04 | 06:57 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 06:37 | 04:53 | 04:52 | 05:22 (WEA II-26) | 05:29 | 06:18 | 07:06 | 06:59 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 05:27 (WEA II-26) | 05:33 | 06:21 | 07:09 | 07:02 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 06:35 | 04:53 | 04:53 | 05:23 (WEA II-26) | 05:30 | 06:19 | 07:08 | 07:01 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 05:27 (WEA II-26) | 05:31 | 06:20 | 07:09 | 07:02 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 06:33 | 04:52 | 04:54 | 05:24 (WEA II-26) | 05:32 | 06:21 | 07:09 | 07:02 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 05:26 (WEA II-26) | 05:30 | 06:19 | 07:08 | 07:01 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 06:31 | 04:51 | 04:54 | 05:25 (WEA II-26) | 05:33 | 06:23 | 07:11 | 07:04 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 05:26 (WEA II-26) | 05:30 | 06:19 | 07:08 | 07:01 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 06:30 | 04:51 | 04:55 | | | | | |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | | | | | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 06:28 | 04:50 | 04:56 | | | | | |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | | | | | |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 06:26 | 04:50 | 05:19 (WEA II-26) | | | | | |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 2 | 05:21 (WEA II-26) | 05:23 | 06:12 | 07:01 | 06:54 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 06:24 | 04:49 | 05:18 (WEA II-26) | | | | | |
| | 16:16 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 3 | 05:21 (WEA II-26) | 05:22 | 06:11 | 07:00 | 06:53 |
| 10 | 08:08 | 07:30 | 06:33 | 06:23 | 06:23 | 04:49 | 05:18 (WEA II-26) | | | | | |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 4 | 05:22 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 06:21 | 04:48 | 05:18 (WEA II-26) | | | | | |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 5 | 05:23 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 06:19 | 04:48 | 05:17 (WEA II-26) | | | | | |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 6 | 05:23 (WEA II-26) | 05:20 | 06:09 | 06:58 | 06:51 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 06:18 | 04:48 | 05:17 (WEA II-26) | | | | | |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 7 | 05:24 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 06:16 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 7 | 05:24 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 06:15 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 8 | 05:25 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 06:13 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:24 | 8 | 05:25 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 06:12 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 9 | 05:26 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 06:10 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 9 | 05:26 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 06:09 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:31 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 9 | 05:26 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 06:07 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 9 | 05:26 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 06:06 | 04:47 | 05:17 (WEA II-26) | | | | | |
| | 16:34 | 17:30 | 18:19 | 20:10 | 20:58 | 21:26 | 9 | 05:26 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 06:05 | 04:48 | 05:18 (WEA II-26) | | | | | |
| | 16:36 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 9 | 05:27 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 06:04 | 04:48 | 05:18 (WEA II-26) | | | | | |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 9 | 05:27 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 06:03 | 04:48 | 05:18 (WEA II-26) | | | | | |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 9 | 05:27 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 06:01 | 04:48 | 05:19 (WEA II-26) | | | | | |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 9 | 05:28 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 06:00 | 04:49 | 05:19 (WEA II-26) | | | | | |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 9 | 05:28 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 06:00 | 04:49 | 05:20 (WEA II-26) | | | | | |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 8 | 05:28 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 06:00 | 04:50 | 05:20 (WEA II-26) | | | | | |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 8 | 05:28 (WEA II-26) | 05:21 | 06:10 | 06:59 | 06:52 |
| 29 | 07:49 | | 06:50 | 05:43 | 06:00 | 04:50 | 05:21 (WEA II-26) | | | | | |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 7 | 05:28 (WEA II-26) | 05:23 | 06:11 | 07:01 | 06:52 |
| 30 | 07:48 | | 06:47 | 05:41 | 06:00 | 04:51 | 05:21 (WEA II-26) | | | | | |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 6 | 05:27 (WEA II-26) | 05:28 | 06:11 | 07:01 | 06:52 |
| 31 | 07:47 | | 06:45 | | 06:00 | 04:51 | | | | | | |
| | 16:51 | | 19:35 | | 21:11 | | | | | | | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| astr.max.mögl.Beschattung | | | | | | 169 | 18 | | | | | |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: SR-02 - SR-02, Gartenweg 1, 01979 Kostebrau
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | | Juni |
|---------------------------|--------|---------|-------|-------|-------|----------------------|-------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | | 04:54 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | | 21:12 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | | 04:53 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | | 21:13 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | | 04:53 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | | 21:14 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | | 04:52 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | | 21:15 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | | 04:51 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | | 21:16 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | | 04:51 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | | 21:17 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | | 04:50 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | | 21:18 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | | 04:50 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | | 21:19 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | | 04:49 |
| | 16:16 | 17:08 | 17:58 | 19:50 | 20:40 | | 21:20 |
| 10 | 08:08 | 07:30 | 06:33 | 06:23 | 05:23 | | 04:49 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | | 21:21 |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | | 04:48 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | | 21:21 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | | 04:48 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | | 21:22 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | | 04:48 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | | 21:23 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | | 04:48 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | | 21:23 |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | | 04:47 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | | 21:24 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | | 04:47 |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | | 21:24 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | | 04:47 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | | 21:25 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | | 04:47 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | | 21:25 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 05:35 (WEA II-26) | 04:47 |
| | 16:31 | 17:26 | 18:15 | 20:07 | 20:55 | 2 05:37 (WEA II-26) | 21:26 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:08 | 05:34 (WEA II-26) | 04:47 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 5 05:39 (WEA II-26) | 21:26 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 05:33 (WEA II-26) | 04:47 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 7 05:40 (WEA II-26) | 21:26 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 05:32 (WEA II-26) | 04:48 |
| | 16:36 | 17:31 | 18:20 | 20:12 | 21:00 | 8 05:40 (WEA II-26) | 21:26 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 05:31 (WEA II-26) | 04:48 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 10 05:41 (WEA II-26) | 21:27 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 05:30 (WEA II-26) | 04:48 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 11 05:41 (WEA II-26) | 21:27 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 05:29 (WEA II-26) | 04:48 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 13 05:42 (WEA II-26) | 21:27 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 05:28 (WEA II-26) | 04:49 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 14 05:42 (WEA II-26) | 21:27 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 05:27 (WEA II-26) | 04:49 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 15 05:42 (WEA II-26) | 21:27 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 05:26 (WEA II-26) | 04:50 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 16 05:42 (WEA II-26) | 21:27 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 05:25 (WEA II-26) | 04:50 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 17 05:42 (WEA II-26) | 21:26 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 05:24 (WEA II-26) | 04:51 |
| | 16:50 | | 19:34 | 20:25 | 21:10 | 18 05:42 (WEA II-26) | 21:26 |
| 31 | 07:47 | | 06:45 | | 04:55 | 05:23 (WEA II-26) | |
| | 16:51 | | 19:35 | | 21:11 | 19 05:42 (WEA II-26) | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | | 497 |
| astr.max.mögl.Beschattung | | | | | 155 | | 441 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: SR-02 - SR-02, Gartenweg 1, 01979 Kostebrau
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Juli | August | September | Oktober | November | Dezember | |
|---------------------------|-------|-------------------|-----------|---------|----------|----------|-------|
| 1 | 04:51 | 05:31 (WEA II-26) | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 21:26 | 05:46 (WEA II-26) | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 04:52 | 05:31 (WEA II-26) | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 21:26 | 05:46 (WEA II-26) | 20:53 | 19:51 | 18:43 | 16:38 | 16:00 |
| 3 | 04:53 | 05:31 (WEA II-26) | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 21:25 | 05:47 (WEA II-26) | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 04:54 | 05:31 (WEA II-26) | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 21:25 | 05:48 (WEA II-26) | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 04:54 | 05:31 (WEA II-26) | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| | 21:24 | 05:48 (WEA II-26) | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 04:55 | 05:30 (WEA II-26) | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 21:24 | 05:48 (WEA II-26) | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 04:56 | 05:31 (WEA II-26) | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 21:23 | 05:48 (WEA II-26) | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 04:57 | 05:31 (WEA II-26) | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 21:23 | 05:49 (WEA II-26) | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 04:58 | 05:31 (WEA II-26) | 05:40 | 06:29 | 07:18 | 07:11 | 07:58 |
| | 21:22 | 05:49 (WEA II-26) | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 04:59 | 05:31 (WEA II-26) | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 |
| | 21:21 | 05:50 (WEA II-26) | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 05:00 | 05:31 (WEA II-26) | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 21:21 | 05:50 (WEA II-26) | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 05:01 | 05:31 (WEA II-26) | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 21:20 | 05:50 (WEA II-26) | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 05:02 | 05:32 (WEA II-26) | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 21:19 | 05:51 (WEA II-26) | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 05:03 | 05:33 (WEA II-26) | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 21:18 | 05:51 (WEA II-26) | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 05:04 | 05:34 (WEA II-26) | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 21:17 | 05:51 (WEA II-26) | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 05:05 | 05:35 (WEA II-26) | 05:51 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 21:16 | 05:51 (WEA II-26) | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 05:07 | 05:36 (WEA II-26) | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 21:15 | 05:51 (WEA II-26) | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 05:08 | 05:38 (WEA II-26) | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 21:14 | 05:51 (WEA II-26) | 20:24 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 05:09 | 05:39 (WEA II-26) | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 21:13 | 05:51 (WEA II-26) | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 05:10 | 05:40 (WEA II-26) | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 21:12 | 05:51 (WEA II-26) | 20:19 | 19:10 | 18:03 | 16:11 | 15:57 |
| 21 | 05:12 | 05:41 (WEA II-26) | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 21:11 | 05:50 (WEA II-26) | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 05:13 | 05:42 (WEA II-26) | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 21:09 | 05:49 (WEA II-26) | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 05:14 | 05:44 (WEA II-26) | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 21:08 | 05:50 (WEA II-26) | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 05:16 | 05:45 (WEA II-26) | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 21:07 | 05:49 (WEA II-26) | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 05:17 | 05:46 (WEA II-26) | 06:05 | 06:55 | 06:45 | 07:38 | 08:10 |
| | 21:05 | 05:47 (WEA II-26) | 20:09 | 18:59 | 16:53 | 16:05 | 16:00 |
| 26 | 05:19 | | 06:07 | 06:56 | 06:47 | 07:40 | 08:10 |
| | 21:04 | | 20:07 | 18:56 | 16:51 | 16:04 | 16:01 |
| 27 | 05:20 | | 06:08 | 06:58 | 06:48 | 07:41 | 08:11 |
| | 21:02 | | 20:05 | 18:54 | 16:49 | 16:03 | 16:01 |
| 28 | 05:21 | | 06:10 | 06:59 | 06:50 | 07:43 | 08:11 |
| | 21:01 | | 20:02 | 18:52 | 16:47 | 16:02 | 16:02 |
| 29 | 05:23 | | 06:11 | 07:01 | 06:52 | 07:44 | 08:11 |
| | 21:00 | | 20:00 | 18:50 | 16:45 | 16:02 | 16:03 |
| 30 | 05:24 | | 06:13 | 07:03 | 06:54 | 07:46 | 08:11 |
| | 20:58 | | 19:58 | 18:47 | 16:43 | 16:01 | 16:04 |
| 31 | 05:26 | | 06:15 | | 06:55 | | 08:11 |
| | 20:56 | | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 500 | | 453 | 381 | 332 | 268 | 246 |
| astr.max.mögl.Beschattung | 356 | | | | | | |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender

Berechnung: Gesamtbelastung Schattenrezeptor: SR-03 - SR-03, Römerkeller Straße 3, 01979 Kostebrau
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | | Juli | August | September | Oktober | November | Dezember | |
|---------------------------|--------|---------|-------|-------|-------|-------|---|-------------------|--------|-----------|---------|----------|----------|-------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 | |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 | |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 16:00 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 | |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 | |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 | |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 | |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 | |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 | |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 | |
| | 16:16 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:08 | 07:30 | 06:33 | 06:23 | 05:23 | 04:49 | | 04:59 | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 | |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 | |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 | |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 | |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:48 | | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 | |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | 04:47 | | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 | |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:05 | |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:24 | | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 | |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 | |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 1 | 05:18 (WEA II-26) | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | | 05:17 (WEA II-26) | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:31 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 1 | 05:18 (WEA II-26) | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:08 | 04:47 | | 05:17 (WEA II-26) | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 1 | 05:18 (WEA II-26) | 21:12 | 20:19 | 19:10 | 18:03 | 16:11 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | | 05:17 (WEA II-26) | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 1 | 05:18 (WEA II-26) | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:48 | | 05:18 (WEA II-26) | 05:13 | 06:00 | 06:50 | 07:40 | 08:09 | 08:09 |
| | 16:36 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 1 | 05:19 (WEA II-26) | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | | 05:18 (WEA II-26) | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 1 | 05:19 (WEA II-26) | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | | 05:18 (WEA II-26) | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 1 | 05:18 (WEA II-26) | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | | 05:17 (WEA II-26) | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | | 05:19 | 06:07 | 06:56 | 07:46 | 07:40 | 08:10 | |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:01 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 | |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 | |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:49 | 06:50 | 05:43 | 04:57 | 04:50 | | | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 | |
| | 16:48 | 06:50 | 05:43 | 04:57 | 04:50 | | | 20:59 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | | | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 | |
| | 16:50 | 19:34 | 20:25 | 21:10 | 21:26 | | | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:45 | 04:55 | | | | 05:26 | 06:15 | | 07:05 | 07:05 | 08:11 | |
| | 16:51 | 19:35 | | 21:11 | | | | 20:56 | 19:56 | | 16:42 | | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | | 500 | 453 | 381 | 332 | 268 | 246 | |
| astr.max.mögl.Beschattung | | | | | | 7 | | | | | | | | |

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

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

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

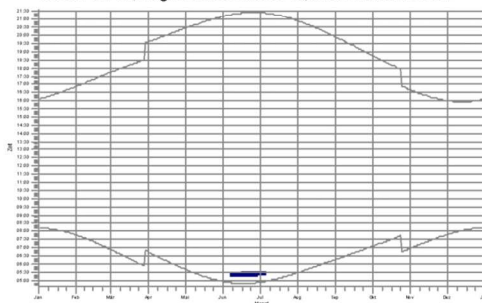
Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
 Bonifatiusstr. 400
 DE-48432 Rheine
 +49 5971 9710-31
 Bunk / bunk@koetter-consulting.com
 Berechnet:
 07.11.2018 07:49/3.2.712

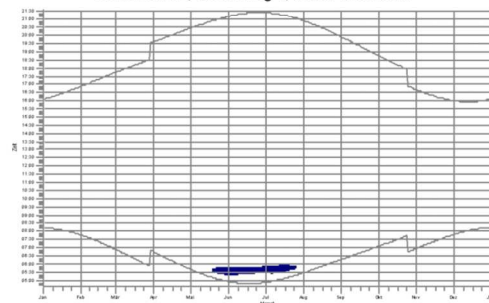
SHADOW - Grafischer Kalender

Berechnung: Gesamtbelastung

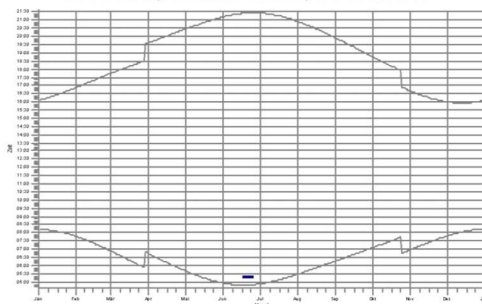
SR-01: SR-01, August-Bebel-Straße 10, 01979 Lauchhammer



SR-02: SR-02, Gartenweg 1, 01979 Kostebrau



SR-03: SR-03, Römerkeller Straße 3, 01979 Kostebrau



WEA
 ■ WEA 11.26 - VESTAS V150-4.2 4200 150 0 10 166.0 m (546 242.6 m) (3)

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-20 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (3)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
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Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-21 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (4)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-22 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (5)

Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:15 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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



Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-23 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (6)

Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:55 | 04:51 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:27 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTNER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung **WEA:** WEA II-24 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (7)

Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember | |
|----|-----------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|
| 1 | 08:11 16:06 | 07:45 16:53 | 06:52 17:44 | 06:43 19:37 | 05:39 20:27 | 04:54 21:12 | 04:51 21:26 | 05:27 20:55 | 06:16 19:54 | 07:04 18:45 | 06:57 16:40 | 07:47 16:00 | |
| 2 | 08:11 16:07 | 07:43 16:55 | 06:50 17:46 | 06:40 19:39 | 05:37 20:29 | 04:53 21:13 | 04:52 21:26 | 05:29 20:53 | 06:18 19:51 | 07:06 18:43 | 06:59 16:38 | 07:49 15:59 | |
| 3 | 08:11 16:08 | 07:42 16:57 | 06:48 17:47 | 06:38 19:40 | 05:35 20:30 | 04:53 21:14 | 04:53 21:25 | 05:30 20:51 | 06:19 19:49 | 07:07 18:40 | 07:01 16:36 | 07:50 15:59 | |
| 4 | 08:11 16:09 | 07:40 16:58 | 06:46 17:49 | 06:36 19:42 | 05:33 20:32 | 04:52 21:15 | 04:53 21:25 | 05:32 20:50 | 06:21 19:47 | 07:09 18:38 | 07:02 16:34 | 07:52 15:58 | |
| 5 | 08:10 16:10 | 07:39 17:00 | 06:44 17:51 | 06:34 19:44 | 05:31 20:34 | 04:51 21:16 | 04:54 21:24 | 05:33 20:48 | 06:22 19:45 | 07:11 18:36 | 07:04 16:33 | 07:53 15:58 | |
| 6 | 08:10 16:12 | 07:37 17:02 | 06:42 17:53 | 06:31 19:45 | 05:29 20:35 | 04:51 21:17 | 04:55 21:24 | 05:35 20:46 | 06:24 19:42 | 07:12 18:34 | 07:06 16:31 | 07:54 15:57 | |
| 7 | 08:10 16:13 | 07:35 17:04 | 06:39 17:54 | 06:29 19:47 | 05:28 20:37 | 04:50 21:18 | 04:56 21:23 | 05:36 20:45 | 06:26 19:40 | 07:14 18:31 | 07:08 16:29 | 07:55 15:57 | |
| 8 | 08:09 16:14 | 07:34 17:06 | 06:37 17:56 | 06:27 19:49 | 05:26 20:38 | 04:49 21:19 | 04:57 21:23 | 05:38 20:43 | 06:27 19:38 | 07:16 18:29 | 07:10 16:28 | 07:57 15:57 | |
| 9 | 08:09 16:15 | 07:32 17:08 | 06:35 17:58 | 06:25 19:50 | 05:24 20:40 | 04:49 21:20 | 04:58 21:22 | 05:39 20:41 | 06:29 19:36 | 07:17 18:27 | 07:11 16:26 | 07:58 15:56 | |
| 10 | 08:08 16:17 | 07:30 17:09 | 06:33 18:00 | 06:22 19:52 | 05:23 20:42 | 04:49 21:21 | 04:59 21:21 | 05:41 20:39 | 06:30 19:33 | 07:19 18:25 | 07:13 16:24 | 07:59 15:56 | |
| 11 | 08:08 16:18 | 07:28 17:11 | 06:30 18:01 | 06:20 19:54 | 05:21 20:43 | 04:48 21:21 | 05:00 21:21 | 05:43 20:37 | 06:32 19:31 | 07:21 18:22 | 07:15 16:23 | 08:00 15:56 | |
| 12 | 08:07 16:20 | 07:26 17:13 | 06:28 18:03 | 06:18 19:55 | 05:19 20:45 | 04:48 21:22 | 05:01 21:20 | 05:44 20:35 | 06:34 19:29 | 07:22 18:20 | 07:17 16:21 | 08:01 15:56 | |
| 13 | 08:07 16:21 | 07:25 17:15 | 06:26 18:05 | 06:16 19:57 | 05:18 20:46 | 04:48 21:23 | 05:02 21:19 | 05:46 20:33 | 06:35 19:26 | 07:24 18:18 | 07:18 16:20 | 08:02 15:56 | |
| 14 | 08:06 16:23 | 07:23 17:17 | 06:24 18:07 | 06:14 19:59 | 05:16 20:48 | 04:47 21:23 | 05:03 21:18 | 05:47 20:31 | 06:37 19:24 | 07:26 18:16 | 07:20 16:18 | 08:03 15:56 | |
| 15 | 08:05 16:24 | 07:21 17:19 | 06:21 18:08 | 06:11 20:00 | 05:15 20:49 | 04:47 21:24 | 05:04 21:17 | 05:49 20:29 | 06:38 19:22 | 07:28 18:14 | 07:22 16:17 | 08:04 15:56 | |
| 16 | 08:04 16:26 | 07:19 17:20 | 06:19 18:10 | 06:09 20:02 | 05:13 20:51 | 04:47 21:24 | 05:05 21:16 | 05:50 20:27 | 06:40 19:19 | 07:29 18:12 | 07:23 16:16 | 08:05 15:56 | |
| 17 | 08:03 16:27 | 07:17 17:22 | 06:17 18:12 | 06:07 20:04 | 05:12 20:52 | 04:47 21:25 | 05:07 21:15 | 05:52 20:25 | 06:42 19:17 | 07:31 18:10 | 07:25 16:14 | 08:05 15:56 | |
| 18 | 08:02 16:29 | 07:15 17:24 | 06:15 18:13 | 06:05 20:05 | 05:10 20:54 | 04:47 21:25 | 05:08 21:14 | 05:54 20:23 | 06:43 19:15 | 07:33 18:07 | 07:27 16:13 | 08:06 15:56 | |
| 19 | 08:01 16:30 | 07:13 17:26 | 06:12 18:15 | 06:03 20:07 | 05:09 20:55 | 04:47 21:26 | 05:09 21:13 | 05:55 20:21 | 06:45 19:13 | 07:34 18:05 | 07:29 16:12 | 08:07 15:57 | |
| 20 | 08:00 16:32 | 07:11 17:28 | 06:10 18:17 | 06:01 20:09 | 05:07 20:57 | 04:47 21:26 | 05:10 21:12 | 05:57 20:19 | 06:46 19:10 | 07:36 18:03 | 07:30 16:10 | 08:08 15:57 | |
| 21 | 07:59 16:34 | 07:09 17:30 | 06:08 18:18 | 05:59 20:10 | 05:06 20:58 | 04:47 21:26 | 05:12 21:10 | 05:58 20:17 | 06:48 19:08 | 07:38 18:01 | 07:32 16:09 | 08:08 15:57 | |
| 22 | 07:58 16:35 | 07:07 17:31 | 06:05 18:20 | 05:57 20:12 | 05:05 21:00 | 04:47 21:26 | 05:13 21:09 | 06:00 20:15 | 06:50 19:06 | 07:40 17:59 | 07:34 16:08 | 08:09 15:58 | |
| 23 | 07:57 16:37 | 07:05 17:33 | 06:03 18:22 | 05:55 20:14 | 05:04 21:01 | 04:48 21:27 | 05:14 21:08 | 06:02 20:13 | 06:51 19:03 | 07:41 17:57 | 07:35 16:07 | 08:09 15:58 | |
| 24 | 07:56 16:39 | 07:03 17:35 | 06:01 18:24 | 05:52 20:15 | 05:02 21:02 | 04:48 21:27 | 05:16 21:08 | 06:03 20:13 | 06:53 19:03 | 07:43 17:57 | 07:37 16:07 | 08:10 15:58 | |
| 25 | 07:55 16:41 | 07:01 17:37 | 06:00 18:25 | 05:50 20:17 | 05:01 21:04 | 04:48 21:27 | 05:17 21:05 | 06:05 20:09 | 06:54 18:59 | 07:45 16:53 | 07:38 16:05 | 08:10 16:00 | |
| 26 | 07:53 16:42 | 06:59 17:38 | 05:56 18:27 | 05:48 20:19 | 05:00 21:05 | 04:49 21:27 | 05:18 21:04 | 06:06 20:07 | 06:56 18:56 | 07:47 16:51 | 07:40 16:04 | 08:10 16:00 | |
| 27 | 07:52 16:44 | 06:57 17:40 | 05:54 18:29 | 05:46 20:20 | 04:59 21:06 | 04:49 21:27 | 05:20 21:02 | 06:08 20:05 | 06:58 18:54 | 07:48 16:49 | 07:41 16:03 | 08:11 16:01 | |
| 28 | 07:51 16:46 | 06:55 17:42 | 05:52 18:30 | 05:44 20:22 | 04:58 21:07 | 04:50 21:27 | 05:21 21:01 | 06:10 20:02 | 06:59 18:52 | 07:50 16:47 | 07:43 16:02 | 08:11 16:02 | |
| 29 | 07:49 16:48 | | 06:49 19:32 | 05:43 20:24 | 04:57 21:09 | 04:50 21:26 | 05:23 20:59 | 06:11 20:00 | 07:01 18:50 | 07:52 16:45 | 07:44 16:01 | 08:11 16:03 | |
| 30 | 07:48 16:49 | | 06:47 19:34 | 05:41 20:25 | 04:56 21:10 | 04:51 21:26 | 05:24 20:58 | 06:13 19:58 | 07:03 18:47 | 07:54 16:43 | 07:46 16:01 | 08:11 16:04 | |
| 31 | 07:46 16:51 | | 06:45 19:35 | | 04:55 21:11 | | 05:26 20:56 | 06:14 19:56 | | 06:55 16:41 | | 08:11 16:05 | |
| | Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| | Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-25 - VESTAS V150-4.2 4200 150.0 !O! NH: 166,0 m (Ges:241,0 m) (8)

Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 16:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 16:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 16:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 16:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 06:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 16:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 06:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 16:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:15 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-01 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (2)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-02 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (3)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:27 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-03 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (4)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
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| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:44 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-04 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (5)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:44 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 16:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 16:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 16:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 16:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 16:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 16:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTNER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-05 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (6)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-06 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (7)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:52 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 16:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 16:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 16:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:49 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 16:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 06:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 16:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 06:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 16:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-07 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (8)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:55 | 04:50 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-08 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (9)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-09 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (10)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:52 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:49 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:42 | 05:34 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:36 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 21:00 | 20:00 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:34 | 04:55 | 04:50 | 05:26 | 06:14 | 07:06 | 07:57 | 07:49 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:27 | 21:00 | 20:00 | 18:45 | 17:41 | 16:01 | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-10 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (11)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:52 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:56 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:42 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:19 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:11 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:11 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:49 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:47 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-11 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (12)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:42 | 05:34 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 21:00 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:36 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 21:00 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:34 | 04:55 | 04:50 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:27 | 21:00 | 19:56 | 18:46 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-12 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (13)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-13 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (14)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:52 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:56 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:42 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:19 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:11 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:11 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:49 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:40 | 04:55 | 04:50 | 05:26 | 06:14 | 07:04 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-14 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (15)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| 1 | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 2 | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| 3 | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| 4 | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 5 | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| 6 | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 7 | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:57 |
| 8 | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| 9 | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 10 | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 11 | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:17 | 08:01 |
| 12 | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 13 | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 14 | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 15 | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| 16 | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| 17 | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 18 | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 19 | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 20 | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 21 | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:33 | 08:09 |
| 22 | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 23 | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 24 | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| 25 | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 26 | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| 27 | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 28 | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| 29 | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| 30 | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| 31 | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-15 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (16)

Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| 1 | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 2 | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| 3 | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| 4 | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 5 | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| 6 | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 7 | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:57 |
| 8 | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| 9 | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 10 | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 11 | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| 12 | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 13 | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 14 | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| 15 | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| 16 | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| 17 | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 18 | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| 19 | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| 20 | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 21 | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:33 | 08:09 |
| 22 | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 23 | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 24 | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| 25 | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| 26 | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| 27 | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 28 | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:42 | 05:34 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| 29 | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:34 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| 30 | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:32 | 04:55 | 04:50 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| 31 | 16:51 | 17:47 | 18:35 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-16 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (17)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:52 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:56 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:42 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:47 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:11 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:49 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 21:01 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 21:01 | 20:00 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:41 | 04:55 | 04:51 | 05:26 | 06:14 | 07:05 | 07:57 | 07:49 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 21:01 | 20:00 | 18:45 | 17:41 | 16:01 | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-17 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (18)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-18 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (19)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:50 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:48 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:04 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-19 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (20)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:40 | 04:55 | 04:51 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-24 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (21)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:41 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:14 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:39 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-25 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (22)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-26 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (23)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
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| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:42 | 05:34 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:36 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:34 | 04:55 | 04:51 | 05:26 | 06:14 | 07:04 | 07:55 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:27 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-27 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (24)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:33 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:22 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:14 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:41 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:14 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:49 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-28 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (25)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:06 | 07:57 | 07:48 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-29 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (26)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:39 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-30 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (27)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:32 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:22 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:41 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:14 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:49 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:40 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA I-31 - VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (28)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:41 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:14 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-01 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (29)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-02 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (30)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:27 | 21:02 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-03 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (31)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-04 - VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges:196,0 m) (32)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-05 - VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges:196,0 m) (33)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-06 - VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges:196,0 m) (34)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-07 - VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges:196,0 m) (35)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:37 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:35 | 04:48 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:33 | 04:46 | 04:55 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-08 - VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges:196,0 m) (36)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:04 | 07:54 | 07:46 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-09 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (37)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:22 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:57 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:56 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-10 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (38)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:16 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:31 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:19 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:46 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-11 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (39)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:19 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:40 | 04:55 | 04:55 | 04:55 | 05:26 | 06:14 | 07:04 | 07:55 | 07:48 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-12 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (40)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:57 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-13 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (41)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:00 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:38 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:22 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:57 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:24 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:14 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:56 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:54 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:41 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-14 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (42)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:16 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:48 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:31 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:11 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:36 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:19 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:29 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:45 | 18:33 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:14 | 07:04 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:47 | 18:35 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:40 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA II-16 - VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (43)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:54 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:22 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:57 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:57 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:48 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 496 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S01 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (48)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:53 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:52 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:31 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:47 | 19:43 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:36 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:56 |
| 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:24 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:51 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:22 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:27 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:24 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:22 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:01 | 20:50 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:53 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:35 | 07:29 | 08:07 |
| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 | |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:39 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:11 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:57 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 06:52 | 07:45 | 07:45 | 08:11 |
| 16:48 | 17:48 | 18:37 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 06:54 | 07:46 | 07:46 | 08:11 |
| 16:49 | 17:49 | 18:38 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:15 | 07:05 | 06:56 | 07:48 | 07:48 | 08:11 |
| 16:51 | 17:51 | 18:40 | 20:28 | 21:11 | 21:27 | 20:57 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 | |
| Sonnenscheinstunden | 260 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S02 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (49)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:53 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:52 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:31 | 21:14 | 21:25 | 20:52 | 19:49 | 18:41 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:43 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:36 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:56 |
| 16:13 | 17:04 | 17:55 | 19:47 | 20:37 | 21:18 | 21:24 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:18 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:51 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:23 | 05:23 | 04:49 | 04:59 | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:22 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:27 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:22 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:01 | 20:50 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:53 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:35 | 07:29 | 08:07 |
| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 | |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:39 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:11 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:57 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 06:52 | 07:45 | 07:45 | 08:11 |
| 16:48 | 17:48 | 18:37 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 06:54 | 07:46 | 07:46 | 08:11 |
| 16:49 | 17:49 | 18:38 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:15 | 07:05 | 06:56 | 07:47 | 07:47 | 08:11 |
| 16:51 | 17:51 | 18:40 | 20:28 | 21:11 | 21:27 | 20:57 | 19:56 | 18:45 | 17:40 | 16:02 | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S03 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (50)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:53 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:52 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:41 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:43 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:56 |
| | 16:13 | 17:04 | 17:55 | 19:47 | 20:37 | 21:18 | 21:24 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:18 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:51 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:23 | 05:23 | 04:49 | 04:59 | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:22 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:27 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:22 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:50 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:53 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:35 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:47 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:39 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:11 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:57 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:15 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:27 | 20:57 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S04 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (51)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 1 | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 2 | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 3 | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 4 | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 5 | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 6 | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:56 |
| 7 | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:24 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 8 | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
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| 9 | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 10 | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 11 | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:22 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 12 | 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 13 | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 14 | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 15 | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16 | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 17 | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 18 | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 19 | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 20 | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 21 | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 22 | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 23 | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 24 | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| 25 | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 26 | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 27 | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 28 | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| 29 | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| 30 | 16:49 | 17:45 | 18:34 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 04:50 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| 31 | 16:51 | 17:47 | 18:35 | 20:27 | 21:11 | 21:26 | 20:57 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 260 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S05 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (52)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:53 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:43 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:56 |
| 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:24 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:51 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:22 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:27 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:22 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 | |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:10 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:57 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 06:52 | 07:45 | 07:45 | 08:11 |
| 16:48 | 17:48 | 18:37 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 06:54 | 07:46 | 07:46 | 08:11 |
| 16:49 | 17:49 | 18:38 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:15 | 07:05 | 06:55 | 07:47 | 07:47 | 08:11 |
| 16:51 | 17:51 | 18:40 | 20:28 | 21:11 | 21:27 | 20:57 | 19:56 | 18:45 | 17:40 | 16:02 | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung **WEA:** WEA S06 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (53)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:53 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:59 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:43 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:50 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:40 | 06:29 | 07:18 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:51 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:31 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:10 | 18:00 | 19:52 | 20:42 | 21:21 | 21:22 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:27 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:22 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:21 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:04 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:20 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:59 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:49 | 05:00 | 04:49 | 05:18 | 06:07 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:57 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:50 | 06:50 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:55 | 04:55 | 05:26 | 06:15 | 07:05 | 07:56 | 07:48 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:27 | 20:57 | 19:56 | 18:45 | 17:40 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S07 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (54)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:25 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S08 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (55)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 1 | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 2 | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 3 | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 4 | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 5 | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 6 | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 7 | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 8 | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| 9 | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 10 | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 11 | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 12 | 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 13 | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 14 | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 15 | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16 | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 17 | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 18 | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 19 | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 20 | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 21 | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 22 | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 23 | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 24 | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| 25 | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 26 | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 27 | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 28 | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:50 | 05:43 | 04:57 | 04:50 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| 29 | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| 30 | 16:49 | 17:45 | 18:34 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:54 | 04:55 | 04:55 | 05:26 | 06:14 | 07:04 | 07:55 | 07:47 | 08:11 |
| 31 | 16:51 | 17:47 | 18:35 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:02 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S09 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (56)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:48 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:23 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:30 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:31 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:56 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:34 | 19:26 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:21 | 06:12 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 08:00 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:59 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:58 | |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:27 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:51 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:47 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:03 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:49 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 | |
| 16:48 | 17:48 | 18:36 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:02 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 | |
| 16:49 | 17:49 | 18:37 | 20:26 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:15 | 07:06 | 07:57 | 07:49 | 08:11 | |
| 16:51 | 17:51 | 18:39 | 20:28 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:40 | 16:02 | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S10 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (57)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:15 | 15:56 | |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:06 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
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| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 | |
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| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:03 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:49 | 06:49 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 | |
| 16:48 | 17:48 | 18:37 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 | |
| 16:49 | 17:49 | 18:38 | 20:25 | 21:10 | 21:26 | 21:00 | 20:00 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 | |
| 16:51 | 17:47 | 18:35 | 20:21 | 21:11 | 21:25 | 21:00 | 20:00 | 18:47 | 17:43 | 16:01 | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S11 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (58)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:51 | 08:42 | 07:45 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:53 | 08:44 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | 06:45 | 05:39 | 04:55 | 04:51 | 05:26 | 06:14 | 07:04 | 07:54 | 08:45 | 07:46 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:27 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S12 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (59)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 | |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 | |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 | |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 | |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 | |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| 16:11 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 | |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 | |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 | |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 | |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 | |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 | |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 | |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 | |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 | |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 | |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:24 | 08:05 |
| 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 | |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 | |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 | |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 | |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 | |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| 16:34 | 17:30 | 18:18 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 | |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 | |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 | |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 | |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 | |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 | |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 | |
| 28 | 07:51 | 06:55 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 | |
| 29 | 07:49 | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 | |
| 16:48 | 17:48 | 18:37 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 | |
| 30 | 07:48 | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 | |
| 16:49 | 17:49 | 18:38 | 20:25 | 21:10 | 21:26 | 21:00 | 20:00 | 18:47 | 17:43 | 16:01 | 16:04 | |
| 31 | 07:47 | 06:45 | 05:40 | 04:55 | 04:50 | 05:26 | 06:14 | 07:05 | 07:56 | 07:48 | 08:11 | |
| 16:51 | 17:51 | 18:40 | 20:26 | 21:11 | 21:26 | 21:00 | 20:00 | 18:47 | 17:43 | 16:01 | 16:05 | |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung WEA: WEA S13 - VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (60)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:44 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:26 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:08 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:52 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:03 | 07:52 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:11 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:34 | 21:16 | 21:25 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:42 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:13 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:45 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:10 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:10 | 07:57 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:39 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:28 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:18 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:36 | 18:27 | 16:26 | 15:56 |
| 10 | 08:09 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:42 | 21:21 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:21 | 20:37 | 19:31 | 18:23 | 16:23 | 15:56 |
| 12 | 08:07 | 07:27 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:23 | 07:17 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:07 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:23 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:07 | 19:59 | 20:48 | 21:23 | 21:18 | 20:32 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:28 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:01 | 20:49 | 21:24 | 21:17 | 20:30 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:51 | 06:40 | 07:29 | 07:24 | 08:05 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:28 | 19:20 | 18:12 | 16:16 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:06 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:26 | 19:17 | 18:10 | 16:14 | 15:56 |
| 18 | 08:03 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:06 | 20:54 | 21:25 | 21:14 | 20:24 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:02 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:29 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:26 | 21:13 | 20:22 | 19:13 | 18:05 | 16:12 | 15:57 |
| 20 | 08:01 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:08 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:12 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:30 | 18:19 | 20:11 | 20:58 | 21:26 | 21:11 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:06 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:40 | 07:34 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 21:00 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:27 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:53 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:10 |
| | 16:39 | 17:35 | 18:24 | 20:16 | 21:02 | 21:27 | 21:07 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:55 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:04 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:54 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:47 | 07:40 | 08:10 |
| | 16:42 | 17:39 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:42 | 08:11 |
| | 16:44 | 17:40 | 18:29 | 20:21 | 21:06 | 21:27 | 21:03 | 20:05 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:55 | 05:52 | 05:45 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:08 | 21:27 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | | 06:50 | 05:43 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:45 | 08:11 |
| | 16:48 | | 19:32 | 20:24 | 21:09 | 21:27 | 21:00 | 20:00 | 18:50 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | | 06:47 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:03 | 07:54 | 07:46 | 08:11 |
| | 16:49 | | 19:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:47 | | 06:45 | | 04:55 | | 05:26 | 06:14 | | 06:55 | | 08:11 |
| | 16:51 | | 19:35 | | 21:11 | | 20:56 | 19:56 | | 16:42 | | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 484 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung **WEA:** WEA S18 - VESTAS V90-2.0 GridStreamer 2000 90.0 IO! NH: 105,0 m (Ges:150,0 m) (61)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:53 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:33 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
| 13 | 08:06 | 07:25 | 06:26 | 06:16 | 05:18 | 04:48 | 05:02 | 05:46 | 06:35 | 07:24 | 07:18 | 08:02 |
| | 16:21 | 17:15 | 18:05 | 19:57 | 20:46 | 21:22 | 21:19 | 20:33 | 19:26 | 18:18 | 16:20 | 15:56 |
| 14 | 08:06 | 07:23 | 06:24 | 06:14 | 05:16 | 04:47 | 05:03 | 05:47 | 06:37 | 07:26 | 07:20 | 08:03 |
| | 16:23 | 17:17 | 18:06 | 19:59 | 20:48 | 21:23 | 21:18 | 20:31 | 19:24 | 18:16 | 16:18 | 15:56 |
| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
| | 16:24 | 17:19 | 18:08 | 20:00 | 20:49 | 21:24 | 21:17 | 20:29 | 19:22 | 18:14 | 16:17 | 15:56 |
| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
| | 16:26 | 17:20 | 18:10 | 20:02 | 20:51 | 21:24 | 21:16 | 20:27 | 19:19 | 18:12 | 16:15 | 15:56 |
| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
| | 16:27 | 17:22 | 18:12 | 20:04 | 20:52 | 21:25 | 21:15 | 20:25 | 19:17 | 18:09 | 16:14 | 15:56 |
| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
| | 16:29 | 17:24 | 18:13 | 20:05 | 20:54 | 21:25 | 21:14 | 20:23 | 19:15 | 18:07 | 16:13 | 15:56 |
| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
| | 16:30 | 17:26 | 18:15 | 20:07 | 20:55 | 21:25 | 21:13 | 20:21 | 19:12 | 18:05 | 16:12 | 15:57 |
| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
| | 16:32 | 17:28 | 18:17 | 20:09 | 20:57 | 21:26 | 21:11 | 20:19 | 19:10 | 18:03 | 16:10 | 15:57 |
| 21 | 07:59 | 07:09 | 06:08 | 05:59 | 05:06 | 04:47 | 05:12 | 05:58 | 06:48 | 07:38 | 07:32 | 08:08 |
| | 16:34 | 17:29 | 18:18 | 20:10 | 20:58 | 21:26 | 21:10 | 20:17 | 19:08 | 18:01 | 16:09 | 15:57 |
| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:08 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:54 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:26 | 21:05 | 20:09 | 18:59 | 16:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:26 | 21:04 | 20:07 | 18:56 | 16:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 16:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 16:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:47 | 05:42 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 16:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:45 | 05:41 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:44 | 18:32 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 16:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:43 | 05:39 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:46 | 18:34 | 20:26 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 16:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

Projekt:
214192-03 WP Lauchhammer

Lizenzierter Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Kalender pro WEA

Berechnung: Gesamtbelastung **WEA:** WEA S8ä - VESTAS V90-2.0 GridStreamer 2000 90.0 IO! NH: 105,0 m (Ges:150,0 m) (62)
Voraussetzungen für Berechnung des Schattenwurfs

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

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|-----------------------------|--------|---------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|
| 1 | 08:11 | 07:45 | 06:52 | 06:43 | 05:39 | 04:54 | 04:51 | 05:27 | 06:16 | 07:04 | 06:57 | 07:47 |
| | 16:06 | 16:53 | 17:44 | 19:37 | 20:27 | 21:12 | 21:26 | 20:55 | 19:54 | 18:45 | 16:40 | 16:00 |
| 2 | 08:11 | 07:43 | 06:50 | 06:40 | 05:37 | 04:53 | 04:52 | 05:29 | 06:18 | 07:06 | 06:59 | 07:49 |
| | 16:07 | 16:55 | 17:46 | 19:39 | 20:29 | 21:13 | 21:25 | 20:53 | 19:51 | 18:43 | 16:38 | 15:59 |
| 3 | 08:11 | 07:42 | 06:48 | 06:38 | 05:35 | 04:53 | 04:53 | 05:30 | 06:19 | 07:07 | 07:01 | 07:50 |
| | 16:08 | 16:57 | 17:47 | 19:40 | 20:30 | 21:14 | 21:25 | 20:51 | 19:49 | 18:40 | 16:36 | 15:59 |
| 4 | 08:11 | 07:40 | 06:46 | 06:36 | 05:33 | 04:52 | 04:53 | 05:32 | 06:21 | 07:09 | 07:02 | 07:51 |
| | 16:09 | 16:58 | 17:49 | 19:42 | 20:32 | 21:15 | 21:25 | 20:50 | 19:47 | 18:38 | 16:34 | 15:58 |
| 5 | 08:10 | 07:39 | 06:44 | 06:34 | 05:31 | 04:51 | 04:54 | 05:33 | 06:22 | 07:11 | 07:04 | 07:53 |
| | 16:10 | 17:00 | 17:51 | 19:44 | 20:33 | 21:16 | 21:24 | 20:48 | 19:45 | 18:36 | 16:33 | 15:58 |
| 6 | 08:10 | 07:37 | 06:41 | 06:31 | 05:29 | 04:51 | 04:55 | 05:35 | 06:24 | 07:12 | 07:06 | 07:54 |
| | 16:12 | 17:02 | 17:53 | 19:45 | 20:35 | 21:17 | 21:24 | 20:46 | 19:42 | 18:34 | 16:31 | 15:57 |
| 7 | 08:10 | 07:35 | 06:39 | 06:29 | 05:28 | 04:50 | 04:56 | 05:36 | 06:26 | 07:14 | 07:08 | 07:55 |
| | 16:13 | 17:04 | 17:54 | 19:47 | 20:37 | 21:18 | 21:23 | 20:44 | 19:40 | 18:31 | 16:29 | 15:57 |
| 8 | 08:09 | 07:34 | 06:37 | 06:27 | 05:26 | 04:49 | 04:57 | 05:38 | 06:27 | 07:16 | 07:09 | 07:56 |
| | 16:14 | 17:06 | 17:56 | 19:49 | 20:38 | 21:19 | 21:23 | 20:43 | 19:38 | 18:29 | 16:27 | 15:57 |
| 9 | 08:09 | 07:32 | 06:35 | 06:25 | 05:24 | 04:49 | 04:58 | 05:39 | 06:29 | 07:17 | 07:11 | 07:58 |
| | 16:15 | 17:08 | 17:58 | 19:50 | 20:40 | 21:20 | 21:22 | 20:41 | 19:35 | 18:27 | 16:26 | 15:56 |
| 10 | 08:08 | 07:30 | 06:33 | 06:22 | 05:23 | 04:49 | 04:59 | 05:41 | 06:30 | 07:19 | 07:13 | 07:59 |
| | 16:17 | 17:09 | 18:00 | 19:52 | 20:41 | 21:20 | 21:21 | 20:39 | 19:33 | 18:25 | 16:24 | 15:56 |
| 11 | 08:08 | 07:28 | 06:30 | 06:20 | 05:21 | 04:48 | 05:00 | 05:43 | 06:32 | 07:21 | 07:15 | 08:00 |
| | 16:18 | 17:11 | 18:01 | 19:54 | 20:43 | 21:21 | 21:20 | 20:37 | 19:31 | 18:22 | 16:23 | 15:56 |
| 12 | 08:07 | 07:26 | 06:28 | 06:18 | 05:19 | 04:48 | 05:01 | 05:44 | 06:34 | 07:22 | 07:16 | 08:01 |
| | 16:20 | 17:13 | 18:03 | 19:55 | 20:45 | 21:22 | 21:20 | 20:35 | 19:29 | 18:20 | 16:21 | 15:56 |
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| 15 | 08:05 | 07:21 | 06:21 | 06:11 | 05:15 | 04:47 | 05:04 | 05:49 | 06:38 | 07:27 | 07:22 | 08:04 |
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| 16 | 08:04 | 07:19 | 06:19 | 06:09 | 05:13 | 04:47 | 05:05 | 05:50 | 06:40 | 07:29 | 07:23 | 08:04 |
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| 17 | 08:03 | 07:17 | 06:17 | 06:07 | 05:12 | 04:47 | 05:07 | 05:52 | 06:42 | 07:31 | 07:25 | 08:05 |
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| 18 | 08:02 | 07:15 | 06:15 | 06:05 | 05:10 | 04:47 | 05:08 | 05:54 | 06:43 | 07:33 | 07:27 | 08:06 |
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| 19 | 08:01 | 07:13 | 06:12 | 06:03 | 05:09 | 04:47 | 05:09 | 05:55 | 06:45 | 07:34 | 07:28 | 08:07 |
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| 20 | 08:00 | 07:11 | 06:10 | 06:01 | 05:07 | 04:47 | 05:10 | 05:57 | 06:46 | 07:36 | 07:30 | 08:07 |
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| 22 | 07:58 | 07:07 | 06:05 | 05:57 | 05:05 | 04:47 | 05:13 | 06:00 | 06:50 | 07:39 | 07:33 | 08:09 |
| | 16:35 | 17:31 | 18:20 | 20:12 | 20:59 | 21:26 | 21:09 | 20:15 | 19:06 | 17:59 | 16:08 | 15:58 |
| 23 | 07:57 | 07:05 | 06:03 | 05:55 | 05:04 | 04:48 | 05:14 | 06:02 | 06:51 | 07:41 | 07:35 | 08:09 |
| | 16:37 | 17:33 | 18:22 | 20:14 | 21:01 | 21:26 | 21:08 | 20:13 | 19:03 | 17:57 | 16:07 | 15:58 |
| 24 | 07:56 | 07:03 | 06:01 | 05:52 | 05:02 | 04:48 | 05:16 | 06:03 | 06:53 | 07:43 | 07:37 | 08:09 |
| | 16:39 | 17:35 | 18:23 | 20:15 | 21:02 | 21:26 | 21:06 | 20:11 | 19:01 | 17:55 | 16:06 | 15:59 |
| 25 | 07:55 | 07:01 | 05:59 | 05:50 | 05:01 | 04:48 | 05:17 | 06:05 | 06:54 | 07:45 | 07:38 | 08:10 |
| | 16:41 | 17:37 | 18:25 | 20:17 | 21:03 | 21:27 | 21:05 | 20:09 | 18:59 | 17:53 | 16:05 | 16:00 |
| 26 | 07:53 | 06:59 | 05:56 | 05:48 | 05:00 | 04:49 | 05:18 | 06:06 | 06:56 | 07:46 | 07:40 | 08:10 |
| | 16:42 | 17:38 | 18:27 | 20:19 | 21:05 | 21:27 | 21:04 | 20:07 | 18:56 | 17:51 | 16:04 | 16:00 |
| 27 | 07:52 | 06:57 | 05:54 | 05:46 | 04:59 | 04:49 | 05:20 | 06:08 | 06:58 | 07:48 | 07:41 | 08:10 |
| | 16:44 | 17:40 | 18:28 | 20:20 | 21:06 | 21:26 | 21:02 | 20:04 | 18:54 | 17:49 | 16:03 | 16:01 |
| 28 | 07:51 | 06:54 | 05:52 | 05:44 | 04:58 | 04:50 | 05:21 | 06:10 | 06:59 | 07:50 | 07:43 | 08:11 |
| | 16:46 | 17:42 | 18:30 | 20:22 | 21:07 | 21:26 | 21:01 | 20:02 | 18:52 | 17:47 | 16:02 | 16:02 |
| 29 | 07:49 | 06:49 | 05:43 | 05:35 | 04:57 | 04:50 | 05:23 | 06:11 | 07:01 | 07:52 | 07:44 | 08:11 |
| | 16:48 | 17:44 | 18:32 | 20:24 | 21:08 | 21:26 | 20:59 | 20:00 | 18:49 | 17:45 | 16:01 | 16:03 |
| 30 | 07:48 | 06:47 | 05:41 | 05:33 | 04:56 | 04:51 | 05:24 | 06:13 | 07:02 | 07:53 | 07:46 | 08:11 |
| | 16:49 | 17:46 | 18:34 | 20:25 | 21:10 | 21:26 | 20:58 | 19:58 | 18:47 | 17:43 | 16:01 | 16:04 |
| 31 | 07:46 | 06:45 | 05:39 | 05:31 | 04:55 | 04:50 | 05:26 | 06:14 | 07:03 | 07:54 | 07:47 | 08:11 |
| | 16:51 | 17:48 | 18:36 | 20:27 | 21:11 | 21:26 | 20:56 | 19:56 | 18:45 | 17:41 | 16:01 | 16:05 |
| Sonnenscheinstunden | 261 | 278 | 367 | 415 | 483 | 497 | 500 | 453 | 381 | 332 | 268 | 246 |
| Anzahl Minuten mit Schatten | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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

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

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

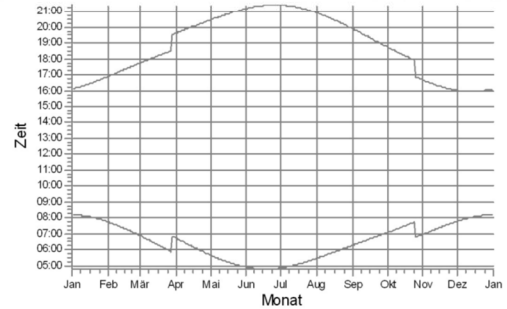
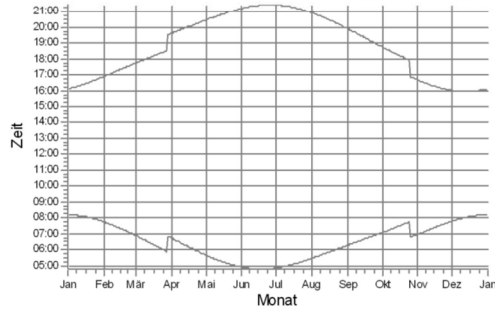
Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

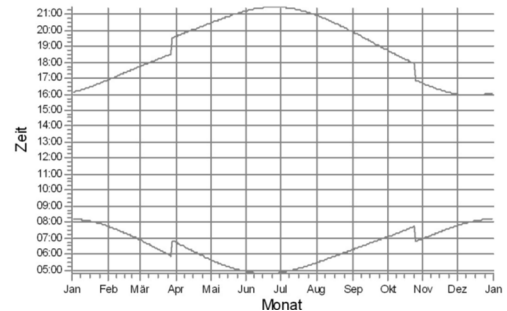
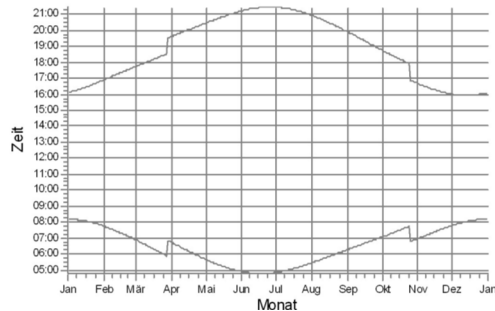
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung

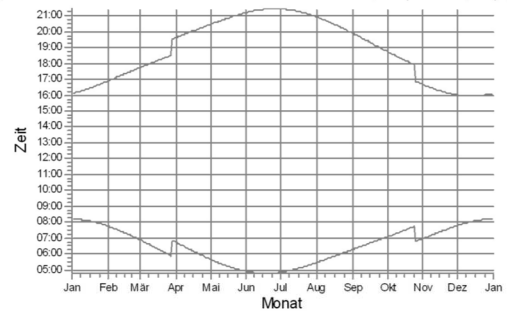
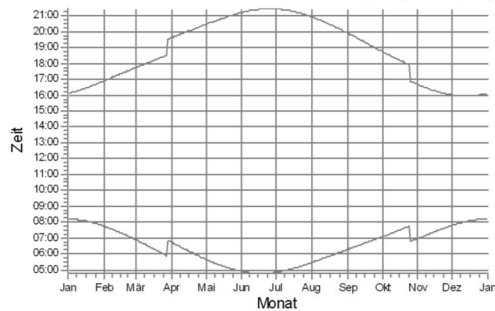
WEA II-20: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (WEA II-21: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (



WEA II-22: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (WEA II-23: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (



WEA II-24: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (WEA II-25: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m) (



Schattenrezeptoren

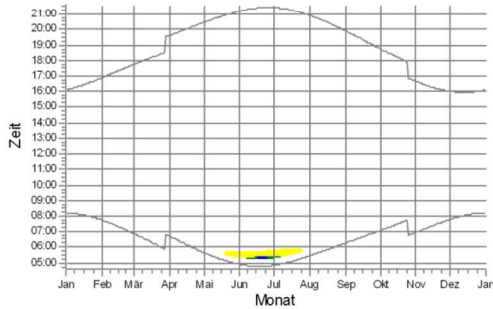
Projekt:
214192-03 WP Lauchhammer

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+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

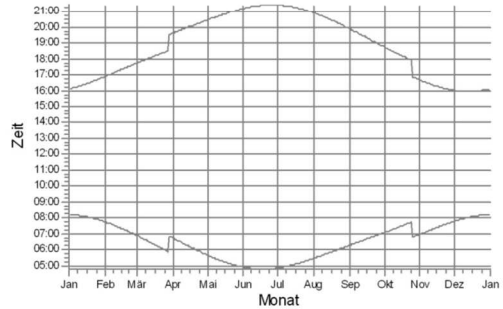
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung

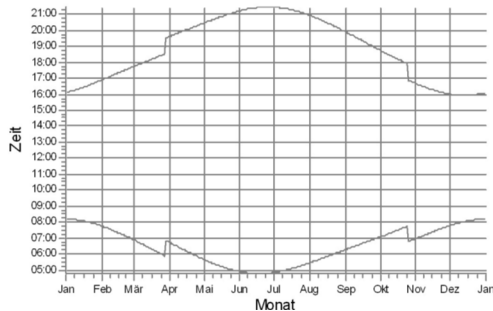
WEA II-26: VESTAS V150-4.2 4200 150.0 IO! NH: 166,0 m (Ges.:241,0 m)



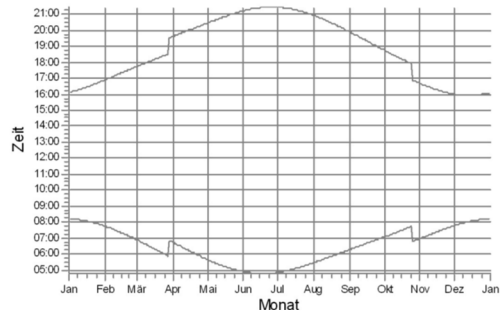
WEA I-01: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges.:252,0 m)



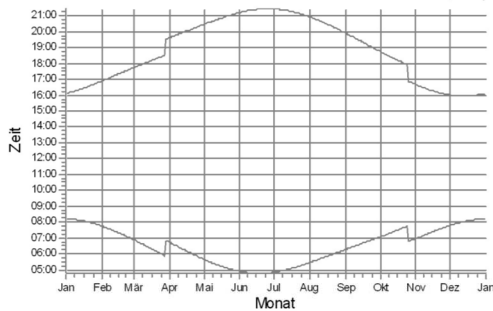
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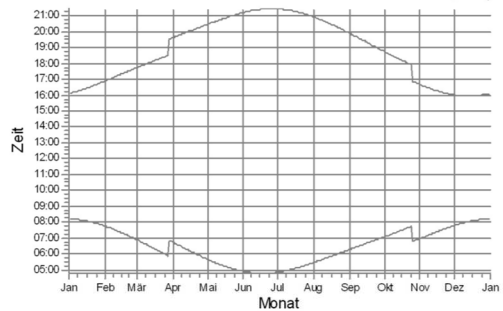
WEA I-03: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges.:252,0 m)



WEA I-04: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges.:252,0 m)



WEA I-05: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (Ges.:252,0 m)



Schattenrezeptoren

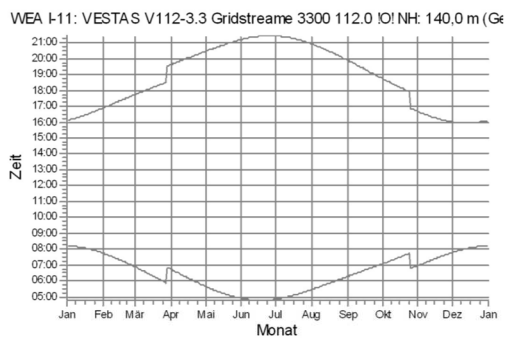
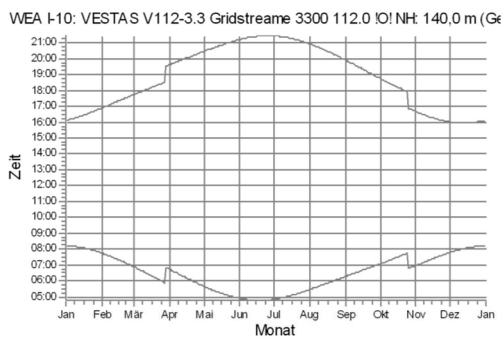
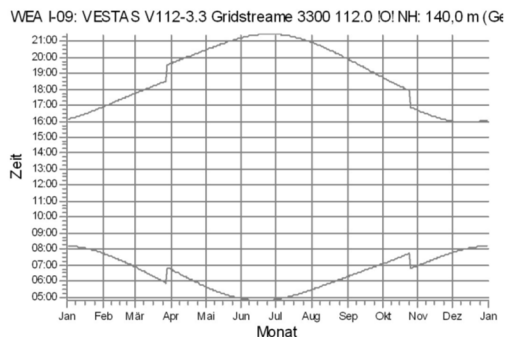
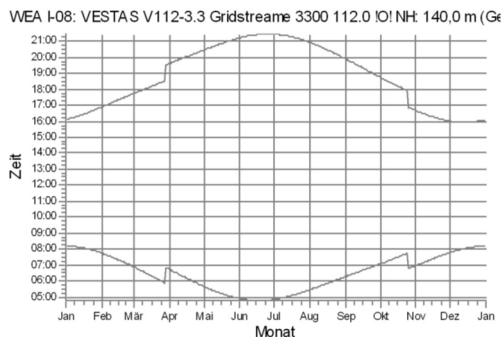
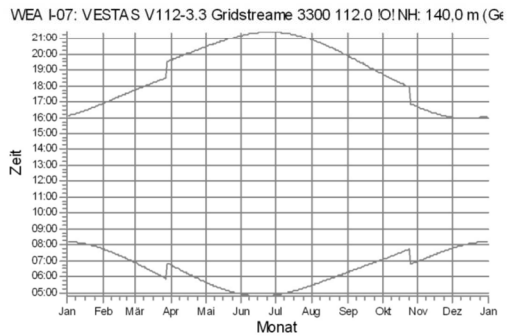
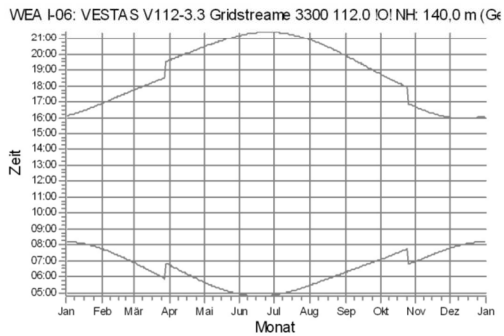
- SR-01: SR-01, August-Bebel-Straße 10, 01979 Lauchhammer
- SR-02: SR-02, Gartenweg 1, 01979 Kostebrau
- SR-03: SR-03, Römerkeller Straße 3, 01979 Kostebrau

Projekt:
214192-03 WP Lauchhammer

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Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



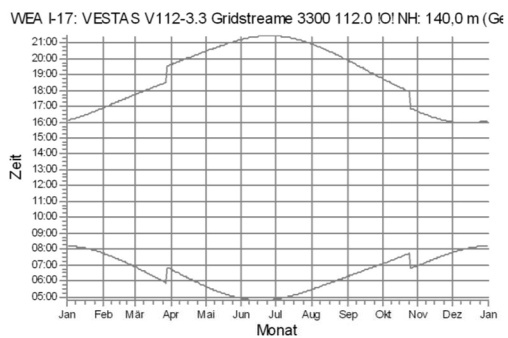
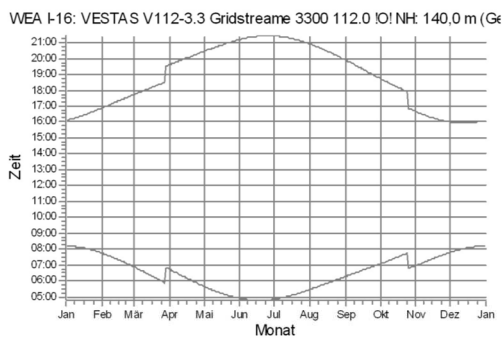
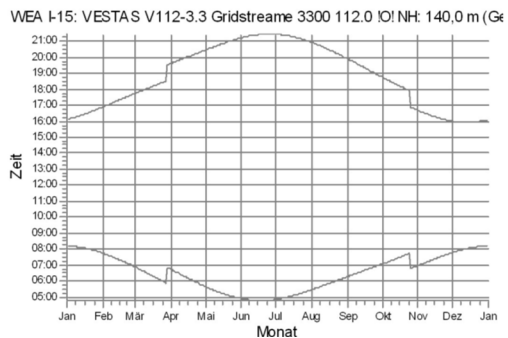
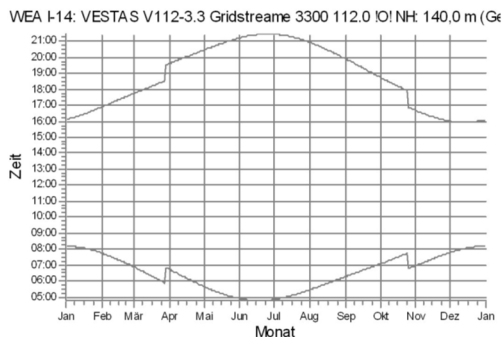
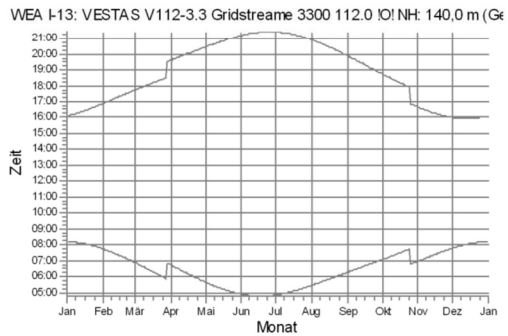
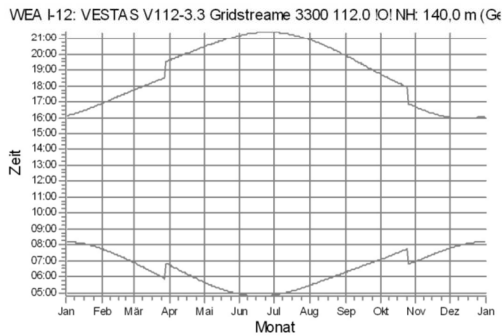
Schattenrezeptoren

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



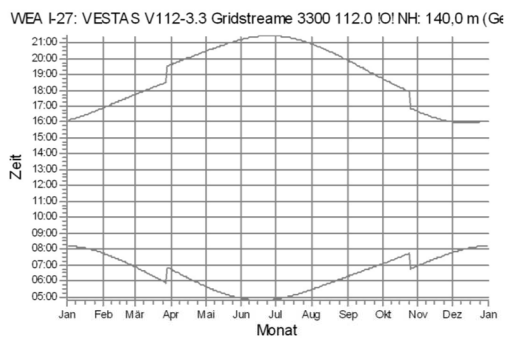
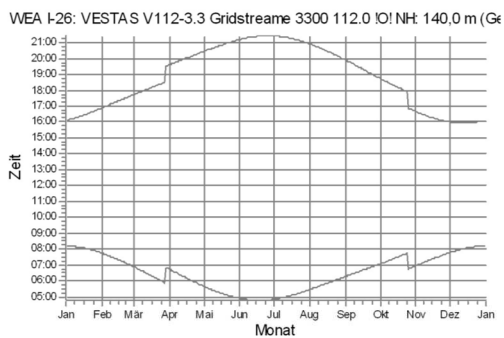
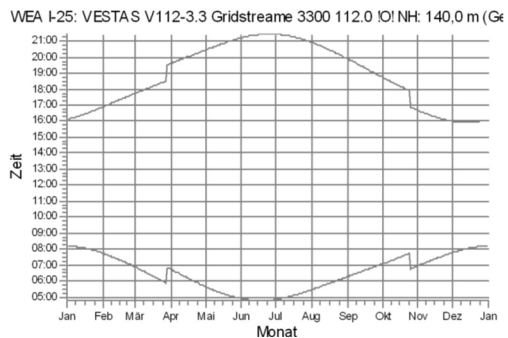
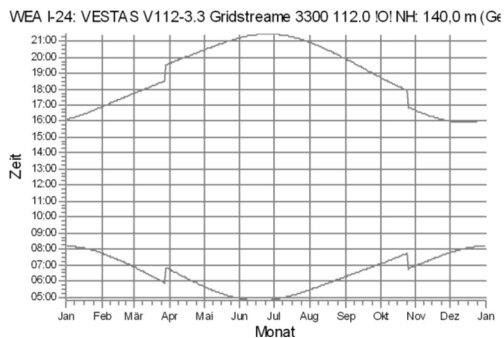
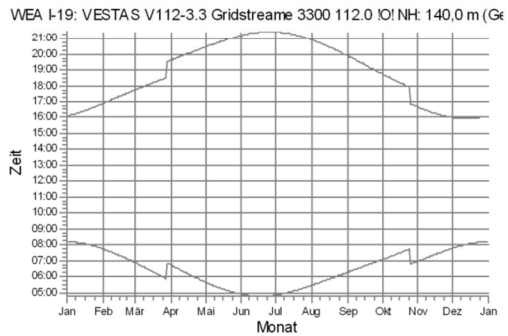
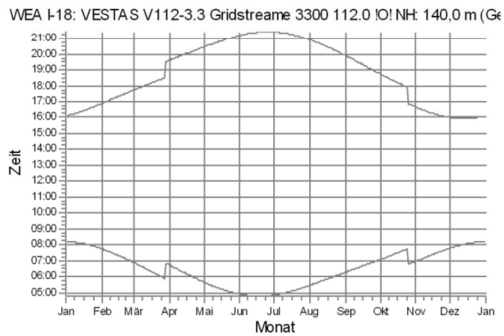
Schattenrezeptoren

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214192-03 WP Lauchhammer

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Berechnet:
07.11.2018 07:49/3.2.712

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



Schattenrezeptoren

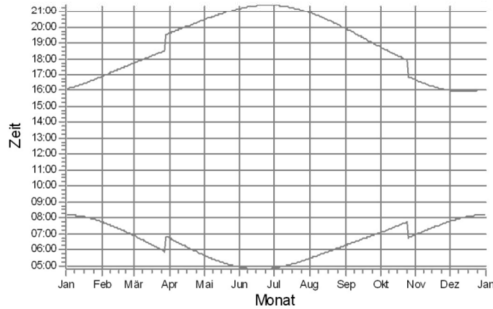
Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
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DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:49/3.2.712

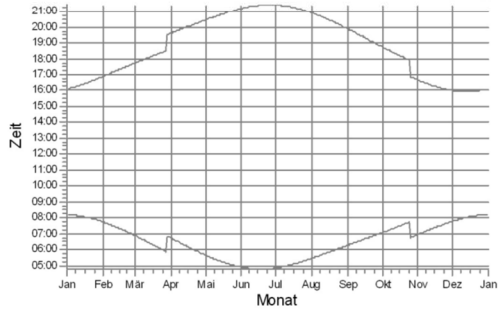
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung

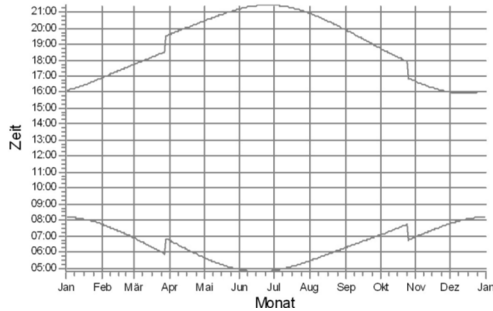
WEA I-28: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (G)



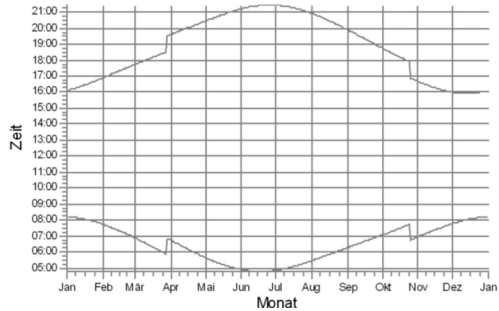
WEA I-29: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (G)



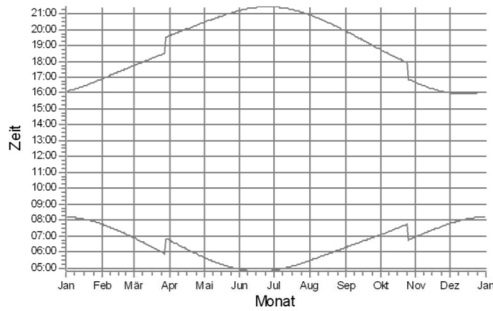
WEA I-30: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (G)



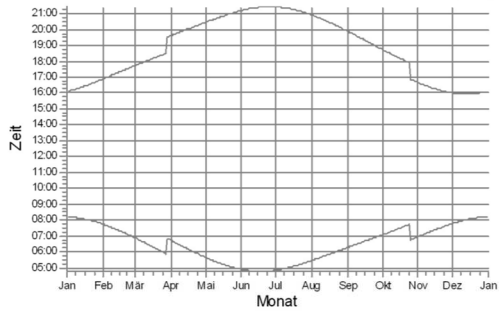
WEA I-31: VESTAS V112-3.3 Gridstreame 3300 112.0 IO! NH: 140,0 m (G)



WEA II-01: VESTAS V117-3.3 GridStreame 3300 117.0 IO! NH: 141,5 m (G)



WEA II-02: VESTAS V117-3.3 GridStreame 3300 117.0 IO! NH: 141,5 m (G)



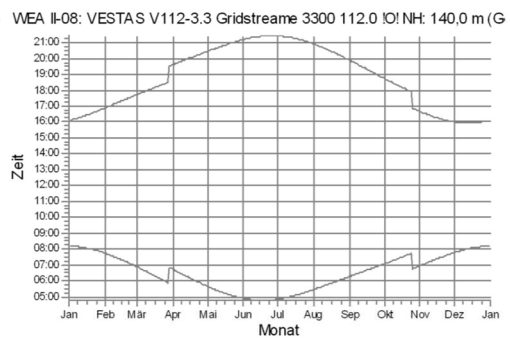
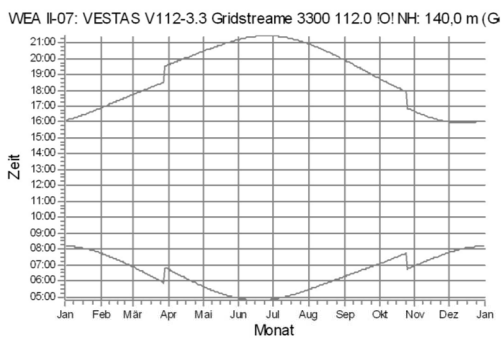
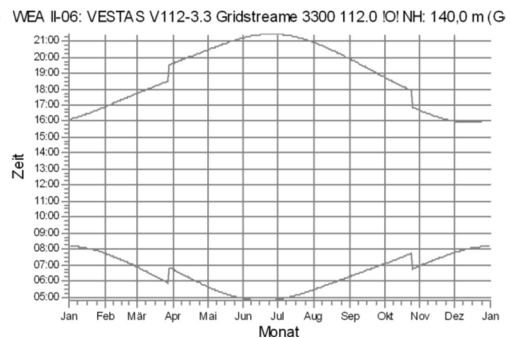
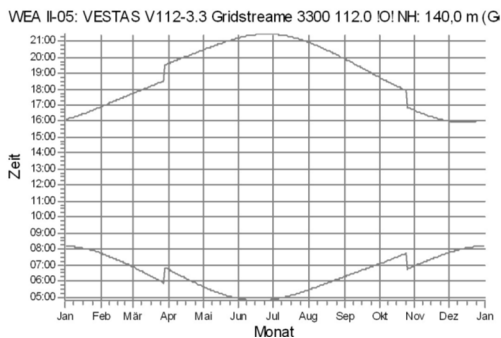
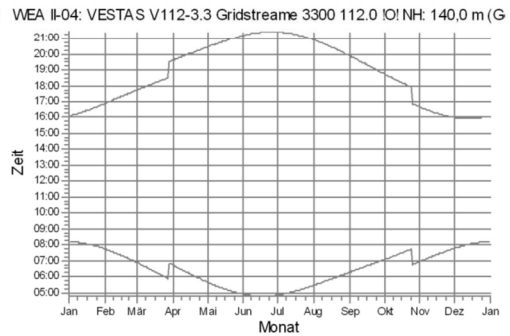
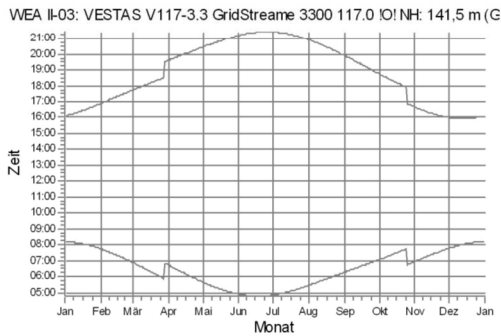
Schattenrezeptoren

Projekt:
214192-03 WP Lauchhammer

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 07.11.2018 07:49/3.2.712

SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



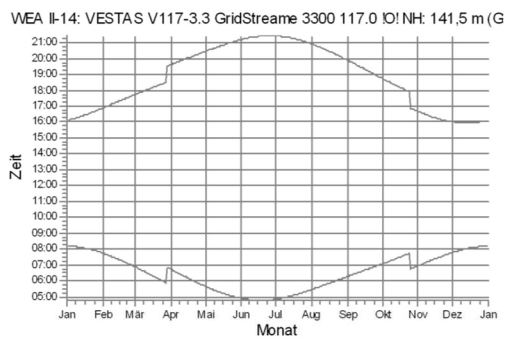
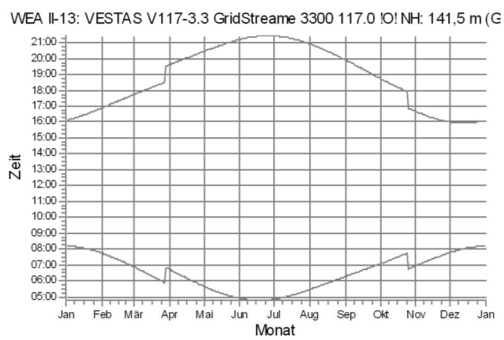
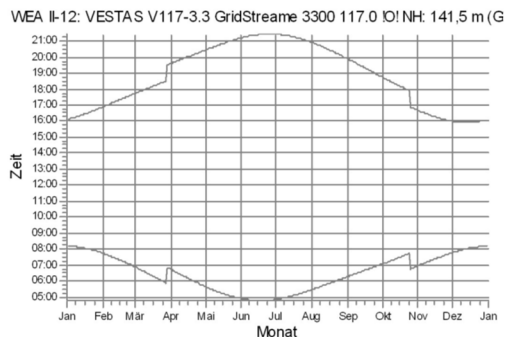
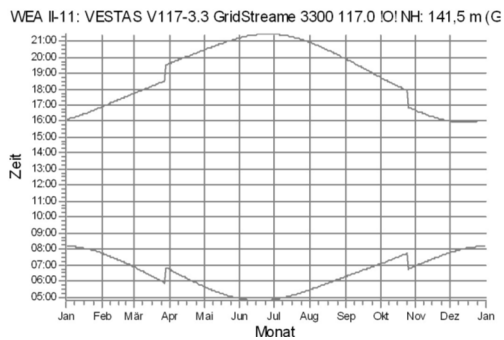
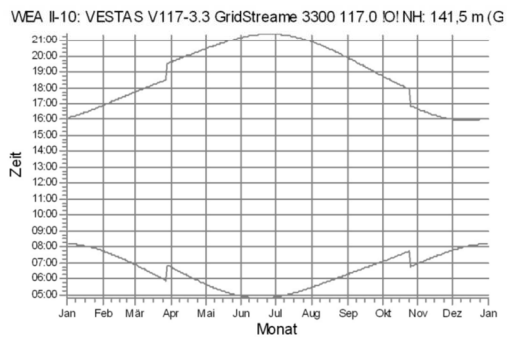
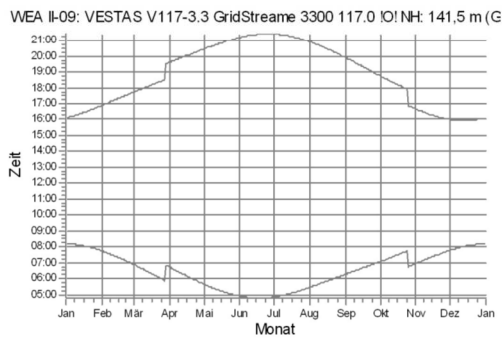
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SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



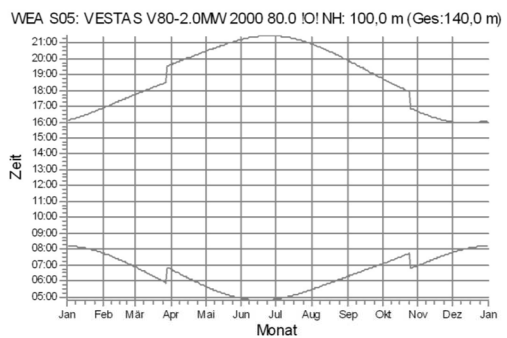
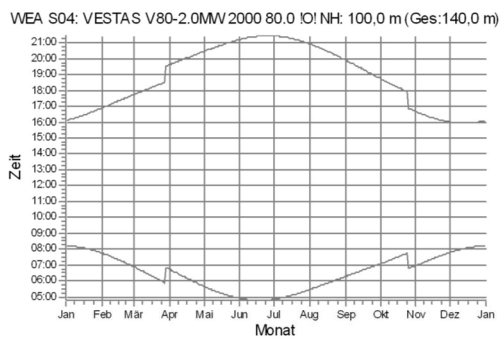
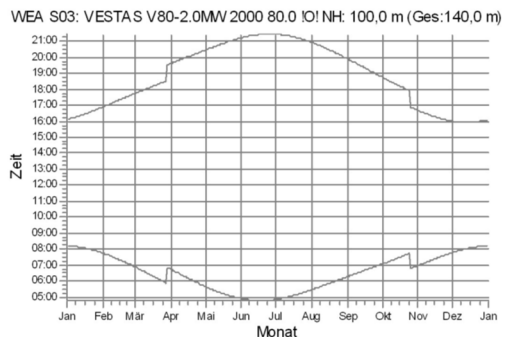
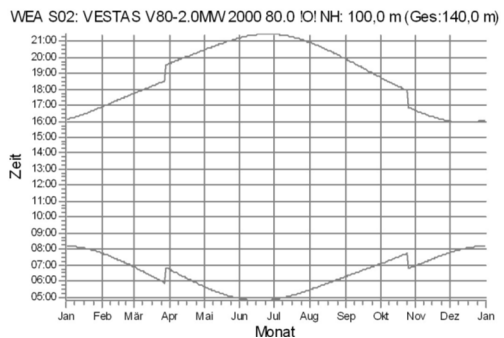
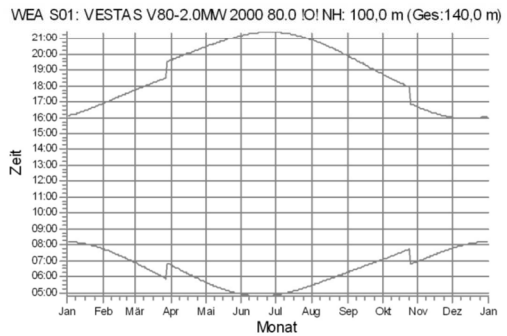
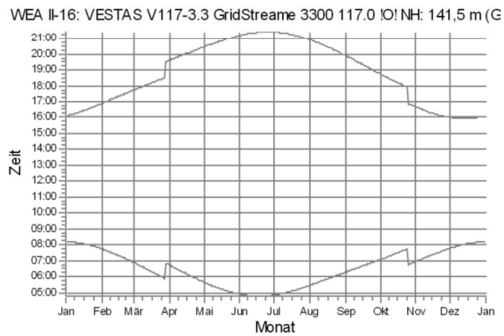
Schattenrezeptoren

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SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung



Schattenrezeptoren

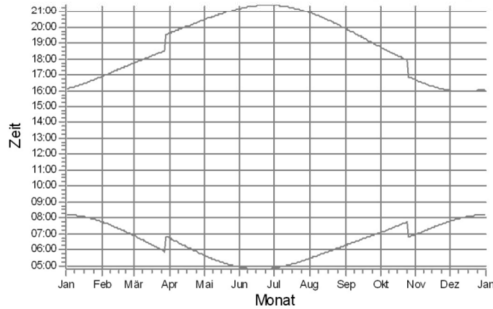
Projekt:
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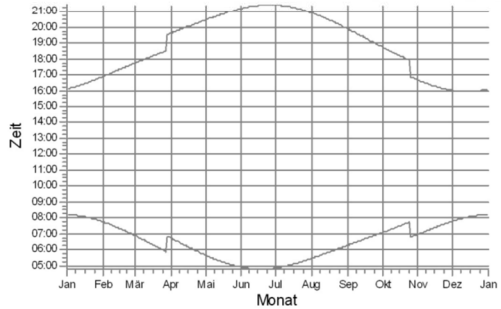
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung

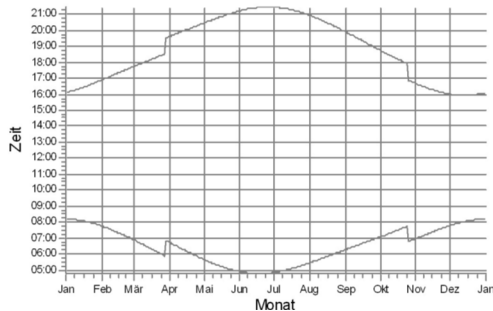
WEA S06: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



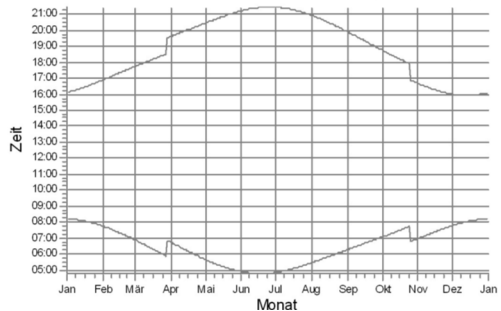
WEA S07: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



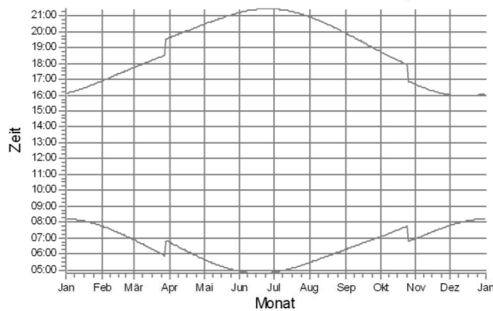
WEA S08: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



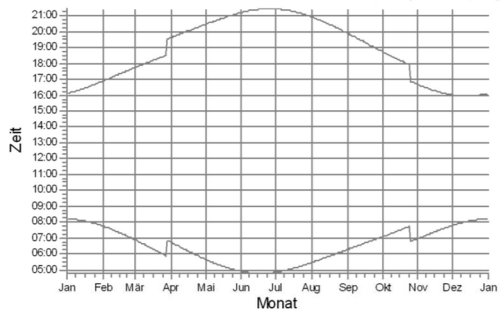
WEA S09: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



WEA S10: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



WEA S11: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



Schattenrezeptoren

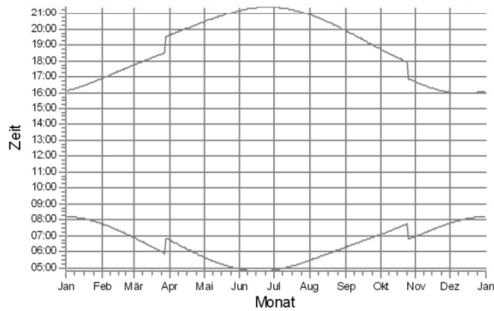
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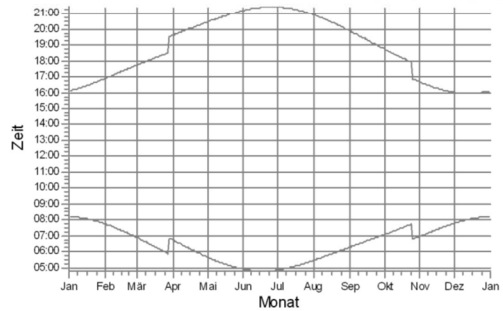
SHADOW - Grafischer Kalender pro WEA

Berechnung: Gesamtbelastung

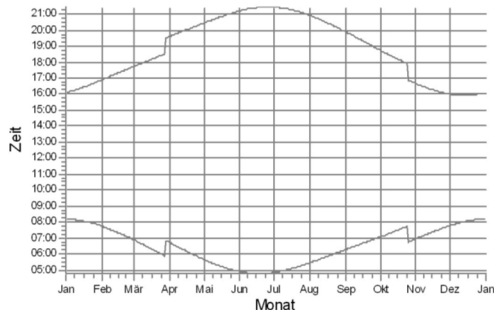
WEA S12: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



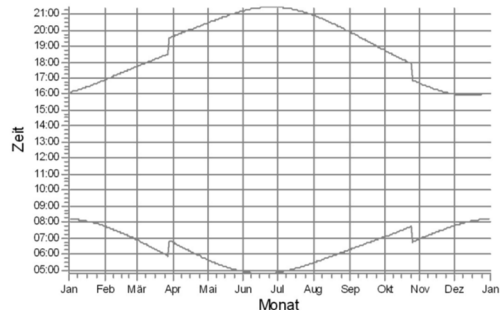
WEA S13: VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m)



WEA S18: VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:140,0 m)



WEA S8a: VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:140,0 m)



Schattenrezeptoren

Anlage B: Schattenausbreitung der Vor- und Zusatzbelastung

Anlage B1: SHADOW-Hauptergebnis mit Darstellung der Vorbelastung, Immissionsorte SR-01 bis SR-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
214192-03 WP Lauchhammer

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SHADOW - Hauptergebnis

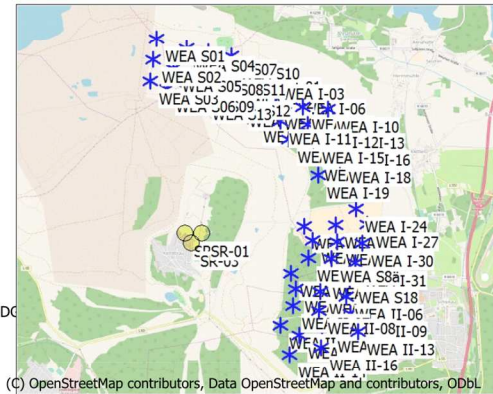
Berechnung: Vorbelastung
Voraussetzungen für Berechnung des Schattenwurfs

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

Minimale relevante Sonnenhöhe über Horizont 3 °
Tage zwischen Berechnungen 1 Tag(e)
Berechnungszeitsprung 1 Minuten
Die dargestellten Zeiten sind die astronomisch maximal mögliche
Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
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: 214192-03 WP Klettwitz_EMD
Hindernisse in Berechnung verwendet
Berechnungshöhe ü. Gr. für Karte: 1,5 m
Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:
UTM (north)-ETRS89 Zone: 33



WEA

| | Ost Nord Z | | | Beschreibung | Ak-tuell | WEA-Typ | | | Nenn-leistung | Rotor-durch-messer | Naben-höhe | Schattendaten | |
|-----------|------------|-----------|-------|---------------|----------|------------|----------|-------------------|---------------|--------------------|------------|---------------|------|
| | [m] | [m] | [m] | | | Hersteller | Typ | Beschatt.-Bereich | | | | U/min | |
| WEA I-01 | 420.133 | 5.712.388 | 133,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-02 | 420.005 | 5.712.088 | 131,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-03 | 420.573 | 5.712.249 | 131,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-04 | 419.968 | 5.711.758 | 132,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-05 | 420.408 | 5.711.947 | 132,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-06 | 420.952 | 5.711.965 | 155,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-07 | 420.213 | 5.711.486 | 132,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-08 | 420.601 | 5.711.706 | 132,4 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-09 | 421.096 | 5.711.687 | 154,8 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-10 | 421.544 | 5.711.640 | 153,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-11 | 420.688 | 5.711.433 | 132,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-12 | 421.175 | 5.711.366 | 155,7 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-13 | 421.650 | 5.711.340 | 153,4 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-14 | 420.821 | 5.711.091 | 152,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-15 | 421.283 | 5.711.079 | 154,7 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-16 | 421.750 | 5.711.035 | 154,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-17 | 421.303 | 5.710.760 | 153,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-18 | 421.757 | 5.710.705 | 151,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-19 | 421.346 | 5.710.445 | 150,3 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-24 | 422.038 | 5.709.811 | 149,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-25 | 421.090 | 5.709.518 | 156,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-26 | 421.656 | 5.709.530 | 151,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-27 | 422.234 | 5.709.543 | 148,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-28 | 421.232 | 5.709.259 | 158,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-29 | 421.675 | 5.709.225 | 153,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-30 | 422.144 | 5.709.194 | 148,9 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA I-31 | 422.009 | 5.708.845 | 151,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-01 | 421.147 | 5.708.948 | 158,3 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-02 | 420.839 | 5.708.667 | 152,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-03 | 420.916 | 5.708.385 | 151,0 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-04 | 421.426 | 5.708.630 | 151,2 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-05 | 421.362 | 5.708.325 | 149,1 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-06 | 421.826 | 5.708.237 | 152,5 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-07 | 420.866 | 5.708.085 | 146,0 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-08 | 421.321 | 5.707.983 | 137,6 | VESTAS V11... | Ja | VESTAS | V112-3.3 | Gridstreame-3.300 | 3.300 | 112,0 | 140,0 | 1.708 | 13,1 |
| WEA II-09 | 421.903 | 5.707.924 | 150,4 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-10 | 420.629 | 5.707.730 | 146,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-11 | 420.975 | 5.707.547 | 149,7 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStreame-3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |

(Fortsetzung nächste Seite)...

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Berechnet:
07.11.2018 08:08/3.2.712

SHADOW - Hauptergebnis

Berechnung: Vorbelastung

...(Fortsetzung von letzter Seite)

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | Hersteller | Typ | Nennleistung | Rotor-durchmesser | Nabenhöhe | Schattendaten | | |
|-----------|---------|-----------|-------|----------------|----------|--------|------------|-----------|--------------|-------------------|-----------|-------------------|---------|------|
| | | | | | Ak-tuell | | | | | | | Beschatt.-Bereich | U/min | |
| | | | [m] | | | | | | [kW] | [m] | [m] | [m] | [U/min] | |
| WEA II-12 | 421.503 | 5.707.650 | 150,4 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStrea | 3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-13 | 422.036 | 5.707.592 | 150,1 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStrea | 3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-14 | 420.779 | 5.707.199 | 148,7 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStrea | 3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA II-16 | 421.364 | 5.707.304 | 150,6 | VESTAS V11... | Ja | VESTAS | V117-3.3 | GridStrea | 3.300 | 3.300 | 117,0 | 141,5 | 1.732 | 13,1 |
| WEA S01 | 418.450 | 5.712.973 | 155,8 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S02 | 418.384 | 5.712.584 | 157,8 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S03 | 418.316 | 5.712.191 | 155,2 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S04 | 418.992 | 5.712.780 | 153,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S05 | 418.748 | 5.712.420 | 155,7 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S06 | 418.627 | 5.712.048 | 153,2 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S07 | 419.385 | 5.712.709 | 152,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S08 | 419.142 | 5.712.348 | 151,9 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S09 | 418.976 | 5.712.041 | 154,1 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S10 | 419.818 | 5.712.628 | 150,9 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S11 | 419.542 | 5.712.339 | 152,5 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S12 | 419.641 | 5.711.952 | 147,6 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S13 | 419.295 | 5.711.898 | 153,1 | VESTAS V80-... | Ja | VESTAS | V80-2.0MW | -2.000 | 2.000 | 80,0 | 100,0 | 1.581 | 16,7 | |
| WEA S18 | 421.901 | 5.708.538 | 152,3 | VESTAS V90-... | Nein | VESTAS | V90-2.0 | GridStrea | 2.000 | 2.000 | 90,0 | 105,0 | 1.506 | 15,2 |
| WEA S88 | 421.573 | 5.708.923 | 153,0 | VESTAS V90-... | Nein | VESTAS | V90-2.0 | GridStrea | 2.000 | 2.000 | 90,0 | 105,0 | 1.506 | 15,2 |

Schattenrezeptor-Eingabe

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Azimutwinkel (von Süd) | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. [m] |
|-------|--|---------|-----------|-------|--------|------|------------|------------------------|----------------------|---------------------|---------------------------|
| SR-01 | SR-01, August-Bebel-Straße 10, 01979 Lauchhammer | 419.230 | 5.709.424 | 157,2 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 418.913 | 5.709.421 | 158,5 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 419.035 | 5.709.243 | 161,3 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |

Berechnungsergebnisse

Schattenrezeptor

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | |
|-------|--|--------------------------------------|-------------------|-----------------------|
| | | Stunden/Jahr | Schattentage/Jahr | Max.Schattendauer/Tag |
| SR-01 | SR-01, August-Bebel-Straße 10, 01979 Lauchhammer | 0:00 | 0 | 0:00 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 0:00 | 0 | 0:00 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 0:00 | 0 | 0:00 |

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

| Nr. | Name | Maximal [h/a] |
|----------|---|---------------|
| WEA I-01 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (2) | 0:00 |
| WEA I-02 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (3) | 0:00 |
| WEA I-03 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (4) | 0:00 |
| WEA I-04 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (5) | 0:00 |
| WEA I-05 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (6) | 0:00 |
| WEA I-06 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (7) | 0:00 |
| WEA I-07 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (8) | 0:00 |
| WEA I-08 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (9) | 0:00 |
| WEA I-09 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (10) | 0:00 |
| WEA I-10 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (11) | 0:00 |
| WEA I-11 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (12) | 0:00 |
| WEA I-12 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (13) | 0:00 |
| WEA I-13 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (14) | 0:00 |
| WEA I-14 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (15) | 0:00 |
| WEA I-15 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (16) | 0:00 |
| WEA I-16 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (17) | 0:00 |
| WEA I-17 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (18) | 0:00 |
| WEA I-18 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (19) | 0:00 |
| WEA I-19 | VESTAS V112-3.3 Gridstreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (20) | 0:00 |

(Fortsetzung nächste Seite)...

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
 Bonifatiusstr. 400
 DE-48432 Rheine
 +49 5971 9710-31
 Bunk / bunk@koetter-consulting.com
 Berechnet:
 07.11.2018 08:08/3.2.712

SHADOW - Hauptergebnis

Berechnung: Vorbelastung

...(Fortsetzung von letzter Seite)

| Nr. | Name | Maximal [h/a] |
|-----------|---|------------------|
| WEA I-24 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (21) | 0:00 |
| WEA I-25 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (22) | 0:00 |
| WEA I-26 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (23) | 0:00 |
| WEA I-27 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (24) | 0:00 |
| WEA I-28 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (25) | 0:00 |
| WEA I-29 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (26) | 0:00 |
| WEA I-30 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (27) | 0:00 |
| WEA I-31 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (28) | 0:00 |
| WEA II-01 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (29) | 0:00 |
| WEA II-02 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (30) | 0:00 |
| WEA II-03 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (31) | 0:00 |
| WEA II-04 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (32) | 0:00 |
| WEA II-05 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (33) | 0:00 |
| WEA II-06 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (34) | 0:00 |
| WEA II-07 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (35) | 0:00 |
| WEA II-08 | VESTAS V112-3.3 GridStreame 3300 112.0 !O! NH: 140,0 m (Ges:196,0 m) (36) | 0:00 |
| WEA II-09 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (37) | 0:00 |
| WEA II-10 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (38) | 0:00 |
| WEA II-11 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (39) | 0:00 |
| WEA II-12 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (40) | 0:00 |
| WEA II-13 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (41) | 0:00 |
| WEA II-14 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (42) | 0:00 |
| WEA II-16 | VESTAS V117-3.3 GridStreame 3300 117.0 !O! NH: 141,5 m (Ges:200,0 m) (43) | 0:00 |
| WEA S01 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (48) | 0:00 |
| WEA S02 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (49) | 0:00 |
| WEA S03 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (50) | 0:00 |
| WEA S04 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (51) | 0:00 |
| WEA S05 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (52) | 0:00 |
| WEA S06 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (53) | 0:00 |
| WEA S07 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (54) | 0:00 |
| WEA S08 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (55) | 0:00 |
| WEA S09 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (56) | 0:00 |
| WEA S10 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (57) | 0:00 |
| WEA S11 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (58) | 0:00 |
| WEA S12 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (59) | 0:00 |
| WEA S13 | VESTAS V80-2.0MW 2000 80.0 !O! NH: 100,0 m (Ges:140,0 m) (60) | 0:00 |
| WEA S18 | VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:150,0 m) (61) | 0:00 |
| WEA S8ä | VESTAS V90-2.0 GridStreamer 2000 90.0 !O! NH: 105,0 m (Ges:150,0 m) (62) | 0:00 |

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-Hauptergebnis mit Darstellung der Zusatzbelastung, Immissionsorte SR-01 bis SR-03, Berechnungsergebnisse Stunden / Jahr, Schattentage / Jahr und maximalen Stunden / Tag

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:51/3.2.712

SHADOW - Hauptergebnis

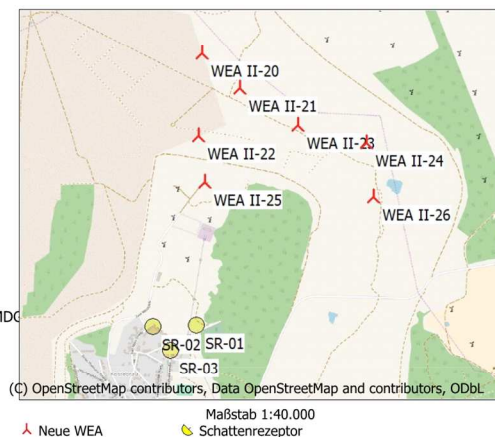
Berechnung: Zusatzbelastung Voraussetzungen für Berechnung des Schattenwurfs

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

Minimale relevante Sonnenhöhe über Horizont 3 °
Tage zwischen Berechnungen 1 Tag(e)
Berechnungszeitsprung 1 Minuten
Die dargestellten Zeiten sind die astronomisch maximal mögliche
Beschattungsdauer, berechnet unter folgenden Annahmen:
Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
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: 214192-03 WP Klettwitz_EMD
Hindernisse in Berechnung verwendet
Berechnungshöhe ü.Gr. für Karte: 1,5 m
Rasterauflösung: 1,0 m

Alle Koordinatenangaben in:
UTM (north)-ETRS89 Zone: 33



WEA

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | | Nennleistung | Rotordurchmesser | Nabenhöhe | Schattendaten | |
|-----------|---------|-----------|-------|---------------------------|---------|------------|----------------|--------------|------------------|-----------|-------------------|---------|
| | | | | | Aktuell | Hersteller | Typ | | | | Beschatt.-Bereich | U/min |
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [U/min] |
| WEA II-20 | 419.303 | 5.711.398 | 121,9 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-21 | 419.571 | 5.711.138 | 122,0 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-22 | 419.263 | 5.710.795 | 121,2 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-23 | 419.990 | 5.710.861 | 121,9 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-24 | 420.484 | 5.710.723 | 122,7 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-25 | 419.301 | 5.710.459 | 162,2 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |
| WEA II-26 | 420.526 | 5.710.332 | 122,5 | VESTAS V150-4.2 4200 1... | Ja | VESTAS | V150-4.2-4.200 | 4.200 | 150,0 | 166,0 | 1.901 | 10,4 |

Schattenrezeptor-Eingabe

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Azimuthwinkel (von Süd) | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. |
|-------|--|---------|-----------|-------|--------|------|------------|-------------------------|----------------------|---------------------|-----------------------|
| | | | | [m] | [m] | [m] | [m] | [°] | [°] | | [m] |
| SR-01 | SR-01, August-Bebel-Straße 10, 01979 Lauchhammer | 419.230 | 5.709.424 | 157,2 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 418.913 | 5.709.421 | 158,5 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 419.035 | 5.709.243 | 161,3 | 0,1 | 0,1 | 2,0 | 0,0 | 90,0 | "Gewächshaus-Modus" | 2,1 |

Berechnungsergebnisse

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | |
|-------|--|--------------------------------------|-------------------|-----------------------|
| | | Stunden/Jahr | Schattentage/Jahr | Max.Schattendauer/Tag |
| | | [h/a] | [d/a] | [h/d] |
| SR-01 | SR-01, August-Bebel-Straße 10, 01979 Lauchhammer | 3:07 | 28 | 0:09 |
| SR-02 | SR-02, Gartenweg 1, 01979 Kostebrau | 15:52 | 68 | 0:20 |
| SR-03 | SR-03, Römerkeller Straße 3, 01979 Kostebrau | 0:07 | 7 | 0:01 |

| Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA | | Maximal |
|--|--|---------|
| Nr. | Name | [h/a] |
| WEA II-20 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (3) | 0:00 |
| WEA II-21 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (4) | 0:00 |
| WEA II-22 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (5) | 0:00 |
| WEA II-23 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (6) | 0:00 |
| WEA II-24 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (7) | 0:00 |
| WEA II-25 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (8) | 0:00 |
| WEA II-26 | VESTAS V150-4.2 4200 150,0 !O! NH: 166,0 m (Ges:241,0 m) (9) | 18:59 |

Projekt:
214192-03 WP Lauchhammer

Lizenziertes Anwender:
KÖTTER Consulting Engineers GmbH & Co. KG
Bonifatiusstr. 400
DE-48432 Rheine
+49 5971 9710-31
Bunk / bunk@koetter-consulting.com
Berechnet:
07.11.2018 07:51/3.2.712

SHADOW - Hauptergebnis

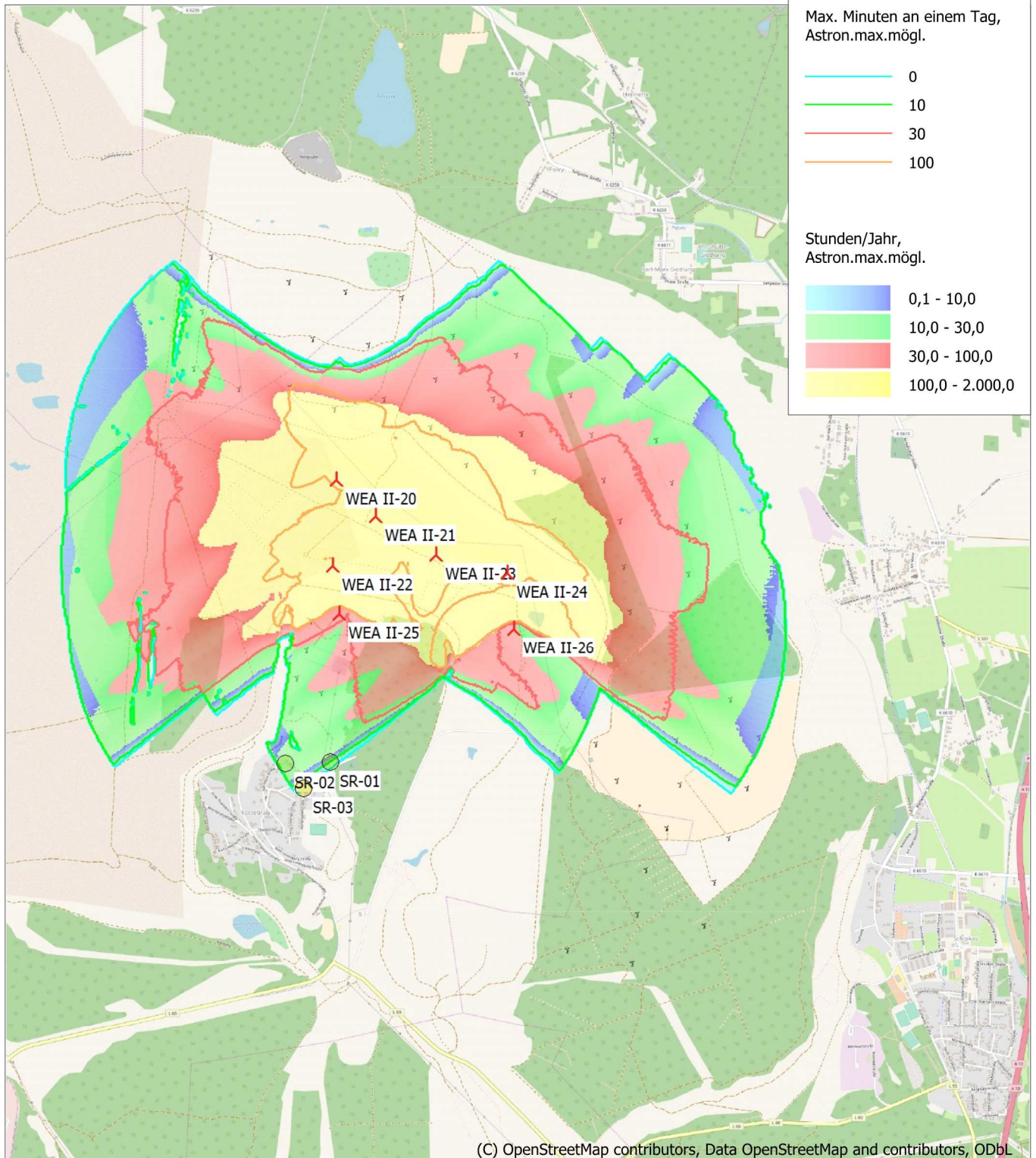
Berechnung: Zusatzbelastung

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 B3: SHADOW-Karte mit Darstellung des Lageplanes und der Schattenausbreitung der Zusatzbelastung unterteilt in Minuten / Tag und Stunden / Jahr

SHADOW - Karte

Berechnung: Zusatzbelastung



0 500 1000 1500 2000 m

Karte: EMD OpenStreetMap , Maßstab 1:40.000, Mitte: UTM (north)-ETRS89 Zone: 33 Ost: 420.610 Nord: 5.710.710

▲ Neue WEA

● Schattenrezeptor

Höhe der Schattenkarte: Höhenraster-Objekt: 214192-03 WP Klettwitz_EMDGrid_0.wpg (1)

Anlage C: Bilder der untersuchten Immissionsorte



Bild 1: Schattenrezeptor SR-01, Luftbild, © 2018 Google Kartendienst



Bild 2: Schattenrezeptoren SR-02



Bild 3: Schattenrezeptoren SR-03, Luftbild, © 2018 Google Kartendienst