

Schattengutachten

mit Schattenausbreitungskarte
zur Ermittlung des Schattenwurfes von 17 neuen
Windenergieanlagen an einem Standort bei
Söllingen (Niedersachsen)

Landwind Planung GmbH & Co. KG



November 2021

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INHALT

| | | |
|----------|--|-----------|
| 1 | EINLEITUNG | 3 |
| 2 | DER STANDORT | 4 |
| 3 | ALLGEMEINES ZUM SCHATTENWURF | 5 |
| 4 | BERECHNUNG DES SCHATTENWURFS | 7 |
| 5 | ERLÄUTERUNG ZU DEN RESULTATAUSDRUCKEN | 9 |
| | SHADOW – HAUPTERGEBNIS | 9 |
| | SHADOW – KALENDER | 9 |
| | SHADOW – KALENDER, GRAPHISCH | 10 |
| | SHADOW – KARTE DER SCHATTENDAUERLINIEN | 11 |
| 6 | ERGEBNIS DER SCHATTENWURFBERECHNUNG | 12 |
| 7 | ZUSAMMENFASSUNG | 15 |

ANHANG

ERGEBNISSE DER WINDPRO BERECHNUNG SHADOW:

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

| | |
|---------------------|-----------|
| Hauptergebnis | 3 Seiten |
| Kalender | 69 Seiten |
| Grafischer Kalender | 7 Seiten |
| Karte | 1 Seite |

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

| | |
|---------------|----------|
| Hauptergebnis | 3 Seiten |
|---------------|----------|

1 Einleitung

Die Landwind Planung GmbH & Co. KG plant südöstlich der Ortschaft Söllingen (Landkreis Helmstedt, Niedersachsen) als Repowering-Projekt den Neubau eines Windparks, bestehend aus 17 Anlagen mit 164 m Nabenhöhe. Dazu wird der bestehende Windpark mit 17 Anlagen komplett zurück gebaut.

Für dieses Vorhaben wird in dem vorliegenden Gutachten eine Prognose über den zu erwartenden Schattenwurf in der Umgebung erstellt. Dazu werden an den vom Auftraggeber vorgesehenen 17 Standorten die neuen, geplanten Windenergieanlagen angesetzt. Dabei werden keine weiteren Anlagen berücksichtigt.

Es wird die aus dem Betrieb aller Windenergieanlagen resultierende Beschattung im Umfeld der Anlagen, insbesondere an ausgewählten Gebäuden mit Wohnnutzung in den umliegenden Ortschaften, ermittelt.

2 Der Standort

Die Windparkfläche befindet sich südöstlich von Söllingen (Landkreis Helmstedt). Weitere Ortschaften in der Umgebung sind Jerxheim im Westen und Ohrleben im Osten. Der Ort Schöningen liegt 6 km nördlich.

Das nähere Umfeld ist durch großräumige landwirtschaftliche Nutzung ohne Hecken und nur vereinzelte Büsche und Baumreihen entlang der Feldwege und Straßen geprägt. Die nächstgelegenen geschlossenen Waldbestände befinden sich im Norden entlang des Höhenzugs Elm ab ca. 5 km Entfernung. In nordwestlicher Richtung liegt in ca. 15 km Entfernung ein schmaler, West-Ost gerichteter bewaldeter Hügelkamm (Asse) und im Südwesten in 14 km Abstand der bewaldete Große Fallstein.

Das Gelände ist im nahen Umfeld leicht hügelig mit typischen Höhen von 80-130 m NN. Im Norden steigt das Gelände zum Elm auf Höhen bis über 300 m NN an. Nach Süden fällt es zum Großen Graben auf ca. 80 m NN ab. Der Höhenzug Asse im Nordwesten weist Höhen um 220-230 m NN auf. Im Südwesten liegt in ca. 14 km Abstand der Große Fallstein mit Höhen bis 288 m NN.

Die neuen Standorte befinden sich auf Höhen von 81-105 m ü. NN. Es sollen Nordex N163/5.x-5.700 mit 163 m Rotordurchmesser und 164 m Nabenhöhe errichtet werden. Die Bestandsanlagen werden im Rahmen des Vorhabens zurückgebaut. Überlagerungen durch den gleichzeitigen Betrieb aller 17 Anlagen werden bei der Berechnung berücksichtigt.

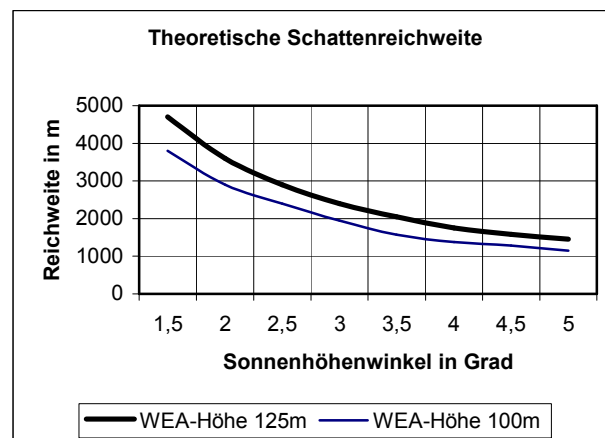
Alle 17 Anlagenstandorte sind nach Angabe des Auftraggebers angesetzt worden. Die Immissionsorte wurden auf Kartengrundlage angesetzt und mit dem Auftraggeber abgestimmt. Die Lage ist den Karten im Anhang zu entnehmen.

3 Allgemeines zum Schattenwurf

Die Nutzung der Windenergie ist insgesamt eine umweltfreundliche Maßnahme, da fossile Energieträger geschont werden. Neben dem positiven Umwelteffekt, sind jedoch bei einer konkreten Entscheidung über die Errichtung von Windenergieanlagen an einem vorgesehenen Standort auch potentielle negative Auswirkungen zu untersuchen und zu berücksichtigen. Neben dem schon länger beachteten Schall gewinnt gerade in Anbetracht der größer werdenden Naben- und Gesamthöhen der eingesetzten Windenergieanlagen der Schattenwurf an Bedeutung. Zusätzlich wurde in der Vergangenheit teilweise die Reflexion des Sonnenlichts an den Rotorblättern als störend für Anwohner eingeschätzt (Disco-Effekt). Hier konnte durch veränderte Anstriche und Oberflächen der Rotorblätter die Reflexion weitgehend ausgeschlossen werden.

Im Mittelpunkt der Betrachtung des Schattenwurfs von Windenergieanlagen steht die Frage nach dessen Einwirkung auf Menschen, die in Nachbarschaft der Windenergieanlagen leben und wohnen. Ziel ist es dabei, den positiven Umwelteffekt – Nutzung der Windenergie – mit möglichst geringen bzw. zu vernachlässigenden negativen Effekten zu erreichen.

Während die störenden Wirkungen von Schall schon wesentlich länger wissenschaftlich untersucht worden sind, gibt es für die Beschattungsproblematik kaum Anhaltspunkte. Somit existieren auch keine rechtlichen Grundlagen sondern allenfalls Empfehlungen aus den Hinweisen des Länderausschusses für Immissionen (LAI) die für die Genehmigung als Entscheidungsgrundlage dienen. Diese orientieren sich dabei am Versuch, Werte festzusetzen, die mit hoher Wahrscheinlichkeit von Menschen nicht als störend empfunden werden. Alles in allem handelt es sich um eine



vorsichtige Betrachtungsweise.

Unterschieden wird dabei zwischen dem als praktisch nicht störend empfundenen ruhenden Schatten der Windenergieanlage und dem bewegten Schatten der Anlage im Betrieb.

Vom DEWI – Deutsches Windenergieinstitut in Wilhelmshaven wurden im Jahre 1998 theoretische Betrachtungen zur Schattenreichweite in Abhängigkeit der Höhe einer Windenergieanlage und dem Sonnenstand angestellt und veröffentlicht¹. Eine grafische Aufbereitung dieser Ergebnisse zeigt die Abbildung auf dieser Seite. Dargestellt ist hier die theoretische Reichweite des Schattens, ausgehend von wolkenfreiem Himmel. Aufgetragen ist die Schat-

¹ Tjado Osten, Thomas Pahlke in DEWI Magazin Nr. 13, August 1998, S. 6ff.

tenwurfreichweite über der Sonnenhöhe – angegeben in Grad über dem Horizont.

Die längste Reichweite hat der Schatten bei tiefstehender Sonne, also insbesondere kurz nach Sonnenaufgang bzw. kurz vor Sonnenuntergang und im Winter. Zur Einordnung der dargestellten Werte sei darauf hingewiesen, dass eine Sonnenhöhe von 1,5 Grad zehn Minuten nach Sonnenaufgang erreicht wird, eine Sonnenhöhe von 3 Grad schon 15 Minuten später. Innerhalb einer knappen halben Stunde ändert sich der theoretische Einwirkungsbereich drastisch, die Reichweite halbiert sich. Im weiteren Verlauf des Tages ändert sich die theoretische Reichweite nicht mehr ganz so stark. Der zu prüfende Bereich ergibt sich aus dem Abstand zur WEA, in welchem die Sonnenfläche gerade zu 20 % durch ein Rotorblatt verdeckt wird. Da die Blatttiefe nicht über den gesamten Flügel konstant ist, sondern zur Rotorblattspitze hin abnimmt, wird ersatzweise ein rechteckiges Rotorblatt mit einer mittleren Blatttiefe ermittelt und zugrunde gelegt.

Eine Charakteristik des Schattenwurfes besteht darin, dass im Tagesverlauf entsprechend der Sonnenbahn sich auch die Himmelsrichtung ändert, in die der Schatten fällt. Somit sind einzelne Gebäude im Tagesverlauf immer nur innerhalb begrenzter Zeiträume vom Schatten betroffen. Ob innerhalb des theoretischen Zeitraums und der theoretisch maximalen Reichweite tatsächlich ein Schatten entsteht, hängt letztendlich auch vom Wetter, der Bewölkung, ab.

Da bei Windenergieanlagen praktisch nur der sich schnell verändernde Schatten der Rotorblätter als störend empfunden wird, reduzieren sich die Zeiten der tatsächlichen Beeinträchtigung gegenüber den theoretischen Zeiten um die Stillstandszeiten der Windenergieanlagen. Steht der Rotor der Windenergieanlage quer zur Schattenrichtung (Windrichtung quer zur Schattenrichtung) so ist die Störwirkung nochmals deutlich reduziert.

Als tolerierbare Belastung durch Schattenwurf bei maximal möglicher Beschattung werden die Anhaltswerte der „WEA-Schattenwurf-Hinweise“ (vom staatlichen Umweltamt Schleswig und anderen 2002 erarbeitet) angesetzt. Sie wurden von dem Länderausschuss für Immissionen (LAI) anerkannt. Diese empfehlen eine aufsummierte maximale Beschattungsdauer von 30 Stunden jährlich und täglich maximal 30 Minuten (Grenzwerte). Für diese Angaben wird von „worst-case“ Bedingungen ausgegangen und ein Sonnenhöhenwinkel größer 3 Grad zugrundegelegt. Die Berechnung soll für einen punktförmigen Rezeptor in 2 m Höhe erfolgen. Für die hier vorliegende Betrachtung wird von den oben genannten Bedingungen und Grenzwerten ausgegangen. Der Rezeptor wird aus programmtechnischen Gründen jedoch nicht punktförmig, sondern mit einer Fläche von 10 cm x 10 cm angenommen. Dadurch liegen die berechneten Schattenwurfdauern leicht über den Ergebnissen für punktförmige Rezeptoren. Die Rezeptoren sind wegen der großen Anzahl von Windenergieanlagen auf den Gewächshausmodus eingestellt. Hier wird der Schatten im Gegensatz zum Fenstermodus aus allen Richtungen empfangen.

4 Berechnung des Schattenwurfs

In Berechnungen von Schattenwurf-Weiten und -Zeiten werden alle Randbedingungen, die vorstehend geschildert wurden, mit ihren ungünstigsten Ausprägungen angesetzt. D.h. es wird davon ausgegangen, dass es nie Wolken gibt, keine Flaute herrscht und somit die Windenergieanlagen sich immer drehen und der Wind immer aus der gleichen Richtung wie die Sonne kommt und damit die größte mögliche Fläche von Schatten betroffen ist.

Der Einfluss des Bewölkungsgrades, der Flautezeiten (Zeiten, in denen der Rotor steht) und der Stellung des Rotors wird im zweiten Schritt durch eine Berechnung des meteorologisch wahrscheinlichen Schattenwurfs erfasst.

Die Berechnung des Schattenwurfes wird mit dem Programm WindPRO von EMD International A/S (Aalborg-Dänemark) in der Version 3.4.424 vom Juli 2021 mit dem Programmteil *Shadow* vorgenommen.

Als Schattenverursacher wurden 17 geplante Windenergieanlagen angenommen. Eine Vorbelastung ist nicht vorhanden. Die angesetzten Koordinaten sind dem Anhang (Shadow-Hauptergebnis) zu entnehmen. Dabei wurden die folgenden technischen Daten der Windenergieanlagen zugrundegelegt. Die Nummerierung der Anlagen bezieht sich auf die im Berechnungsausdruck SHADOW (siehe Anhang) angegebene Liste:

- o **Gesamtbelastung:**
alle geplanten 17 WEA im Windpark Söllingen
- o **17 x Nordex N163/5.x-5.700** WEA 01 bis WEA 17
5.700 kW Nennleistung
163 m Rotordurchmesser
164 m Nabenhöhe

Der Schattenwurf wird an ausgewählten auf der Kartengrundlage erkennbaren Gebäuden mit vermuteter Wohnnutzung im Umfeld der Windenergieanlagen ermittelt, die den neu zu errichtenden Windenergieanlagen am nächsten liegen.

Die dadurch entstehenden Untersuchungspunkte werden im Vokabular der verwendeten Software als „Schattenrezeptoren“ bezeichnet. Hier im Text auch Immissionsorte (IO) genannt. Die Schattenrezeptoren werden entsprechend der Vorgabe des „Arbeitskreises Schattenwurf von Windenergieanlagen“ angesetzt. Konkret sind jeweils über den entsprechenden Hauswänden in einer Höhe von 2 m ebene Rezeptoren mit einer Größe von 0,1 m x 0,1 m angenommen (annähernd punktförmig). Für real in den Gebäuden vorhandene Fenster können sich andere Beschattungsdauern, als hier rechnerisch ermittelt, ergeben, da die Positionen und Größen von den hier getroffenen Annahmen abweichen werden. Allerdings bleibt

auch ggf. vorhandener schattenverdeckender Bewuchs vor den Fenstern hier unbeachtet.

In einem zweiten Schritt wurden Schattendauerlinien für die Umgebung des Windparks berechnet. Hier wird für jeden Punkt auf einem Raster von 20 x 20 Metern die im Jahresverlauf auftretende Beschattung ermittelt und Punkte gleicher Beschattungsdauer werden durch Linien verbunden. Im Anhang befinden sich die Ausdrücke der Berechnungen.

5 Erläuterung zu den Resultatausdrucken

Die Berechnungsergebnisse des Programmes WindPRO, Programmteil Shadow zum Berechnen des Schattenwurfes im Rahmen dieses Gutachtens befinden sich im Anhang, nachfolgend einige ergänzende Erläuterungen zu den einzelnen Berechnungsergebnissen.

SHADOW – Hauptergebnis

Auf dieser Ausgabeseite werden die Berechnungsgrundlagen und eine Kurzfassung der Berechnungsergebnisse aufgeführt. Das Berechnungsverfahren ist kurz textlich erläutert und die berücksichtigten Anlagenstandorte und Schattenrezeptoren sind tabellarisch angegeben.

Für die Windenergieanlagen sind neben den genauen Standorten und den entscheidenden technischen Daten Nabenhöhe und Rotordurchmesser auch weitere Angaben enthalten, wie z.B. den Beschattungsbereich (siehe Kapitel 3) und -wenn vorhanden- die Rotordrehzahl.

Die Schattenrezeptoren (Untersuchungspunkte) sind in einer gesonderten Tabelle mit allen relevanten Daten abgedruckt. Der hier genannte Azimutwinkel (nur wichtig im Fenstermodus) bezeichnet die Himmelsrichtung, in die das Fenster zeigt. Nach Süden zeigenden Fenstern ist ein Winkel von 0 Grad zugeordnet, der Winkel ist im Uhrzeigersinn positiv gezählt, so dass sich für nach Westen gerichtete Fenster ein Winkel von +90 Grad und für nach Osten weisende Fenster ein Winkel von -90 Grad ergibt. Im Ausrichtungsmodus „Gewächshaus-Modus“ wird Schatten aus allen Himmelsrichtungen empfangen und der Azimutwinkel steht auf -180,0 Grad.

Die „Neigung des Fensters“ bezieht sich auf die Neigung gegenüber dem Boden. Fenster in den Außenwänden haben einen Winkel von 90 Grad, gegebenenfalls vorhandene Dachfenster haben entsprechend abweichende Ausrichtungen.

Unter „Berechnungsergebnisse“ werden die unter „worst-case“-Annahmen, (d. h. die astronomische, maximale Beschattungsdauer) berechneten Ergebnisse kurz zusammengefasst. Diese sind neben der Anzahl der Tage im Jahr, die Gesamtdauer in Stunden und Minuten pro Jahr sowie die maximalen täglichen Schattendauern in Stunden und Minuten pro Tag.

An einem Vergleich der Ergebnisse für die verschiedenen Fenster wird deutlich, wie vielschichtig die Erscheinungsformen der Beschattung sind. So gibt es Fenster, die im Jahresverlauf an recht vielen Tagen, aber jeweils nur kurz betroffen sind, während auf andere an wenigen Tagen, dafür aber umso länger der Schatten fällt.

SHADOW – Kalender

Der Kalenderausdruck „Kalender“ (nur ausgedruckt für die Rezeptoren an denen Schatten auftritt) zeigt für jeden Schattenrezeptor separat, an wel-

chen Tagen im Jahr und über welche Dauer am einzelnen Tag mit Schatten zu rechnen ist.

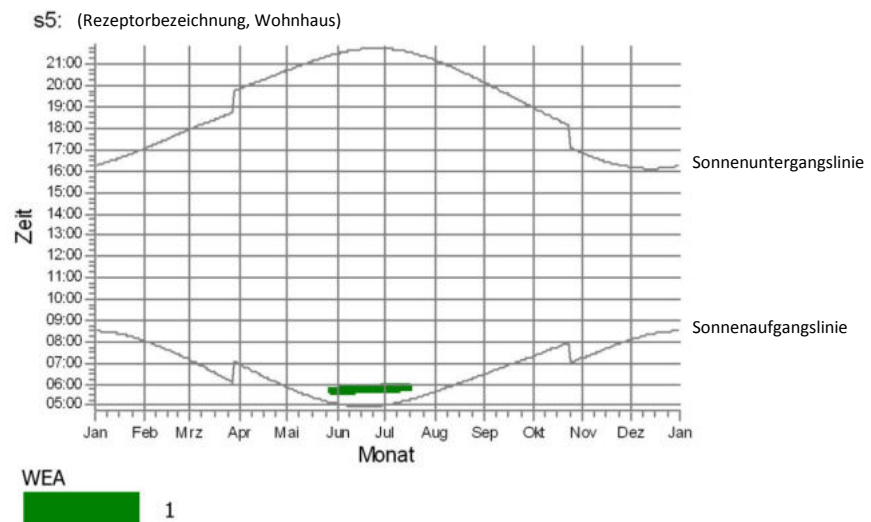
In einer Tabelle sind spaltenweise die Monate und zeilenweise die Tage (zwei Zeilen pro Tag) angegeben. Für jeden Tag sind die Sonnenaufgangs- und die Sonnenuntergangszeit ausgedrückt. Fällt an dem entsprechenden Tag ein Schatten einer Windenergieanlage auf das Fenster, wird die Schattendauer, die Anfangs- und Endzeit des Schattens sowie die Bezeichnung der verursachenden Windenergieanlage aufgeführt.

Eine Erläuterung der einzelnen Werte befindet sich unterhalb der Tabelle. Als letzte Zeile der Tabelle sind die Schattendauern in Minuten pro Monat aufaddiert. Im Shadow Kalender sind nur die Schatten verursachenden Windenergieanlagen aufgeführt.

Anhand der Angaben kann ermittelt werden, welchen Beitrag zur Gesamtbeschattung die einzelnen Anlagen liefern.

SHADOW – Kalender, graphisch

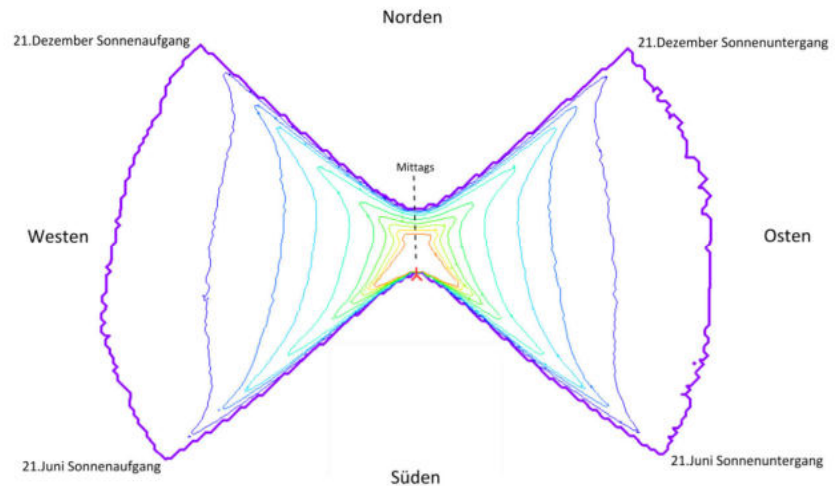
Die graphische Kalenderdarstellung ist eine übersichtliche Aufbereitung und Ergänzung zu den tabellarischen Kalendern. Die Darstellung ist für alle Schattenrezeptoren, die vom Schattenwurf der Windenergieanlagen betroffen sind, ausgeführt. In den Grafiken ist für die einzelnen Rezeptoren schnell erkennbar, wie sich die Beschattungszeiten über das Jahr und die einzelnen Tage verteilen. Als Anhaltspunkte sind jeweils die Zeiten des Sonnenauf- und untergangs, für die Sommermonate unter Berücksichtigung der Sommerzeit, als Begrenzungslinien eingetragen. Die Schattenanteile der verschiedenen Anlagenstandorte sind durch die Farbgebung identifizierbar.



SHADOW – Karte der Schattendauerlinien

Als letzter Ausdruck findet sich eine Karte mit eingetragenen Linien gleicher Schattendauer pro Jahr. Aus dieser Karte ist leicht ablesbar, welche Bereiche am stärksten vom Schattenwurf betroffen sind. Die Karte zeigt deutlich, dass die Schattenwirkung weit nach Osten und Westen reicht und in direkter Nord- bzw. Süd-Richtung unproblematischer ist.

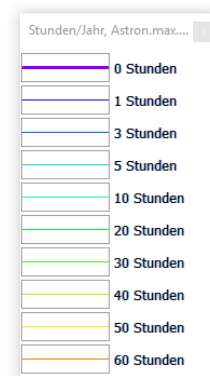
Schattenwurfdiagramm für eine Windanlage für ein ganzes Jahr



Das Diagramm zeigt die komplette Fläche, auf der eine Windanlage im Laufe eines Jahres Schatten werfen kann.

Die Windanlage ist der rote Stern in der Mitte. Dort und in deren näherer Umgebung ist der meiste Schatten möglich, da dort die Sonne oben am Himmel steht (die rote bis zu den grünen Linien). Diese hohen Sonnenwinkel sind häufiger als die sehr niedrigen zur Dämmerung in deren Folge der Schattenwurf auf einer Fläche weniger wird. Dann werden auch weiter entfernte Gebiete erreicht (die blauen Linien). Die violette Linie ist die Grenze, ab der kein Schatten mehr vorkommt.

Die Farben der Linien in der Karte im Anhang können von den hier beschriebenen abweichen.



6 Ergebnis der Schattenwurfberechnung

An dieser Stelle werden kurz die Endergebnisse der im Anhang befindlichen Ausdrücke zusammengefasst. Die Berechnungen wurden für die 17 geplanten Windenergieanlagen (**Gesamtbelastung**) durchgeführt.

Der real entstehende Anteil der Beschattung wird langfristig gesehen bei nur ca. 25% dieser berechneten Werte liegen. Hinzu kommt, dass bei diesen Werten eine Abschirmung der Fenster durch Hindernisse und auch Bäume nicht berücksichtigt wird, und so die Schattenwirkung besonders von Frühjahr bis Herbst weiter gemindert wird.

Auf dem Kalender und den graphischen Kalenderausdrücken ist der Schattenwurfanteil der vom Auftraggeber beantragten Windenergieanlagen gut zu erkennen. Der Kalender und der graphische Kalender, für die vom Schattenwurf betroffenen Rezeptoren, befinden sich im Anhang. An den im Einzelnen betrachteten Schattenrezeptoren ergibt sich folgende Situation der astronomisch maximal möglichen und der meteorologischen wahrscheinlichen Beschattungsdauer:

| Immissionspunkt | | Gesamtbelastung astr. max. | Gesamtbelastung meteor. wahrsch. | Gesamtbelastung |
|-----------------|---------------------------------|-------------------------------|-------------------------------------|----------------------------|
| IO Nr. | Name | Stunden / Jahr [Std:Min] | Stunden / Jahr [Std:Min] | Minuten / Tag [Std:Min] |
| IO d01 | Jerxheim, Am Pfingstgras 16 | 10:09 | 01:36 | 00:24 |
| IO d02 | Jerxheim, Halberstädter Str. 6B | 00:00 | 00:00 | 00:00 |
| IO d03 | Jerxheim, Helmstedter Str. 162 | 16:39 | 01:43 | 00:23 |
| IO d04 | Ohrsleben, Wiesenweg 1 | 00:00 | 00:00 | 00:00 |
| IO d08 | Söllingen, An der Schäferei 5 | 52:50 | 07:26 | 00:25 |
| IO d09 | Söllingen, Bahnhofstraße 4 | 55:52 | 07:27 | 00:47 |
| IO d12 | Söllingen, Bahnhofstraße 7 | 59:21 | 08:03 | 00:30 |
| IO d14 | Söllingen, Gartenstraße 9 | 65:28 | 10:29 | 00:32 |
| IO d17 | Söllingen, Gartenstraße 18 | 81:27 | 13:51 | 00:33 |
| IO d20 | Söllingen, Gartenstraße 22 | 98:30 | 16:53 | 00:33 |
| IO d23 | Söllingen, Hauptstraße 1 | 12:51 | 01:42 | 00:25 |
| IO d25 | Söllingen, Hauptstraße 5 | 33:09 | 03:51 | 00:26 |
| IO d28 | Söllingen, Hauptstraße 12 | 28:02 | 03:51 | 00:27 |
| IO d32 | Söllingen, Hauptstraße 24 | 39:28 | 06:06 | 00:27 |
| IO d35 | Söllingen, Hauptstraße 30 | 47:13 | 07:16 | 00:28 |
| IO d37 | Söllingen, Hauptstraße 36 | 70:31 | 11:13 | 00:30 |
| IO d39 | Söllingen, Hauptstraße 40 | 55:51 | 08:26 | 00:28 |
| IO d40 | Söllingen, Hauptstraße 52 | 40:38 | 05:43 | 00:26 |
| IO d42 | Söllingen, Hauptstraße 56 | 45:19 | 05:44 | 00:25 |
| IO d44 | Söllingen, Hauptstraße 60 | 43:33 | 05:20 | 00:26 |
| IO d45 | Söllingen, Hauptstraße 70 | 28:14 | 03:37 | 00:26 |
| IO d46 | Söllingen, Hauptstraße 72 | 11:23 | 01:43 | 00:25 |

| | | | | |
|--------|------------------------------|--------|-------|-------|
| IO d48 | Söllingen, Mühlenhof 3 | 15:47 | 05:03 | 00:29 |
| IO d51 | Söllingen, Pabstorfer Weg 10 | 99:24 | 16:41 | 00:33 |
| IO d54 | Söllingen, Pabstorfer Weg 15 | 123:23 | 21:28 | 00:39 |
| IO d56 | Söllingen, Poststraße 4 | 52:46 | 06:46 | 00:30 |
| IO d57 | Söllingen, Ringstraße 5 | 62:04 | 09:10 | 00:28 |
| IO d60 | Söllingen, Ringstraße 15 | 69:00 | 10:34 | 00:29 |
| IO d61 | Söllingen, Ringstraße 16 | 77:26 | 12:02 | 00:31 |
| IO d63 | Söllingen, Ringstraße 21 | 62:35 | 09:40 | 00:28 |
| IO d67 | Söllingen, Schulstraße 1 | 51:10 | 06:34 | 00:28 |
| IO d69 | Söllingen, Schulstraße 3 | 50:58 | 06:53 | 00:28 |
| IO d71 | Söllingen, Schulstraße 6 | 46:32 | 07:21 | 00:29 |
| IO d75 | Söllingen, Schulstraße 14 | 53:47 | 08:31 | 00:30 |
| IO d77 | Söllingen, Sonnenhof 1 | 161:57 | 27:42 | 00:56 |
| IO d79 | Söllingen, Tongrubenweg 2 | 41:53 | 05:10 | 00:28 |
| IO d80 | Söllingen, Tongrubenweg 3 | 46:40 | 05:47 | 00:29 |

Tabelle 1: Die **jährlichen** Schattenzeiten für die astronomisch maximal mögliche und die meteorologische, wahrscheinliche Beschattungsdauer sowie die **tägliche** maximale Beschattungsdauer in der rechten Spalte

Die Verteilung der Schattenwurfzeit auf der gesamten betrachteten Fläche kann der Karte im Anhang anhand der Iso-Schattenlinien für den jährlichen Schattenwurf entnommen werden.

Die neuen Anlagen erzeugen besonders im Ort Söllingen hohe Schattenwurfzeiten. Diese werden vor allem von den Anlagen 10-13 erzeugt, die östlich bis südöstlich des Ortes am nächsten stehen. Jede der 4 Anlagen alleine würde die Grenzwerte einhalten. Zusammen addieren sich die Schattenzeiten im Jahresverlauf, von Winter bis spätes Frühjahr und vom späten Sommer bis in den Winter, jeweils in den Morgenstunden und führen zu Überschreitungen der astronomisch maximal möglichen 30 Stunden jährlich. Die Schattenwurfzeiten sind im Südosten von Söllingen am höchsten und nehmen tendenziell Richtung Norden und Westen ab. Im Nordwesten werden Schattenwurfzeiten von weniger als 30 Stunden jährlich erreicht. Der meteorologisch wahrscheinliche Schattenwurf, also das was tatsächlich im Mittel zu erwarten wäre, liegt bei ca. ein Sechstel bis ein Achtel des astronomisch maximal möglichen Schattenwurfes.

Die täglichen Schattenwurfzeiten bleiben meist unter den maximal möglichen 30 Minuten. Es gibt Ausnahmen mit geringer Überschreitung von wenigen Minuten und zwei größere mit maximal 56 Minuten täglich am Sonnenhof 1 und mit maximal 47 Minuten in der Bahnhofstraße 4.

Für die Einhaltung der Grenzwerte muss eine spezielle Steuerung die Windenergieanlagen 10 bis 14 und WEA 16 abschalten können (s. Berechnung im Anhang). Das Abschaltmodul besteht aus einem Sonnenscheindetektor und einer Steuereinheit, die bei einem möglichen Schattenwurf (in Abhängigkeit des Azimutwinkels der Windanlage und des Sonnenstands) die entsprechenden Windkraftanlagen abschaltet. Durch dieses Modul muss sichergestellt werden, dass die Windenergieanlagen, in dem kritischen Zeitraum mit Schattenwurf auf die betroffenen Immissionsorte, abgeschaltet werden und so die Richtwerte nicht überschritten werden.

In den weiteren umliegenden Ortschaften werden die Grenzwerte deutlich unterschritten (im Osten von Jerxheim) oder es wird kein Schattenwurf erzeugt, wie im restlichen Jerxheim, in Jerxheim Bahnhof und in Ohrleben.

7 Zusammenfassung

Durch Errichtung und Betrieb der beantragten neuen Windenergieanlagen ist Schattenwurf in den umliegenden Ortschaften zu erwarten.

Der den Anlagen am nächsten gelegene Ort Söllingen ist dabei am stärksten betroffen. Hier wird im größten Teil des Ortes der Richtwert von jährlich maximal 30 Stunden überschritten. Dabei nimmt der astronomisch maximale Schattenwurf vom Südosten des Ortes mit Beschattungszeiten von um 50 bis über 100 Stunden jährlich nach Nordwesten ab mit Beschattungszeiten von um 45 bis 30 Stunden und weniger jährlich. In den weiteren umliegenden Ortschaften liegt der Schattenwurf unter dem Grenzwert (Jerxheim) oder ist bei null (Bahnhof Jerxheim und Ohrleben). Die tatsächlichen Beschattungszeiten (meteorologisch wahrscheinlich) wurden mit einem Sechstel (der oben genannten Zeiten) und weniger berechnet.

Die tägliche Beschattungsdauer liegt bis auf Ausnahmen meist unter 30 Minuten täglich.

Zur Verhinderung der Überschreitungen müssen die Anlagen 10-14 und 16 an ein Schattenabschaltmodul angeschlossen werden. Damit werden die Grenzwerte an den Immissionsorten eingehalten.

Für die Untersuchung wurden die durch den Auftraggeber dieses Gutachtens beantragten 17 Windenergieanlagen des Typs Nordex N163/5.x-5.700 mit einer Nabenhöhe von 164 m und einem Rotordurchmesser von 163 m an den vom Auftraggeber vorgegebenen Positionen angesetzt.

SOWIWAS – Energie GmbH

Die vorstehenden Angaben sind unparteiisch und nach bestem Wissen und Gewissen ermittelt worden. Schadensersatzansprüche sind ausgeschlossen. Abschriften und Auszüge dürfen ohne Genehmigung des Verfassers nur vom Auftraggeber erstellt werden, um am beschriebenen Standort das Projekt zu realisieren.

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Gevensleben, den 22. November 2021

Dipl.-Ing. (FH) Andreas Schulze

Peter Peters

(Teamleiter Zertifizierung u. Gutachten)

Anhang

Ergebnisse der WindPRO Berechnung Shadow:

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

| | |
|---------------------|-----------|
| Hauptergebnis | 3 Seiten |
| Kalender | 69 Seiten |
| Grafischer Kalender | 7 Seiten |
| Karte | 1 Seite |

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

| | |
|---------------|----------|
| Hauptergebnis | 3 Seiten |
|---------------|----------|

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SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

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

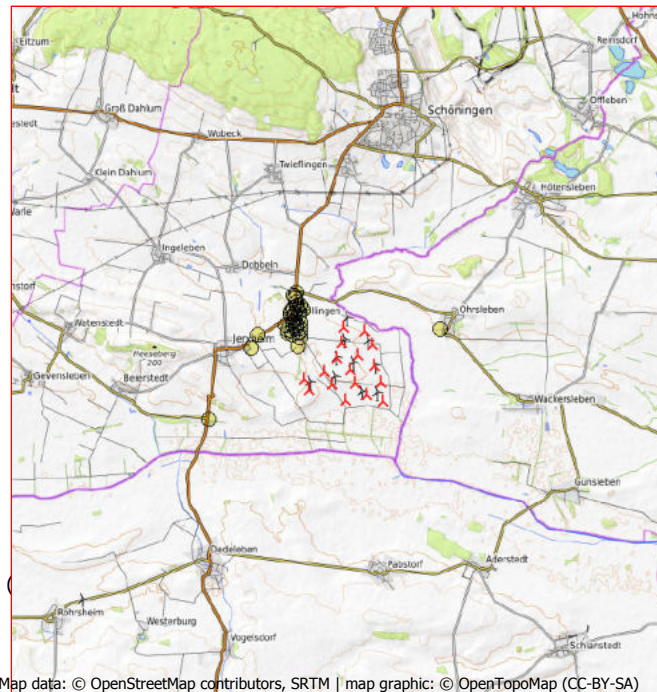
Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]
 Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
 1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsstunden ermittelt aus WEA in Berechnung und Windverteilung:
 Söllingen

Betriebsdauer je Sektor
 N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
 226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
 Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

Eine WEA wird nicht berücksichtigt, wenn sie von keinem Teil der Rezeptorfläche aus sichtbar ist. Die Sichtbarkeitsberechnung basiert auf den folgenden Annahmen:
 Verwendete Höhenlinien: HOHENLINIEN: CONTOURLINE_ONLINEDATA_0.wpo
 Hindernisse in Berechnung verwendet
 Berechnungshöhe ü.Gr. für Karte: 1,5 m
 Rasterauflösung: 1,0 m

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



WEA

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | | Nennleistung | Rotor-durchmesser | Nabenhöhe | Schattendaten | |
|--------|---------|-----------|-------|-----------------------------|---------|------------|----------------|--------------|-------------------|-----------|-------------------|---------|
| | | | | | Aktuell | Hersteller | Typ | | | | Beschatt.-Bereich | U/min |
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [U/min] |
| WEA 01 | 633.817 | 5.772.562 | 94,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 02 | 634.022 | 5.772.222 | 87,5 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 03 | 634.097 | 5.771.663 | 86,6 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 04 | 634.287 | 5.771.215 | 88,4 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 05 | 634.358 | 5.770.716 | 81,4 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 06 | 633.641 | 5.771.919 | 97,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 07 | 633.447 | 5.771.526 | 104,6 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 08 | 633.609 | 5.771.171 | 98,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 09 | 633.904 | 5.770.878 | 88,1 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 10 | 633.241 | 5.772.652 | 100,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 11 | 633.196 | 5.772.243 | 103,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 12 | 633.079 | 5.771.821 | 105,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 13 | 632.772 | 5.771.456 | 101,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 14 | 632.986 | 5.771.125 | 93,7 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 15 | 633.359 | 5.770.720 | 83,9 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 16 | 632.226 | 5.771.246 | 100,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 17 | 632.355 | 5.770.957 | 105,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |

Schattenrezeptor-Eingabe

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. |
|--------|---------------------------------|---------|-----------|-------|--------|------|------------|----------------------|---------------------|-----------------------|
| | | | | | | | | | | |
| IO d01 | Jerxheim, Am Pfingstgras 16 | 630.789 | 5.772.027 | 105,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d02 | Jerxheim, Halberstädter Str. 6B | 629.709 | 5.770.108 | 87,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d03 | Jerxheim, Helmstedter Str. 162 | 630.964 | 5.772.381 | 103,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d04 | Ohrsleben, Wiesenweg 1 | 635.847 | 5.772.667 | 100,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d08 | Söllingen, An der Schäferei 5 | 631.703 | 5.772.658 | 104,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d09 | Söllingen, Bahnhofstraße 4 | 632.158 | 5.773.086 | 98,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d12 | Söllingen, Bahnhofstraße 7 | 632.052 | 5.772.892 | 105,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d14 | Söllingen, Gartenstraße 9 | 632.082 | 5.772.738 | 104,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |

(Fortsetzung nächste Seite)...

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17.11.2021 11:42/3.4.424

SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

...(Fortsetzung von vorheriger Seite)

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. |
|--------|------------------------------|---------|-----------|-------|--------|------|---------------|-------------------------|---------------------|--------------------------|
| | | | | [m] | [m] | [m] | [m] | [°] | | [m] |
| IO d17 | Söllingen, Gartenstraße 18 | 632.103 | 5.772.598 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d20 | Söllingen, Gartenstraße 22 | 632.104 | 5.772.495 | 103,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d23 | Söllingen, Hauptstraße 1 | 631.953 | 5.773.544 | 90,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d25 | Söllingen, Hauptstraße 5 | 631.953 | 5.773.432 | 92,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d28 | Söllingen, Hauptstraße 12 | 631.963 | 5.773.285 | 94,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d32 | Söllingen, Hauptstraße 24 | 631.853 | 5.772.876 | 103,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d35 | Söllingen, Hauptstraße 30 | 631.898 | 5.772.736 | 104,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d37 | Söllingen, Hauptstraße 36 | 631.989 | 5.772.594 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d39 | Söllingen, Hauptstraße 40 | 631.905 | 5.772.648 | 104,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d40 | Söllingen, Hauptstraße 52 | 631.830 | 5.772.982 | 99,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d42 | Söllingen, Hauptstraße 56 | 631.858 | 5.773.059 | 97,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d44 | Söllingen, Hauptstraße 60 | 631.892 | 5.773.140 | 95,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d45 | Söllingen, Hauptstraße 70 | 631.931 | 5.773.378 | 93,4 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d46 | Söllingen, Hauptstraße 72 | 631.885 | 5.773.470 | 92,4 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d48 | Söllingen, Mühlenhof 3 | 632.076 | 5.773.219 | 94,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d51 | Söllingen, Pabstorfer Weg 10 | 632.043 | 5.772.465 | 103,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d54 | Söllingen, Pabstorfer Weg 15 | 632.109 | 5.772.353 | 102,5 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d56 | Söllingen, Poststraße 4 | 632.065 | 5.773.026 | 101,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d57 | Söllingen, Ringstraße 5 | 631.772 | 5.772.539 | 104,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d60 | Söllingen, Ringstraße 15 | 631.874 | 5.772.502 | 103,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d61 | Söllingen, Ringstraße 16 | 631.903 | 5.772.422 | 103,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d63 | Söllingen, Ringstraße 21 | 631.751 | 5.772.458 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d67 | Söllingen, Schulstraße 1 | 631.966 | 5.773.014 | 100,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d69 | Söllingen, Schulstraße 3 | 631.937 | 5.772.940 | 102,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d71 | Söllingen, Schulstraße 6 | 631.963 | 5.772.790 | 104,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d75 | Söllingen, Schulstraße 14 | 631.981 | 5.772.678 | 104,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d77 | Söllingen, Sonnenhof 1 | 632.058 | 5.772.117 | 101,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d79 | Söllingen, Tongrubenweg 2 | 632.002 | 5.773.184 | 95,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d80 | Söllingen, Tongrubenweg 3 | 632.003 | 5.773.111 | 95,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |

Berechnungsergebnisse

Schattenrezeptor

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | | met. wahrsch. Beschattungsdauer | |
|--------|---------------------------------|--------------------------------------|----------------------------|--------------------------------|---------------------------------|--|
| | | Stunden/Jahr [h/a] | Schattentage/Jahr [d/a] | Max.Schattendauer/Tag [h/d] | Stunden/Jahr [h/a] | |
| IO d01 | Jerxheim, Am Pflingstgras 16 | 10:09 | 34 | 0:24 | 1:36 | |
| IO d02 | Jerxheim, Halberstädter Str. 6B | 0:00 | 0 | 0:00 | 0:00 | |
| IO d03 | Jerxheim, Helmstedter Str. 162 | 16:39 | 60 | 0:23 | 1:43 | |
| IO d04 | Ohrleben, Wiesenweg 1 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d08 | Söllingen, An der Schäferei 5 | 52:50 | 159 | 0:25 | 7:26 | |
| IO d09 | Söllingen, Bahnhofstraße 4 | 55:52 | 134 | 0:47 | 7:27 | |
| IO d12 | Söllingen, Bahnhofstraße 7 | 59:21 | 153 | 0:30 | 8:03 | |
| IO d14 | Söllingen, Gartenstraße 9 | 65:28 | 175 | 0:32 | 10:29 | |
| IO d17 | Söllingen, Gartenstraße 18 | 81:27 | 213 | 0:33 | 13:51 | |
| IO d20 | Söllingen, Gartenstraße 22 | 98:30 | 243 | 0:33 | 16:53 | |
| IO d23 | Söllingen, Hauptstraße 1 | 12:51 | 40 | 0:25 | 1:42 | |
| IO d25 | Söllingen, Hauptstraße 5 | 33:09 | 113 | 0:26 | 3:51 | |
| IO d28 | Söllingen, Hauptstraße 12 | 28:02 | 85 | 0:27 | 3:51 | |
| IO d32 | Söllingen, Hauptstraße 24 | 39:28 | 120 | 0:27 | 6:06 | |
| IO d35 | Söllingen, Hauptstraße 30 | 47:13 | 144 | 0:28 | 7:16 | |
| IO d37 | Söllingen, Hauptstraße 36 | 70:31 | 186 | 0:30 | 11:13 | |
| IO d39 | Söllingen, Hauptstraße 40 | 55:51 | 158 | 0:28 | 8:26 | |
| IO d40 | Söllingen, Hauptstraße 52 | 40:38 | 134 | 0:26 | 5:43 | |
| IO d42 | Söllingen, Hauptstraße 56 | 45:19 | 137 | 0:25 | 5:44 | |
| IO d44 | Söllingen, Hauptstraße 60 | 43:33 | 131 | 0:26 | 5:20 | |
| IO d45 | Söllingen, Hauptstraße 70 | 28:14 | 90 | 0:26 | 3:37 | |
| IO d46 | Söllingen, Hauptstraße 72 | 11:23 | 37 | 0:25 | 1:43 | |
| IO d48 | Söllingen, Mühlenhof 3 | 39:47 | 122 | 0:29 | 5:03 | |
| IO d51 | Söllingen, Pabstorfer Weg 10 | 99:24 | 246 | 0:33 | 16:41 | |
| IO d54 | Söllingen, Pabstorfer Weg 15 | 123:23 | 269 | 0:39 | 21:28 | |
| IO d56 | Söllingen, Poststraße 4 | 52:46 | 139 | 0:30 | 6:46 | |
| IO d57 | Söllingen, Ringstraße 5 | 62:04 | 171 | 0:28 | 9:10 | |
| IO d60 | Söllingen, Ringstraße 15 | 69:00 | 179 | 0:29 | 10:34 | |

(Fortsetzung nächste Seite)...

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Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

...(Fortsetzung von vorheriger Seite)

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | | met. wahrsch. Beschattungsdauer | |
|--------|---------------------------|--------------------------------------|-------------------|-----------------------|---------------------------------|--|
| | | Stunden/Jahr | Schattentage/Jahr | Max.Schattendauer/Tag | Stunden/Jahr | |
| | | [h/a] | [d/a] | [h/d] | [h/a] | |
| IO d61 | Söllingen, Ringstraße 16 | 77:26 | 190 | 0:31 | 12:02 | |
| IO d63 | Söllingen, Ringstraße 21 | 62:35 | 184 | 0:28 | 9:40 | |
| IO d67 | Söllingen, Schulstraße 1 | 51:10 | 142 | 0:28 | 6:34 | |
| IO d69 | Söllingen, Schulstraße 3 | 50:58 | 151 | 0:28 | 6:53 | |
| IO d71 | Söllingen, Schulstraße 6 | 46:32 | 130 | 0:29 | 7:21 | |
| IO d75 | Söllingen, Schulstraße 14 | 53:47 | 155 | 0:30 | 8:31 | |
| IO d77 | Söllingen, Sonnenhof 1 | 161:57 | 309 | 0:56 | 27:42 | |
| IO d79 | Söllingen, Tongrubenweg 2 | 41:53 | 125 | 0:28 | 5:10 | |
| IO d80 | Söllingen, Tongrubenweg 3 | 46:40 | 133 | 0:29 | 5:47 | |

Gesamtdauer Beschattung an Rezeptoren pro WEA

| Nr. | Name | | | | Maximal | Erwartet |
|--------|--------------------------------|---------------------------|-------|--|---------|----------|
| | | | | | [h/a] | [h/a] |
| WEA 01 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (409) | | 34:37 | 7:45 |
| WEA 02 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (410) | | 0:00 | 0:00 |
| WEA 03 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (411) | | 0:00 | 0:00 |
| WEA 04 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (412) | | 0:00 | 0:00 |
| WEA 05 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (413) | | 0:00 | 0:00 |
| WEA 06 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (414) | | 39:18 | 7:08 |
| WEA 07 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (415) | | 41:18 | 5:48 |
| WEA 08 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (416) | | 0:00 | 0:00 |
| WEA 09 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (417) | | 0:00 | 0:00 |
| WEA 10 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (418) | | 182:07 | 41:51 |
| WEA 11 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (419) | | 157:11 | 27:18 |
| WEA 12 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (420) | | 146:47 | 18:51 |
| WEA 13 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (421) | | 109:37 | 10:46 |
| WEA 14 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (422) | | 45:53 | 4:02 |
| WEA 15 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (423) | | 0:00 | 0:00 |
| WEA 16 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (424) | | 42:03 | 4:31 |
| WEA 17 | NORDEX N163/5.X 5700 163.0 !O! | NH: 164,0 m (Ges:245,5 m) | (425) | | 0:00 | 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.

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d01 - Jerxheim, Am Pfingstgras 16

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|-------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------------------------|----------------|-------------------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 07:05 17:55 | 06:54 19:49 | 05:49 20:41 | 05:03 21:27 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 07:39 (WEA 16) 16:09 |
| 2 | 08:26 16:16 | 07:57 17:05 | 07:03 17:57 | 06:52 19:51 | 05:47 20:42 | 05:02 21:28 | 05:01 21:40 | 05:38 21:07 | 06:29 20:04 | 07:18 18:54 | 07:12 16:48 | 07:40 (WEA 16) 16:09 |
| 3 | 08:25 16:17 | 07:55 17:07 | 07:00 17:59 | 06:49 19:53 | 05:45 20:44 | 05:02 21:29 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 07:42 (WEA 16) 16:08 |
| 4 | 08:25 16:18 | 07:54 17:09 | 06:58 18:00 | 06:47 19:54 | 05:43 20:46 | 05:01 21:30 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:50 | 07:16 16:44 | 07:44 (WEA 16) 16:07 |
| 5 | 08:25 16:19 | 07:52 17:10 | 08:18 (WEA 16) 18:02 | 06:56 19:56 | 06:45 20:47 | 05:41 21:31 | 05:00 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 07:46 (WEA 16) 16:07 |
| 6 | 08:25 16:21 | 07:50 17:12 | 08:16 (WEA 16) 18:04 | 06:54 19:58 | 06:42 20:49 | 05:39 21:32 | 05:04 21:39 | 05:45 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 07:55 (WEA 16) 16:08 |
| 7 | 08:24 16:22 | 07:49 17:14 | 08:14 (WEA 16) 18:06 | 06:52 20:00 | 06:40 20:51 | 05:38 21:33 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 08:24 16:23 | 07:47 17:16 | 08:12 (WEA 16) 18:07 | 06:49 20:01 | 06:38 20:52 | 05:36 21:34 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:38 | 08:11 16:06 |
| 9 | 08:23 16:25 | 07:45 17:18 | 08:10 (WEA 16) 18:09 | 06:47 20:03 | 06:36 20:54 | 05:34 21:35 | 05:07 21:37 | 05:49 20:55 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 08:23 16:26 | 07:43 17:20 | 08:09 (WEA 16) 18:11 | 06:45 20:05 | 06:33 20:55 | 05:32 21:35 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 08:22 16:27 | 07:42 17:22 | 08:10 (WEA 16) 18:13 | 06:43 20:06 | 06:31 20:57 | 05:31 21:36 | 05:09 21:35 | 05:53 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 08:22 16:29 | 07:40 17:24 | 08:10 (WEA 16) 18:15 | 06:40 20:08 | 06:29 20:59 | 05:29 21:37 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 08:21 16:30 | 07:38 17:25 | 08:09 (WEA 16) 18:16 | 06:38 20:10 | 06:27 21:00 | 05:27 21:37 | 05:11 21:33 | 05:56 20:47 | 06:47 19:39 | 07:37 18:29 | 07:32 16:30 | 08:16 16:05 |
| 14 | 08:20 16:32 | 07:36 17:27 | 08:10 (WEA 16) 18:18 | 06:36 20:12 | 06:24 21:02 | 05:26 21:38 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 08:19 16:33 | 07:34 17:29 | 08:10 (WEA 16) 18:20 | 06:33 20:13 | 06:22 21:03 | 05:24 21:39 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 08:18 16:35 | 07:32 17:31 | 08:09 (WEA 16) 18:22 | 06:31 20:15 | 06:20 21:05 | 05:23 21:39 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:23 | 07:37 16:25 | 08:19 16:05 |
| 17 | 08:17 16:37 | 07:30 17:33 | 08:10 (WEA 16) 18:23 | 06:29 20:17 | 06:18 21:06 | 05:21 21:40 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 08:17 16:38 | 07:28 17:35 | 08:11 (WEA 16) 18:25 | 06:26 20:18 | 06:16 21:08 | 05:20 21:40 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:23 | 08:21 16:05 |
| 19 | 08:16 16:40 | 07:26 17:37 | 08:12 (WEA 16) 18:27 | 06:24 20:20 | 06:13 21:09 | 05:18 21:40 | 05:18 21:27 | 06:06 20:35 | 06:56 19:25 | 07:47 18:21 | 07:42 16:21 | 08:21 16:06 |
| 20 | 08:14 16:42 | 07:24 17:38 | 08:14 (WEA 16) 18:29 | 06:22 20:22 | 06:11 21:11 | 05:17 21:41 | 05:19 21:26 | 06:07 20:33 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 08:13 16:43 | 07:22 17:40 | 08:18 (WEA 16) 18:30 | 06:19 20:24 | 06:09 21:12 | 05:15 21:41 | 05:16 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 08:12 16:45 | 07:20 17:42 | 08:23 (WEA 16) 18:32 | 06:17 20:25 | 06:07 21:14 | 05:14 21:41 | 05:16 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:48 16:18 | 08:24 16:07 |
| 23 | 08:11 16:47 | 07:18 17:44 | 08:33 (WEA 16) 18:34 | 06:05 20:27 | 06:05 21:15 | 05:13 21:41 | 05:14 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:17 | 08:24 16:07 |
| 24 | 08:10 16:48 | 07:16 17:46 | 08:30 (WEA 16) 18:35 | 06:03 20:29 | 06:03 21:17 | 05:12 21:41 | 05:15 21:21 | 06:14 20:24 | 07:05 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 08:09 16:50 | 07:14 17:48 | 08:30 (WEA 16) 18:37 | 06:01 20:30 | 06:01 21:18 | 05:10 21:42 | 05:16 21:19 | 06:15 20:22 | 07:06 19:10 | 07:58 17:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 08:07 16:52 | 07:11 17:49 | 08:30 (WEA 16) 18:39 | 06:08 20:32 | 06:08 21:19 | 05:09 21:42 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:54 17:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 08:06 16:54 | 07:09 17:51 | 06:05 18:41 | 05:57 20:34 | 05:08 21:21 | 05:08 21:41 | 05:29 21:17 | 06:19 20:17 | 07:10 19:06 | 07:01 17:00 | 07:56 16:13 | 08:25 16:10 |
| 28 | 08:04 16:56 | 07:07 17:53 | 06:03 18:42 | 05:55 20:35 | 05:07 21:22 | 05:07 21:41 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 08:03 16:57 | 07:03 17:54 | 07:01 19:44 | 05:53 20:37 | 05:06 21:23 | 05:06 21:41 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:26 16:12 |
| 30 | 08:02 16:59 | 07:02 17:55 | 06:59 19:46 | 05:51 20:39 | 05:05 21:24 | 05:05 21:41 | 05:34 21:12 | 06:24 20:11 | 07:15 18:59 | 07:07 16:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 08:00 17:01 | 07:00 17:59 | 06:56 19:48 | 05:54 20:39 | 05:04 21:26 | 05:04 21:40 | 05:35 21:10 | 06:25 20:09 | 07:09 16:52 | 07:39 (WEA 16) 08:01 (WEA 16) | 08:00 16:10 | 08:26 16:14 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | | | | | | | | | 214 | 91 |
| Red.Sonnenscheinwahrsch. | | | | | | | | | | | 0,31 | 0,21 |
| Reduktion Betriebsdauer | | | | | | | | | | | 0,96 | 0,96 |
| Reduktion Windrichtung | | | | | | | | | | | 0,62 | 0,62 |
| Gesamte Reduktion | | | | | | | | | | | 0,15 | 0,13 |
| Met.wahrsch.Beschattung | | | | | | | | | | | 40 | 12 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d02 - Jerxheim, Halberstädter Str. 6B

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

Januar | **Februar** | **März** | **April** | **Mai** | **Juni** | **Juli** | **August** | **September** | **Oktober** | **November** | **Dezember**

| | | | | | | | | | | | | | |
|----|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|
| 1 | 08:26 16:15 | 07:59 17:03 | 07:05 17:55 | 06:54 19:49 | 05:49 20:41 | 05:03 21:27 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:57 | 07:10 16:50 | 08:02 16:09 | |
| 2 | 08:26 16:16 | 07:57 17:05 | 07:03 17:57 | 06:52 19:51 | 05:47 20:42 | 05:02 21:28 | 05:01 21:40 | 05:38 21:07 | 06:29 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:09 | |
| 3 | 08:25 16:17 | 07:55 17:07 | 07:01 17:59 | 06:49 19:53 | 05:45 20:44 | 05:02 21:29 | 05:02 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 08:04 16:08 | |
| 4 | 08:25 16:18 | 07:54 17:09 | 06:58 18:00 | 06:47 19:54 | 05:43 20:46 | 05:01 21:30 | 05:02 21:40 | 05:42 21:04 | 06:32 19:59 | 07:21 18:50 | 07:16 16:45 | 08:06 16:08 | |
| 5 | 08:25 16:20 | 07:52 17:11 | 06:56 18:02 | 06:45 19:56 | 05:41 20:47 | 05:00 21:31 | 05:03 21:39 | 05:43 21:02 | 06:34 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 | |
| 6 | 08:25 16:21 | 07:50 17:12 | 06:54 18:04 | 06:42 19:58 | 05:39 20:49 | 05:00 21:32 | 05:04 21:39 | 05:45 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:07 | |
| 7 | 08:24 16:22 | 07:49 17:14 | 06:52 18:06 | 06:40 20:00 | 05:38 20:51 | 04:59 21:33 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 | |
| 8 | 08:24 16:23 | 07:47 17:16 | 06:49 18:08 | 06:38 20:01 | 05:36 20:52 | 04:58 21:34 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:38 | 08:11 16:06 | |
| 9 | 08:23 16:25 | 07:45 17:18 | 06:47 18:09 | 06:36 20:03 | 05:34 20:54 | 04:58 21:35 | 05:07 21:37 | 05:50 20:55 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:06 | |
| 10 | 08:23 16:26 | 07:43 17:20 | 06:45 18:11 | 06:33 20:05 | 05:32 20:55 | 04:58 21:35 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:32 18:36 | 07:27 16:34 | 08:13 16:05 | |
| 11 | 08:22 16:28 | 07:42 17:22 | 06:43 18:13 | 06:31 20:06 | 05:31 20:57 | 04:57 21:36 | 05:09 21:35 | 05:53 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 | |
| 12 | 08:21 16:29 | 07:40 17:24 | 06:40 18:15 | 06:29 20:08 | 05:29 20:59 | 04:57 21:37 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 | |
| 13 | 08:21 16:31 | 07:38 17:25 | 06:38 18:16 | 06:27 20:10 | 05:27 21:00 | 04:56 21:37 | 05:11 21:33 | 05:56 20:47 | 06:47 19:39 | 07:37 18:29 | 07:32 16:30 | 08:16 16:05 | |
| 14 | 08:20 16:32 | 07:36 17:27 | 06:36 18:18 | 06:24 20:12 | 05:26 21:02 | 04:56 21:38 | 05:12 21:33 | 05:58 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 | |
| 15 | 08:19 16:34 | 07:34 17:29 | 06:33 18:20 | 06:22 20:13 | 05:24 21:03 | 04:56 21:39 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 | |
| 16 | 08:18 16:35 | 07:32 17:31 | 06:31 18:22 | 06:20 20:15 | 05:23 21:05 | 04:56 21:39 | 05:15 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:23 | 07:37 16:25 | 08:19 16:05 | |
| 17 | 08:17 16:37 | 07:30 17:33 | 06:29 18:23 | 06:18 20:17 | 05:21 21:06 | 04:56 21:40 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:21 | 07:39 16:24 | 08:20 16:05 | |
| 18 | 08:17 16:38 | 07:28 17:35 | 06:26 18:25 | 06:16 20:18 | 05:20 21:08 | 04:56 21:40 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:23 | 08:21 16:06 | |
| 19 | 08:16 16:40 | 07:26 17:37 | 06:24 18:27 | 06:14 20:20 | 05:18 21:09 | 04:56 21:40 | 05:18 21:27 | 06:06 20:35 | 06:56 19:25 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 | |
| 20 | 08:14 16:42 | 07:24 17:39 | 06:22 18:29 | 06:11 20:22 | 05:17 21:11 | 04:56 21:41 | 05:20 21:26 | 06:07 20:33 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 | |
| 21 | 08:13 16:43 | 07:22 17:40 | 06:20 18:30 | 06:09 20:24 | 05:16 21:12 | 04:56 21:41 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:07 | |
| 22 | 08:12 16:45 | 07:20 17:42 | 06:17 18:32 | 06:07 20:25 | 05:14 21:14 | 04:56 21:41 | 05:22 21:23 | 06:11 20:28 | 07:01 19:18 | 07:52 18:10 | 07:48 16:18 | 08:23 16:07 | |
| 23 | 08:11 16:47 | 07:18 17:44 | 06:15 18:34 | 06:05 20:27 | 05:13 21:15 | 04:57 21:41 | 05:24 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:17 | 08:24 16:08 | |
| 24 | 08:10 16:49 | 07:16 17:46 | 06:13 18:36 | 06:03 20:29 | 05:12 21:17 | 04:57 21:41 | 05:25 21:21 | 06:14 20:24 | 07:05 19:13 | 07:56 18:06 | 07:51 16:16 | 08:24 16:08 | |
| 25 | 08:09 16:50 | 07:14 17:48 | 06:10 18:37 | 06:01 20:30 | 05:10 21:18 | 04:57 21:42 | 05:27 21:19 | 06:16 20:22 | 07:06 19:11 | 06:58 17:04 | 07:52 16:15 | 08:25 16:09 | |
| 26 | 08:07 16:52 | 07:11 17:50 | 06:08 18:39 | 05:59 20:32 | 05:09 21:19 | 04:58 21:42 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:00 17:02 | 07:54 16:14 | 08:25 16:10 | |
| 27 | 08:06 16:54 | 07:09 17:51 | 06:06 18:41 | 05:57 20:34 | 05:08 21:21 | 04:58 21:41 | 05:29 21:17 | 06:19 20:17 | 07:10 19:06 | 07:01 17:00 | 07:56 16:13 | 08:25 16:10 | |
| 28 | 08:05 16:56 | 07:07 17:53 | 06:03 18:42 | 05:55 20:35 | 05:07 21:22 | 04:58 21:41 | 05:31 21:15 | 06:20 20:15 | 07:11 19:04 | 07:03 16:58 | 07:57 16:12 | 08:25 16:11 | |
| 29 | 08:03 16:58 | | 07:01 19:44 | 05:53 20:37 | 05:06 21:23 | 04:59 21:41 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:25 16:12 | |
| 30 | 08:02 16:59 | | 06:59 19:46 | 05:51 20:39 | 05:05 21:24 | 05:00 21:41 | 05:34 21:12 | 06:24 20:11 | 07:15 18:59 | 07:07 16:54 | 08:00 16:10 | 08:26 16:13 | |
| 31 | 08:00 17:01 | | 06:56 19:48 | 05:04 21:26 | 05:04 21:26 | 05:04 21:10 | 05:35 20:09 | 06:25 20:09 | 06:25 16:52 | 07:09 16:52 | 07:09 16:14 | 08:26 16:14 | |
| | Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | 503 | 454 | 381 | 331 | 266 | 243 |
| | astr.max.mögl.Beschattung | | | | | | | | | | | | |
| | Red.Sonnenscheinwahrsch. | | | | | | | | | | | | |
| | Reduktion Betriebsdauer | | | | | | | | | | | | |
| | Reduktion Windrichtung | | | | | | | | | | | | |
| | Gesamte Reduktion | | | | | | | | | | | | |
| | Met.wahrsch.Beschattung | | | | | | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d03 - Jerxheim, Helmstedter Str. 162

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember | | | | | |
|---------------------------|--------|----------------|-------|-------|-------|-------|-------|--------|-----------|---------|----------|----------|-------|----------------|----------------|--|------|
| 1 | 08:26 | 08:57 (WEA 16) | 07:59 | 07:05 | 06:54 | 05:49 | 05:03 | 05:00 | 05:37 | 06:27 | 07:16 | 07:10 | 08:02 | 08:34 (WEA 16) | | | |
| 16:15 | 3 | 09:00 (WEA 16) | 17:03 | 17:55 | 19:49 | 20:41 | 21:27 | 21:41 | 21:09 | 20:06 | 18:56 | 16:50 | 16:09 | 19 | 08:53 (WEA 16) | | |
| 2 | 08:26 | 08:57 (WEA 16) | 07:57 | 07:03 | 06:52 | 05:47 | 05:02 | 05:01 | 05:38 | 06:29 | 07:18 | 07:12 | 08:03 | | 08:36 (WEA 16) | | |
| 16:16 | 5 | 09:02 (WEA 16) | 17:05 | 17:57 | 19:51 | 20:42 | 21:28 | 21:40 | 21:07 | 20:04 | 18:54 | 16:48 | 16:09 | 18 | 08:54 (WEA 16) | | |
| 3 | 08:25 | 08:57 (WEA 16) | 07:55 | 07:00 | 06:49 | 05:45 | 05:01 | 05:01 | 05:40 | 06:30 | 07:20 | 07:14 | 08:04 | | 08:37 (WEA 16) | | |
| 16:17 | 6 | 09:03 (WEA 16) | 17:07 | 17:59 | 19:53 | 20:44 | 21:29 | 21:40 | 21:05 | 20:02 | 18:52 | 16:46 | 16:08 | 16 | 08:53 (WEA 16) | | |
| 4 | 08:25 | 08:56 (WEA 16) | 07:54 | 06:58 | 06:47 | 05:43 | 05:01 | 05:02 | 05:41 | 06:32 | 07:21 | 07:16 | 08:06 | | 08:39 (WEA 16) | | |
| 16:18 | 8 | 09:04 (WEA 16) | 17:09 | 18:00 | 19:54 | 20:46 | 21:30 | 21:40 | 21:04 | 19:59 | 18:50 | 16:44 | 16:07 | 15 | 08:54 (WEA 16) | | |
| 5 | 08:25 | 08:56 (WEA 16) | 07:52 | 06:56 | 06:45 | 05:41 | 05:00 | 05:03 | 05:43 | 06:33 | 07:23 | 07:18 | 08:07 | | 08:40 (WEA 16) | | |
| 16:19 | 10 | 09:06 (WEA 16) | 17:10 | 18:02 | 19:56 | 20:47 | 21:31 | 21:39 | 21:02 | 19:57 | 18:47 | 16:43 | 16:07 | 13 | 08:50 (WEA 16) | | |
| 6 | 08:25 | 08:55 (WEA 16) | 07:50 | 06:54 | 06:42 | 05:39 | 04:59 | 05:04 | 05:45 | 06:35 | 07:25 | 07:19 | 08:09 | | 08:41 (WEA 16) | | |
| 16:21 | 11 | 09:06 (WEA 16) | 17:12 | 18:04 | 19:58 | 20:49 | 21:32 | 21:39 | 21:00 | 19:55 | 18:45 | 16:41 | 16:06 | 11 | 08:52 (WEA 16) | | |
| 7 | 08:24 | 08:55 (WEA 16) | 07:49 | 06:52 | 06:40 | 05:38 | 04:59 | 05:05 | 05:46 | 06:37 | 07:26 | 07:21 | 08:10 | | 08:43 (WEA 16) | | |
| 16:22 | 13 | 09:08 (WEA 16) | 17:14 | 18:06 | 20:00 | 20:51 | 21:33 | 21:38 | 20:58 | 19:53 | 18:43 | 16:39 | 16:06 | 10 | 08:53 (WEA 16) | | |
| 8 | 08:24 | 08:54 (WEA 16) | 07:47 | 06:49 | 06:38 | 05:36 | 04:58 | 05:06 | 05:48 | 06:38 | 07:28 | 07:23 | 08:11 | | 08:44 (WEA 16) | | |
| 16:23 | 14 | 09:08 (WEA 16) | 17:16 | 18:07 | 20:01 | 20:52 | 21:34 | 21:37 | 20:56 | 19:50 | 18:40 | 16:38 | 16:06 | 8 | 08:52 (WEA 16) | | |
| 9 | 08:23 | 08:54 (WEA 16) | 07:45 | 06:47 | 06:36 | 05:34 | 04:58 | 05:07 | 05:49 | 06:40 | 07:30 | 07:25 | 08:12 | | 08:45 (WEA 16) | | |
| 16:25 | 16 | 09:10 (WEA 16) | 17:18 | 18:09 | 20:03 | 20:54 | 21:35 | 21:37 | 20:55 | 19:48 | 18:38 | 16:36 | 16:05 | 7 | 08:52 (WEA 16) | | |
| 10 | 08:23 | 08:53 (WEA 16) | 07:43 | 06:45 | 06:33 | 05:32 | 04:57 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | 08:13 | | 08:46 (WEA 16) | | |
| 16:26 | 18 | 09:11 (WEA 16) | 17:20 | 18:11 | 20:05 | 20:55 | 21:35 | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | 16:05 | 5 | 08:51 (WEA 16) | | |
| 11 | 08:22 | 08:52 (WEA 16) | 07:42 | 06:43 | 06:31 | 05:31 | 04:57 | 05:09 | 05:53 | 06:43 | 07:33 | 07:28 | 08:14 | | 08:47 (WEA 16) | | |
| 16:27 | 19 | 09:11 (WEA 16) | 17:22 | 18:13 | 20:06 | 20:57 | 21:36 | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | 16:05 | 3 | 08:50 (WEA 16) | | |
| 12 | 08:22 | 08:51 (WEA 16) | 07:40 | 06:40 | 06:29 | 05:29 | 04:57 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | 08:15 | | 08:48 (WEA 16) | | |
| 16:29 | 21 | 09:12 (WEA 16) | 17:23 | 18:15 | 20:08 | 20:59 | 21:37 | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | 5 | 08:41 (WEA 16) | 16:05 | | |
| 13 | 08:21 | 08:51 (WEA 16) | 07:38 | 06:38 | 06:27 | 05:27 | 04:56 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | 08:16 | | 08:49 (WEA 16) | | |
| 16:30 | 21 | 09:12 (WEA 16) | 17:25 | 18:16 | 20:10 | 21:00 | 21:38 | 21:33 | 20:47 | 19:39 | 18:29 | 16:30 | 11 | 08:44 (WEA 16) | 16:05 | | |
| 14 | 08:20 | 08:51 (WEA 16) | 07:36 | 06:36 | 06:24 | 05:26 | 04:56 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | 08:17 | | 08:52 (WEA 16) | | |
| 16:32 | 22 | 09:13 (WEA 16) | 17:27 | 18:18 | 20:12 | 21:02 | 21:38 | 21:33 | 20:45 | 19:36 | 18:27 | 16:28 | 14 | 08:46 (WEA 16) | 16:05 | | |
| 15 | 08:19 | 08:51 (WEA 16) | 07:34 | 06:33 | 06:22 | 05:24 | 04:56 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | 08:18 | | 08:51 (WEA 16) | | |
| 16:33 | 23 | 09:14 (WEA 16) | 17:29 | 18:20 | 20:13 | 21:03 | 21:39 | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 17 | 08:48 (WEA 16) | 16:05 | | |
| 16 | 08:18 | 08:51 (WEA 16) | 07:32 | 06:31 | 06:20 | 05:23 | 04:56 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | 08:19 | | 08:47 (WEA 16) | | |
| 16:35 | 23 | 09:14 (WEA 16) | 17:31 | 18:22 | 20:15 | 21:05 | 21:39 | 21:31 | 20:41 | 19:32 | 18:23 | 16:25 | 19 | 08:49 (WEA 16) | 16:05 | | |
| 17 | 08:17 | 08:52 (WEA 16) | 07:30 | 06:29 | 06:18 | 05:21 | 04:56 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | 08:20 | | 08:49 (WEA 16) | | |
| 16:37 | 23 | 09:15 (WEA 16) | 17:33 | 18:23 | 20:17 | 21:06 | 21:40 | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | 20 | 08:49 (WEA 16) | 16:05 | | |
| 18 | 08:17 | 08:52 (WEA 16) | 07:28 | 06:26 | 06:16 | 05:20 | 04:56 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:21 | | 08:29 (WEA 16) | | |
| 16:38 | 23 | 09:15 (WEA 16) | 17:35 | 18:25 | 20:18 | 21:08 | 21:40 | 21:28 | 20:37 | 19:27 | 18:18 | 16:23 | 21 | 08:50 (WEA 16) | 16:05 | | |
| 19 | 08:16 | 08:53 (WEA 16) | 07:26 | 06:24 | 06:13 | 05:18 | 04:56 | 05:18 | 06:06 | 06:56 | 07:47 | 07:42 | 08:21 | | 08:29 (WEA 16) | | |
| 16:40 | 23 | 09:16 (WEA 16) | 17:37 | 18:27 | 20:20 | 21:09 | 21:40 | 21:27 | 20:35 | 19:25 | 18:16 | 16:21 | 22 | 08:51 (WEA 16) | 16:06 | | |
| 20 | 08:14 | 08:53 (WEA 16) | 07:24 | 06:22 | 06:11 | 05:17 | 04:56 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | 08:21 | | 08:29 (WEA 16) | | |
| 16:42 | 23 | 09:16 (WEA 16) | 17:38 | 18:29 | 20:22 | 21:11 | 21:41 | 21:26 | 20:33 | 19:22 | 18:14 | 16:20 | 22 | 08:51 (WEA 16) | 16:06 | | |
| 21 | 08:13 | 08:53 (WEA 16) | 07:22 | 06:19 | 06:09 | 05:15 | 04:56 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | 08:21 | | 08:29 (WEA 16) | | |
| 16:43 | 23 | 09:16 (WEA 16) | 17:40 | 18:30 | 20:24 | 21:12 | 21:41 | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 23 | 08:52 (WEA 16) | 16:06 | | |
| 22 | 08:12 | 08:54 (WEA 16) | 07:20 | 06:17 | 06:07 | 05:14 | 04:56 | 05:22 | 06:10 | 07:01 | 07:52 | 07:48 | 08:21 | | 08:29 (WEA 16) | | |
| 16:45 | 22 | 09:16 (WEA 16) | 17:42 | 18:32 | 20:25 | 21:14 | 21:41 | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 23 | 08:52 (WEA 16) | 16:07 | | |
| 23 | 08:11 | 08:55 (WEA 16) | 07:18 | 06:15 | 06:05 | 05:13 | 04:56 | 05:24 | 06:12 | 07:03 | 07:54 | 07:49 | 08:21 | | 08:30 (WEA 16) | | |
| 16:47 | 22 | 09:17 (WEA 16) | 17:44 | 18:34 | 20:27 | 21:15 | 21:41 | 21:22 | 20:26 | 19:15 | 18:08 | 16:16 | 23 | 08:53 (WEA 16) | 16:07 | | |
| 24 | 08:10 | 08:55 (WEA 16) | 07:16 | 06:12 | 06:03 | 05:12 | 04:57 | 05:25 | 06:14 | 07:05 | 07:56 | 07:51 | 08:21 | | 08:29 (WEA 16) | | |
| 16:48 | 21 | 09:16 (WEA 16) | 17:46 | 18:35 | 20:29 | 21:17 | 21:41 | 21:21 | 20:24 | 19:13 | 18:06 | 16:15 | 23 | 08:52 (WEA 16) | 16:08 | | |
| 25 | 08:09 | 08:56 (WEA 16) | 07:13 | 06:10 | 06:01 | 05:10 | 04:57 | 05:26 | 06:15 | 07:06 | 07:58 | 07:52 | 08:21 | | 08:30 (WEA 16) | | |
| 16:50 | 20 | 09:16 (WEA 16) | 17:48 | 18:37 | 20:30 | 21:18 | 21:42 | 21:19 | 20:22 | 19:10 | 17:04 | 16:14 | 23 | 08:53 (WEA 16) | 16:09 | | |
| 26 | 08:07 | 08:56 (WEA 16) | 07:11 | 06:08 | 05:59 | 05:09 | 04:57 | 05:28 | 06:17 | 07:08 | 07:00 | 07:54 | 08:30 | | 08:30 (WEA 16) | | |
| 16:52 | 19 | 09:15 (WEA 16) | 17:49 | 18:39 | 20:32 | 21:19 | 21:42 | 21:18 | 20:20 | 19:08 | 17:02 | 16:13 | 23 | 08:53 (WEA 16) | 16:09 | | |
| 27 | 08:06 | 08:58 (WEA 16) | 07:09 | 06:05 | 05:57 | 05:08 | 04:58 | 05:29 | 06:19 | 07:10 | 07:01 | 07:56 | 08:21 | | 08:31 (WEA 16) | | |
| 16:54 | 17 | 09:15 (WEA 16) | 17:51 | 18:41 | 20:34 | 21:21 | 21:41 | 21:17 | 20:17 | 19:06 | 17:00 | 16:12 | 23 | 08:54 (WEA 16) | 16:10 | | |
| 28 | 08:05 | 08:59 (WEA 16) | 07:07 | 06:03 | 05:55 | 05:07 | 04:58 | 05:31 | 06:20 | 07:11 | 07:03 | 07:57 | 08:21 | | 08:31 (WEA 16) | | |
| 16:56 | 14 | 09:13 (WEA 16) | 17:53 | 18:42 | 20:35 | 21:22 | 21:41 | 21:15 | 20:15 | 19:03 | 16:58 | 16:12 | 22 | 08:53 (WEA 16) | 16:11 | | |
| 29 | 08:03 | 09:02 (WEA 16) | | 07:01 | 05:53 | 05:06 | 04:59 | 05:32 | 06:22 | 07:13 | 07:05 | 07:59 | 08:21 | | 08:32 (WEA 16) | | |
| 16:57 | 10 | 09:12 (WEA 16) | | 19:44 | 20:37 | 21:23 | 21:41 | 21:13 | 20:13 | 19:01 | 16:56 | 16:11 | 22 | 08:54 (WEA 16) | 16:12 | | |
| 30 | 08:02 | 09:05 (WEA 16) | | 06:59 | 05:51 | 05:05 | 04:59 | 05:34 | 06:24 | 07:15 | 07:07 | 08:00 | 08:21 | | 08:32 (WEA 16) | | |
| 16:59 | 4 | 09:09 (WEA 16) | | 19:46 | 20:39 | 21:24 | 21:41 | 21:12 | 20:11 | 18:59 | 16:54 | 16:10 | 21 | 08:53 (WEA 16) | 16:13 | | |
| 31 | 08:00 | | | 06:56 | | 05:04 | | 05:35 | 06:25 | | 07:09 | | 08:26 | | 08:26 | | |
| 17:01 | | | | 19:48 | | 21:26 | | 21:10 | 20:09 | | 16:52 | | 16:14 | | 16:14 | | |
| Sonnenscheinstunden | 258 | | 277 | | 416 | | 500 | | 381 | | 331 | | 266 | | 377 | | 125 |
| astr.max.mögl.Beschattung | | | | | | | | | | | | | | | 0,21 | | 0,14 |
| Red.Sonnenscheinwahrsch. | | | | | | | | | | | | | | | 0,96 | | 0,96 |
| Reduktion Betriebsdauer | | | | | | | | | | | | | | | 0,57 | | 0,57 |
| Reduktion Windrichtung | | | | | | | | | | | | | | | 0,12 | | 0,08 |
| Gesamte Reduktion | | | | | | | | | | | | | | | 0,44 | | 0,44 |
| Met.wahrsch.Beschattung | | | | | | | | | | | | | | | | | 9 |

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

| | | |
|--------------|-----------------------|-----------|
| Tag im Monat | Sonnenaufgang (SS:MM) | Zeitpunkt |
|--------------|-----------------------|-----------|

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d04 - Ohrleben, Wiesenweg 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

Januar | **Februar** | **März** | **April** | **Mai** | **Juni** | **Juli** | **August** | **September** | **Oktober** | **November** | **Dezember**

| | | | | | | | | | | | | | |
|----|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|-----|
| 1 | 08:25 16:15 | 07:58 17:03 | 07:05 17:55 | 06:54 19:49 | 05:48 20:40 | 05:03 21:26 | 05:00 21:40 | 05:36 21:08 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:01 16:09 | |
| 2 | 08:25 16:16 | 07:57 17:04 | 07:02 17:56 | 06:51 19:51 | 05:47 20:42 | 05:02 21:28 | 05:00 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:08 | |
| 3 | 08:25 16:17 | 07:55 17:06 | 07:00 17:58 | 06:49 19:52 | 05:45 20:44 | 05:01 21:29 | 05:01 21:40 | 05:40 21:05 | 06:30 20:01 | 07:19 18:52 | 07:14 16:46 | 08:04 16:08 | |
| 4 | 08:25 16:18 | 07:53 17:08 | 06:58 18:00 | 06:47 19:54 | 05:43 20:45 | 05:00 21:30 | 05:02 21:39 | 05:41 21:03 | 06:31 19:59 | 07:21 18:49 | 07:15 16:44 | 08:06 16:07 | |
| 5 | 08:25 16:19 | 07:52 17:10 | 06:56 18:02 | 06:44 19:56 | 05:41 20:47 | 05:00 21:31 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:17 16:42 | 08:07 16:07 | |
| 6 | 08:24 16:20 | 07:50 17:12 | 06:54 18:04 | 06:42 19:58 | 05:39 20:49 | 04:59 21:32 | 05:04 21:38 | 05:44 21:00 | 06:35 19:55 | 07:24 18:45 | 07:19 16:41 | 08:08 16:06 | |
| 7 | 08:24 16:22 | 07:48 17:14 | 06:51 18:05 | 06:40 19:59 | 05:37 20:50 | 04:59 21:33 | 05:04 21:38 | 05:46 20:58 | 06:36 19:52 | 07:26 18:42 | 07:21 16:39 | 08:09 16:06 | |
| 8 | 08:24 16:23 | 07:47 17:16 | 06:49 18:07 | 06:38 20:01 | 05:35 20:52 | 04:58 21:33 | 05:05 21:37 | 05:47 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:05 | |
| 9 | 08:23 16:24 | 07:45 17:18 | 06:47 18:09 | 06:35 20:03 | 05:34 20:54 | 04:57 21:34 | 05:06 21:36 | 05:49 20:54 | 06:40 19:48 | 07:29 18:38 | 07:25 16:36 | 08:12 16:05 | |
| 10 | 08:22 16:26 | 07:43 17:19 | 06:44 18:11 | 06:33 20:04 | 05:32 20:55 | 04:57 21:35 | 05:07 21:36 | 05:51 20:52 | 06:41 19:45 | 07:31 18:36 | 07:26 16:34 | 08:13 16:05 | |
| 11 | 08:22 16:27 | 07:41 17:21 | 06:42 18:13 | 06:31 20:06 | 05:30 20:57 | 04:57 21:36 | 05:08 21:35 | 05:52 20:50 | 06:43 19:43 | 07:33 18:33 | 07:28 16:32 | 08:14 16:05 | |
| 12 | 08:21 16:29 | 07:39 17:23 | 06:40 18:14 | 06:29 20:08 | 05:29 20:58 | 04:56 21:37 | 05:09 21:34 | 05:54 20:48 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 | |
| 13 | 08:21 16:30 | 07:37 17:25 | 06:38 18:16 | 06:26 20:10 | 05:27 21:00 | 04:56 21:37 | 05:11 21:33 | 05:56 20:47 | 06:46 19:38 | 07:36 18:29 | 07:32 16:29 | 08:16 16:04 | |
| 14 | 08:20 16:32 | 07:36 17:27 | 06:35 18:18 | 06:24 20:11 | 05:25 21:02 | 04:56 21:38 | 05:12 21:32 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:33 16:28 | 08:17 16:04 | |
| 15 | 08:19 16:33 | 07:34 17:29 | 06:33 18:20 | 06:22 20:13 | 05:24 21:03 | 04:56 21:38 | 05:13 21:31 | 05:59 20:43 | 06:49 19:34 | 07:40 18:24 | 07:35 16:26 | 08:18 16:05 | |
| 16 | 08:18 16:35 | 07:32 17:31 | 06:31 18:21 | 06:20 20:15 | 05:22 21:05 | 04:55 21:39 | 05:14 21:30 | 06:00 20:41 | 06:51 19:31 | 07:42 18:22 | 07:37 16:25 | 08:19 16:05 | |
| 17 | 08:17 16:36 | 07:30 17:33 | 06:28 18:23 | 06:17 20:16 | 05:21 21:06 | 04:55 21:39 | 05:15 21:29 | 06:02 20:38 | 06:53 19:29 | 07:43 18:20 | 07:39 16:24 | 08:20 16:05 | |
| 18 | 08:16 16:38 | 07:28 17:34 | 06:26 18:25 | 06:15 20:18 | 05:19 21:08 | 04:55 21:40 | 05:17 21:28 | 06:04 20:36 | 06:54 19:27 | 07:45 18:18 | 07:40 16:22 | 08:20 16:05 | |
| 19 | 08:15 16:40 | 07:26 17:36 | 06:24 18:27 | 06:13 20:20 | 05:18 21:09 | 04:55 21:40 | 05:18 21:27 | 06:05 20:34 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:05 | |
| 20 | 08:14 16:41 | 07:24 17:38 | 06:21 18:28 | 06:11 20:22 | 05:16 21:11 | 04:55 21:40 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 | |
| 21 | 08:13 16:43 | 07:22 17:40 | 06:19 18:30 | 06:09 20:23 | 05:15 21:12 | 04:56 21:41 | 05:21 21:24 | 06:09 20:30 | 06:59 19:20 | 07:50 18:12 | 07:46 16:18 | 08:22 16:06 | |
| 22 | 08:12 16:45 | 07:20 17:42 | 06:17 18:32 | 06:07 20:25 | 05:14 21:14 | 04:56 21:41 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:09 | 07:47 16:17 | 08:23 16:07 | |
| 23 | 08:11 16:46 | 07:17 17:44 | 06:15 18:33 | 06:05 20:27 | 05:12 21:15 | 04:56 21:41 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:07 | 07:49 16:16 | 08:23 16:07 | |
| 24 | 08:10 16:48 | 07:15 17:45 | 06:12 18:35 | 06:03 20:28 | 05:11 21:16 | 04:56 21:41 | 05:25 21:21 | 06:13 20:24 | 07:04 19:13 | 07:56 18:05 | 07:51 16:15 | 08:24 16:08 | |
| 25 | 08:08 16:50 | 07:13 17:47 | 06:10 18:37 | 06:00 20:30 | 05:10 21:18 | 04:57 21:41 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 07:57 17:03 | 07:52 16:14 | 08:24 16:08 | |
| 26 | 08:07 16:52 | 07:11 17:49 | 06:08 18:39 | 05:58 20:32 | 05:09 21:19 | 04:57 21:41 | 05:28 21:18 | 06:17 20:19 | 07:08 19:08 | 07:58 17:01 | 07:54 16:13 | 08:25 16:09 | |
| 27 | 08:06 16:54 | 07:09 17:51 | 06:05 18:40 | 05:56 20:33 | 05:08 21:20 | 04:57 21:41 | 05:29 21:16 | 06:18 20:17 | 07:09 19:05 | 07:01 16:59 | 07:55 16:12 | 08:25 16:10 | |
| 28 | 08:04 16:55 | 07:07 17:53 | 06:03 18:42 | 05:54 20:35 | 05:07 21:22 | 04:58 21:41 | 05:30 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:57 | 07:57 16:11 | 08:25 16:11 | |
| 29 | 08:03 16:57 | | 07:01 19:44 | 05:52 20:37 | 05:06 21:23 | 04:59 21:41 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:55 | 07:58 16:10 | 08:25 16:11 | |
| 30 | 08:01 16:59 | | 06:58 19:46 | 05:50 20:39 | 05:05 21:24 | 04:59 21:41 | 05:33 21:12 | 06:23 20:10 | 07:14 18:58 | 07:06 16:53 | 08:00 16:10 | 08:25 16:12 | |
| 31 | 08:00 17:01 | | 06:56 19:47 | 05:54 21:25 | 05:04 21:25 | 05:04 21:10 | 06:25 20:08 | 07:08 16:52 | 07:08 16:52 | 07:08 16:52 | 08:25 16:13 | 08:25 16:13 | |
| | Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | 503 | 454 | 381 | 331 | 266 | 243 |
| | astr.max.mögl.Beschattung | | | | | | | | | | | | |
| | Red.Sonnenscheinwahrsch. | | | | | | | | | | | | |
| | Reduktion Betriebsdauer | | | | | | | | | | | | |
| | Reduktion Windrichtung | | | | | | | | | | | | |
| | Gesamte Reduktion | | | | | | | | | | | | |
| | Met.wahrsch.Beschattung | | | | | | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d08 - Söllingen, An der Schäferei 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|--------------------------|---------------------------|---------------------------|---------------------------|-------|
| 1 | 08:26 | 09:09 (WEA 13) 07:59 | 08:25 (WEA 12) 07:05 | 07:28 (WEA 11) 06:54 | 07:28 (WEA 10) 05:49 | 05:03 |
| 1 | 16:15 | 09:34 (WEA 13) 17:03 | 11 08:36 (WEA 12) 17:55 | 18 07:46 (WEA 11) 19:49 | 23 07:51 (WEA 10) 20:41 | 21:27 |
| 2 | 08:26 | 09:10 (WEA 13) 07:57 | 08:23 (WEA 12) 07:03 | 07:27 (WEA 11) 06:52 | 07:29 (WEA 10) 05:47 | 05:02 |
| 2 | 16:16 | 09:35 (WEA 13) 17:05 | 15 08:38 (WEA 12) 17:57 | 20 07:47 (WEA 11) 19:51 | 21 07:50 (WEA 10) 20:42 | 21:28 |
| 3 | 08:25 | 09:11 (WEA 13) 07:55 | 08:21 (WEA 12) 07:00 | 07:26 (WEA 11) 06:49 | 07:30 (WEA 10) 05:45 | 05:01 |
| 3 | 16:17 | 09:36 (WEA 13) 17:07 | 18 08:39 (WEA 12) 17:58 | 22 07:48 (WEA 11) 19:53 | 19 07:49 (WEA 10) 20:44 | 21:29 |
| 4 | 08:25 | 09:11 (WEA 13) 07:54 | 08:21 (WEA 12) 06:58 | 07:26 (WEA 11) 06:47 | 07:31 (WEA 10) 05:43 | 05:01 |
| 4 | 16:18 | 09:36 (WEA 13) 17:08 | 20 08:41 (WEA 12) 18:00 | 23 07:49 (WEA 11) 19:54 | 17 07:48 (WEA 10) 20:46 | 21:30 |
| 5 | 08:25 | 09:12 (WEA 13) 07:52 | 08:20 (WEA 12) 06:56 | 07:24 (WEA 11) 06:45 | 07:32 (WEA 10) 05:41 | 05:00 |
| 5 | 16:19 | 09:36 (WEA 13) 17:10 | 21 08:41 (WEA 12) 18:02 | 24 07:48 (WEA 11) 19:56 | 13 07:45 (WEA 10) 20:47 | 21:31 |
| 6 | 08:25 | 09:12 (WEA 13) 07:50 | 08:19 (WEA 12) 06:54 | 07:24 (WEA 11) 06:42 | 07:35 (WEA 10) 05:39 | 04:59 |
| 6 | 16:21 | 09:36 (WEA 13) 17:12 | 23 08:42 (WEA 12) 18:04 | 24 07:48 (WEA 11) 19:58 | 6 07:41 (WEA 10) 20:49 | 21:32 |
| 7 | 08:24 | 09:13 (WEA 13) 07:49 | 08:19 (WEA 12) 06:52 | 07:24 (WEA 11) 06:40 | 05:37 | 04:59 |
| 7 | 16:22 | 09:37 (WEA 13) 17:14 | 23 08:42 (WEA 12) 18:06 | 24 07:48 (WEA 11) 20:00 | 20:51 | 21:33 |
| 8 | 08:24 | 09:13 (WEA 13) 07:47 | 08:19 (WEA 12) 06:49 | 07:24 (WEA 11) 06:38 | 05:36 | 04:58 |
| 8 | 16:23 | 09:37 (WEA 13) 17:16 | 23 08:42 (WEA 12) 18:07 | 23 07:47 (WEA 11) 20:01 | 20:52 | 21:34 |
| 9 | 08:23 | 09:14 (WEA 13) 07:45 | 08:18 (WEA 12) 06:47 | 07:24 (WEA 11) 06:36 | 05:34 | 04:58 |
| 9 | 16:25 | 09:38 (WEA 13) 17:18 | 24 08:42 (WEA 12) 18:09 | 23 07:47 (WEA 11) 20:03 | 20:54 | 21:35 |
| 10 | 08:23 | 09:14 (WEA 13) 07:43 | 08:19 (WEA 12) 06:45 | 07:25 (WEA 11) 06:33 | 05:32 | 04:57 |
| 10 | 16:26 | 09:38 (WEA 13) 17:20 | 23 08:42 (WEA 12) 18:11 | 21 07:46 (WEA 11) 20:05 | 20:55 | 21:35 |
| 11 | 08:22 | 09:15 (WEA 13) 07:41 | 08:20 (WEA 12) 06:42 | 07:25 (WEA 11) 06:31 | 05:31 | 04:57 |
| 11 | 16:27 | 09:38 (WEA 13) 17:22 | 23 08:43 (WEA 12) 18:13 | 19 07:44 (WEA 11) 20:06 | 20:57 | 21:36 |
| 12 | 08:21 | 09:15 (WEA 13) 07:40 | 08:20 (WEA 12) 06:40 | 07:27 (WEA 11) 06:29 | 05:29 | 04:57 |
| 12 | 16:29 | 09:38 (WEA 13) 17:23 | 23 08:43 (WEA 12) 18:15 | 15 07:42 (WEA 11) 20:08 | 20:59 | 21:37 |
| 13 | 08:21 | 09:16 (WEA 13) 07:38 | 08:21 (WEA 12) 06:38 | 07:29 (WEA 11) 06:27 | 05:27 | 04:56 |
| 13 | 16:30 | 09:37 (WEA 13) 17:25 | 21 08:42 (WEA 12) 18:16 | 11 07:40 (WEA 11) 20:10 | 21:00 | 21:37 |
| 14 | 08:20 | 09:17 (WEA 13) 07:36 | 08:22 (WEA 12) 06:36 | 06:24 | 05:26 | 04:56 |
| 14 | 16:32 | 09:37 (WEA 13) 17:27 | 19 08:41 (WEA 12) 18:18 | 20:12 | 21:02 | 21:38 |
| 15 | 08:19 | 09:18 (WEA 13) 07:34 | 08:22 (WEA 12) 06:33 | 06:22 | 05:24 | 04:56 |
| 15 | 16:33 | 09:37 (WEA 13) 17:29 | 17 08:39 (WEA 12) 18:20 | 20:13 | 21:03 | 21:39 |
| 16 | 08:18 | 09:19 (WEA 13) 07:32 | 08:23 (WEA 12) 06:31 | 06:20 | 05:22 | 04:56 |
| 16 | 16:35 | 09:37 (WEA 13) 17:31 | 15 08:38 (WEA 12) 18:22 | 20:15 | 21:05 | 21:39 |
| 17 | 08:17 | 09:20 (WEA 13) 07:30 | 08:26 (WEA 12) 06:29 | 06:18 | 05:21 | 04:56 |
| 17 | 16:37 | 09:36 (WEA 13) 17:33 | 9 08:35 (WEA 12) 18:23 | 20:17 | 21:06 | 21:40 |
| 18 | 08:16 | 09:22 (WEA 13) 07:28 | 06:26 | 06:16 | 05:19 | 04:56 |
| 18 | 16:38 | 09:35 (WEA 13) 17:35 | 18:25 | 20:18 | 21:08 | 21:40 |
| 19 | 08:15 | 09:24 (WEA 13) 07:26 | 06:24 | 06:13 | 05:18 | 04:56 |
| 19 | 16:40 | 09:34 (WEA 13) 17:37 | 18:27 | 20:20 | 21:09 | 21:40 |
| 20 | 08:14 | 09:28 (WEA 13) 07:24 | 06:22 | 06:11 | 05:17 | 04:56 |
| 20 | 16:42 | 3 09:31 (WEA 13) 17:38 | 18:29 | 20:22 | 21:11 | 21:41 |
| 21 | 08:13 | 07:22 | 06:19 | 06:09 | 05:15 | 04:56 |
| 21 | 16:43 | 17:40 | 18:30 | 20:24 | 21:12 | 21:41 |
| 22 | 08:12 | 07:20 | 06:17 | 06:07 | 05:14 | 04:56 |
| 22 | 16:45 | 17:42 | 18:32 | 7 06:47 (WEA 10) 20:25 | 21:14 | 21:41 |
| 23 | 08:11 | 07:18 | 06:15 | 06:37 (WEA 10) 06:05 | 05:13 | 04:56 |
| 23 | 16:47 | 17:44 | 18:34 | 12 06:49 (WEA 10) 20:27 | 21:15 | 21:41 |
| 24 | 08:10 | 07:16 | 06:12 | 06:35 (WEA 10) 06:03 | 05:11 | 04:57 |
| 24 | 16:48 | 17:46 | 18:35 | 16 06:51 (WEA 10) 20:29 | 21:17 | 21:41 |
| 25 | 08:09 | 07:13 | 06:10 | 06:33 (WEA 10) 06:01 | 05:10 | 04:57 |
| 25 | 16:50 | 17:48 | 18:37 | 19 06:52 (WEA 10) 20:30 | 21:18 | 21:42 |
| 26 | 08:07 | 07:11 | 06:08 | 06:31 (WEA 10) 05:59 | 05:09 | 04:57 |
| 26 | 16:52 | 17:49 | 18:39 | 21 06:52 (WEA 10) 20:32 | 21:19 | 21:42 |
| 27 | 08:06 | 07:09 | 07:33 (WEA 11) 06:05 | 06:30 (WEA 10) 05:57 | 05:08 | 04:58 |
| 27 | 16:54 | 17:51 | 10 07:43 (WEA 11) 18:41 | 23 06:53 (WEA 10) 20:34 | 21:21 | 21:41 |
| 28 | 08:04 | 07:07 | 06:03 | 06:30 (WEA 10) 05:55 | 05:07 | 04:58 |
| 28 | 16:56 | 17:53 | 14 07:45 (WEA 11) 18:42 | 23 06:53 (WEA 10) 20:35 | 21:22 | 21:41 |
| 29 | 08:03 | | 07:01 | 07:28 (WEA 10) 05:53 | 05:06 | 04:59 |
| 29 | 16:57 | | 19:44 | 25 07:53 (WEA 10) 20:37 | 21:23 | 21:41 |
| 30 | 08:02 | | 06:58 | 07:28 (WEA 10) 05:51 | 05:05 | 04:59 |
| 30 | 16:59 | | 19:46 | 25 07:53 (WEA 10) 20:39 | 21:24 | 21:41 |
| 31 | 08:00 | 08:27 (WEA 12) | 06:56 | 07:29 (WEA 10) | 05:04 | |
| 31 | 17:01 | 7 08:34 (WEA 12) | 19:47 | 23 07:52 (WEA 10) | 21:25 | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 417 | 352 | 461 | 99 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,56 | 0,62 | 0,66 | 0,70 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,24 | | |
| Met.wahrsch.Beschattung | 41 | 51 | 83 | 24 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d08 - Söllingen, An der Schäferei 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------|---------------------------|---------------------------|---|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 08:07 (WEA 11) 07:10 | 07:48 (WEA 12) 08:02 | 08:57 (WEA 13) |
| | 21:41 | 21:09 | 20:06 | 18:56 | 13 08:20 (WEA 11) 16:50 | 24 08:12 (WEA 12) 16:09 | 23 09:20 (WEA 13) |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 08:05 (WEA 11) 07:12 | 07:48 (WEA 12) 08:03 | 08:57 (WEA 13) |
| | 21:40 | 21:07 | 20:04 | 18:54 | 17 08:22 (WEA 11) 16:48 | 24 08:12 (WEA 12) 16:09 | 24 09:21 (WEA 13) |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 08:04 (WEA 11) 07:14 | 07:48 (WEA 12) 08:04 | 08:57 (WEA 13) |
| | 21:40 | 21:05 | 20:02 | 18:52 | 19 08:23 (WEA 11) 16:46 | 24 08:12 (WEA 12) 16:08 | 24 09:21 (WEA 13) |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 08:03 (WEA 11) 07:16 | 07:49 (WEA 12) 08:06 | 08:57 (WEA 13) |
| | 21:40 | 21:04 | 19:59 | 18:49 | 21 08:24 (WEA 11) 16:44 | 23 08:12 (WEA 12) 16:07 | 24 09:21 (WEA 13) |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 08:01 (WEA 11) 07:18 | 07:49 (WEA 12) 08:07 | 08:58 (WEA 13) |
| | 21:39 | 21:02 | 19:57 | 18:47 | 23 08:24 (WEA 11) 16:43 | 22 08:11 (WEA 12) 16:07 | 24 09:22 (WEA 13) |
| 6 | 05:04 | 05:45 | 06:35 | 07:25 | 08:01 (WEA 11) 07:19 | 07:50 (WEA 12) 08:08 | 08:58 (WEA 13) |
| | 21:39 | 21:00 | 19:55 | 18:45 | 23 08:24 (WEA 11) 16:41 | 21 08:11 (WEA 12) 16:06 | 24 09:22 (WEA 13) |
| 7 | 05:05 | 05:46 | 06:37 | 07:27 | 08:00 (WEA 11) 07:21 | 07:51 (WEA 12) 08:10 | 08:59 (WEA 13) |
| | 21:38 | 20:58 | 19:53 | 18:43 | 24 08:24 (WEA 11) 16:39 | 19 08:10 (WEA 12) 16:06 | 24 09:23 (WEA 13) |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:59 (WEA 11) 07:23 | 07:52 (WEA 12) 08:11 | 08:59 (WEA 13) |
| | 21:37 | 20:56 | 19:50 | 18:40 | 24 08:23 (WEA 11) 16:37 | 17 08:09 (WEA 12) 16:06 | 25 09:24 (WEA 13) |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:59 (WEA 11) 07:25 | 07:54 (WEA 12) 08:12 | 08:59 (WEA 13) |
| | 21:37 | 20:54 | 19:48 | 18:38 | 24 08:23 (WEA 11) 16:36 | 14 08:08 (WEA 12) 16:05 | 25 09:24 (WEA 13) |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 08:00 (WEA 11) 07:27 | 07:56 (WEA 12) 08:13 | 08:59 (WEA 13) |
| | 21:36 | 20:53 | 19:46 | 18:36 | 23 08:23 (WEA 11) 16:34 | 11 08:07 (WEA 12) 16:05 | 25 09:24 (WEA 13) |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | 08:00 (WEA 11) 07:28 | 07:58 (WEA 12) 08:14 | 08:59 (WEA 13) |
| | 21:35 | 20:51 | 19:43 | 18:34 | 22 08:22 (WEA 11) 16:33 | 6 08:04 (WEA 12) 16:05 | 25 09:24 (WEA 13) |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 08:01 (WEA 11) 07:30 | | 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | 20 08:21 (WEA 11) 16:31 | | 16:05 25 09:25 (WEA 13) |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 08:02 (WEA 11) 07:32 | | 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | 17 08:19 (WEA 11) 16:30 | | 16:05 25 09:26 (WEA 13) |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 08:04 (WEA 11) 07:34 | | 08:17 |
| | 21:33 | 20:45 | 19:36 | 18:27 | 13 08:17 (WEA 11) 16:28 | | 16:05 25 09:26 (WEA 13) |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 08:07 (WEA 11) 07:35 | | 08:18 |
| | 21:32 | 20:43 | 19:34 | 18:25 | 6 08:13 (WEA 11) 16:27 | | 16:05 25 09:26 (WEA 13) |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | | 07:37 | 08:19 |
| | 21:31 | 20:41 | 19:32 | 18:23 | | 16:25 | 16:05 25 09:27 (WEA 13) |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | | 07:39 | 08:20 |
| | 21:29 | 20:39 | 19:29 | 18:20 | | 16:24 | 16:05 24 09:27 (WEA 13) |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | | 07:41 | 08:21 |
| | 21:28 | 20:37 | 19:27 | 18:18 | | 16:22 | 16:05 25 09:28 (WEA 13) |
| 19 | 05:18 | 06:06 | 06:56 | 07:47 | | 07:42 | 08:21 |
| | 21:27 | 20:35 | 19:24 | 18:16 | | 16:21 | 16:06 25 09:28 (WEA 13) |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | | 07:44 | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18:14 | | 16:20 | 16:06 25 09:29 (WEA 13) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | | 07:46 | 08:23 |
| | 21:25 | 20:30 | 19:20 | 18:12 | | 16:19 | 16:06 25 09:30 (WEA 13) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | | 07:47 | 09:04 (WEA 13) 08:23 |
| | 21:23 | 20:28 | 19:17 | 18:10 | | 16:18 | 3 09:07 (WEA 13) 16:07 25 09:30 (WEA 13) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | | 07:49 | 09:01 (WEA 13) 08:24 |
| | 21:22 | 20:26 | 19:15 | 18:08 | | 16:16 | 10 09:11 (WEA 13) 16:07 25 09:30 (WEA 13) |
| 24 | 05:25 | 06:14 | 07:05 | 07:56 | | 07:51 | 08:59 (WEA 13) 08:24 |
| | 21:21 | 20:24 | 19:13 | 18:06 | | 16:15 | 13 09:12 (WEA 13) 16:08 25 09:31 (WEA 13) |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 | | 07:52 | 08:58 (WEA 13) 08:25 |
| | 21:19 | 20:22 | 19:10 | 17:04 | 11 08:06 (WEA 12) 16:14 | 16 09:14 (WEA 13) 16:09 | 25 09:31 (WEA 13) |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | | 07:54 | 08:58 (WEA 13) 08:25 |
| | 21:18 | 20:20 | 19:08 | 17:02 | 16 08:09 (WEA 12) 16:13 | 18 09:16 (WEA 13) 16:09 | 25 09:31 (WEA 13) |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | | 07:52 (WEA 12) 07:56 | 08:57 (WEA 13) 08:25 |
| | 21:16 | 20:17 | 19:06 | 17:00 | 18 08:10 (WEA 12) 16:12 | 19 09:16 (WEA 13) 16:10 | 25 09:32 (WEA 13) |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | | 07:50 (WEA 12) 07:57 | 08:57 (WEA 13) 08:25 |
| | 21:15 | 20:15 | 19:03 | 16:58 | 20 08:10 (WEA 12) 16:12 | 20 09:17 (WEA 13) 16:11 | 25 09:33 (WEA 13) |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | | 07:49 (WEA 12) 07:59 | 08:57 (WEA 13) 08:25 |
| | 21:13 | 20:13 | 19:01 | 16:56 | 22 08:11 (WEA 12) 16:11 | 21 09:18 (WEA 13) 16:12 | 25 09:34 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | | 07:49 (WEA 12) 08:00 | 08:56 (WEA 13) 08:26 |
| | 21:12 | 20:11 | 18:59 | 16:54 | 22 08:11 (WEA 12) 16:10 | 23 09:19 (WEA 13) 16:13 | 25 09:34 (WEA 13) |
| 31 | 05:35 | 06:25 | | 07:08 | | 07:48 (WEA 12) | 08:26 |
| | 21:10 | 20:08 | | 16:52 | 24 08:12 (WEA 12) | | 16:14 25 09:34 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | 766 |
| astr.max.mögl.Beschattung | | | 305 | 422 | 348 | | 0,14 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | | 0,96 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | | 0,56 |
| Reduktion Windrichtung | | | 0,70 | 0,63 | 0,59 | | 0,07 |
| Gesamte Reduktion | | | 0,24 | 0,18 | 0,12 | | 0,07 |
| Met.wahrsch.Beschattung | | | 74 | 77 | 41 | | 55 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d09 - Söllingen, Bahnhofstraße 4

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:35 (WEA 12) | 07:59 | 08:46 (WEA 11) | 07:05 | 07:31 (WEA 01) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 20 09:55 (WEA 12) | 17:03 | 29 09:15 (WEA 11) | 17:55 | 47 08:18 (WEA 10) | 19:49 | 20:40 | 21:27 | | | |
| 2 | 08:26 | 09:36 (WEA 12) | 07:57 | 08:46 (WEA 11) | 07:03 | 07:31 (WEA 01) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 20 09:56 (WEA 12) | 17:05 | 29 09:15 (WEA 11) | 17:57 | 47 08:18 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:37 (WEA 12) | 07:55 | 08:46 (WEA 11) | 07:00 | 07:31 (WEA 01) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 19 09:56 (WEA 12) | 17:07 | 28 09:14 (WEA 11) | 17:58 | 47 08:18 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:37 (WEA 12) | 07:54 | 08:48 (WEA 11) | 06:58 | 07:32 (WEA 01) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 19 09:56 (WEA 12) | 17:08 | 27 09:15 (WEA 11) | 18:00 | 46 08:18 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:38 (WEA 12) | 07:52 | 08:48 (WEA 11) | 06:56 | 07:32 (WEA 01) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 18 09:56 (WEA 12) | 17:10 | 26 09:14 (WEA 11) | 18:02 | 44 08:16 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:39 (WEA 12) | 07:50 | 08:49 (WEA 11) | 06:54 | 07:33 (WEA 01) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 16 09:55 (WEA 12) | 17:12 | 24 09:13 (WEA 11) | 18:04 | 42 08:15 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:40 (WEA 12) | 07:49 | 08:49 (WEA 11) | 06:51 | 07:34 (WEA 01) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 15 09:55 (WEA 12) | 17:14 | 23 09:12 (WEA 11) | 18:06 | 39 08:14 (WEA 10) | 19:59 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:41 (WEA 12) | 07:47 | 08:51 (WEA 11) | 06:49 | 07:36 (WEA 01) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 14 09:55 (WEA 12) | 17:16 | 20 09:11 (WEA 11) | 18:07 | 31 08:12 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:43 (WEA 12) | 07:45 | 08:52 (WEA 11) | 06:47 | 07:51 (WEA 10) | 06:35 | 05:34 | 04:58 | | | |
| | 16:24 | 12 09:55 (WEA 12) | 17:18 | 17 09:09 (WEA 11) | 18:09 | 19 08:10 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:45 (WEA 12) | 07:43 | 08:54 (WEA 11) | 06:45 | 07:53 (WEA 10) | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 8 09:53 (WEA 12) | 17:20 | 13 09:07 (WEA 11) | 18:11 | 15 08:08 (WEA 10) | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | | 07:41 | 08:58 (WEA 11) | 06:42 | 07:57 (WEA 10) | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | | 17:22 | 5 09:03 (WEA 11) | 18:13 | 6 08:03 (WEA 10) | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | | 07:40 | | 06:40 | | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | | 17:23 | | 18:15 | | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | | 07:38 | | 06:38 | | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | | 17:25 | | 18:16 | | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | | 07:36 | | 06:36 | | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | | 17:27 | | 18:18 | | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | | 07:34 | | 06:33 | | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | | 17:29 | | 18:20 | | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | | 07:32 | | 06:31 | | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | | 17:31 | | 18:22 | | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | 08:52 (WEA 11) | 07:30 | | 06:29 | | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 8 09:00 (WEA 11) | 17:33 | | 18:23 | | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | 08:50 (WEA 11) | 07:28 | | 06:26 | | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 13 09:03 (WEA 11) | 17:35 | | 18:25 | | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | 08:49 (WEA 11) | 07:26 | 07:58 (WEA 10) | 06:24 | | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 16 09:05 (WEA 11) | 17:36 | 11 08:09 (WEA 10) | 18:27 | | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | 08:49 (WEA 11) | 07:24 | | 06:22 | | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | 18 09:07 (WEA 11) | 17:38 | 17 08:12 (WEA 10) | 18:28 | | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | 08:47 (WEA 11) | 07:22 | | 06:19 | | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | 21 09:08 (WEA 11) | 17:40 | 21 08:14 (WEA 10) | 18:30 | | 20:23 | 21:12 | 21:41 | | | |
| 22 | 08:12 | 08:47 (WEA 11) | 07:20 | | 06:17 | | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | 22 09:09 (WEA 11) | 17:42 | 24 08:16 (WEA 10) | 18:32 | | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | 08:47 (WEA 11) | 07:18 | | 06:15 | | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 23 09:10 (WEA 11) | 17:44 | 32 08:17 (WEA 10) | 18:34 | | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | 08:46 (WEA 11) | 07:16 | | 06:12 | | 06:03 | 05:11 | 04:56 | | | |
| | 16:48 | 25 09:11 (WEA 11) | 17:46 | 38 08:17 (WEA 10) | 18:35 | | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | 08:46 (WEA 11) | 07:13 | | 06:10 | | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | 26 09:12 (WEA 11) | 17:48 | 41 08:18 (WEA 10) | 18:37 | | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | 08:45 (WEA 11) | 07:11 | | 06:08 | | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | 27 09:12 (WEA 11) | 17:49 | 43 08:18 (WEA 10) | 18:39 | | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | 08:46 (WEA 11) | 07:09 | | 06:05 | | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | 27 09:13 (WEA 11) | 17:51 | 46 08:19 (WEA 10) | 18:41 | | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | 08:45 (WEA 11) | 07:07 | | 06:03 | | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | 28 09:13 (WEA 11) | 17:53 | 47 08:19 (WEA 10) | 18:42 | | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | 08:46 (WEA 11) | | | 07:01 | | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | 28 09:14 (WEA 11) | | | 19:44 | | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | 08:45 (WEA 11) | | | 06:58 | | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | 29 09:14 (WEA 11) | | | 19:46 | | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | 08:46 (WEA 11) | | | 06:56 | | | 05:04 | | | | |
| | 17:01 | 29 09:15 (WEA 11) | | | 19:47 | | | 21:25 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 501 | | 561 | | 383 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,58 | | 0,61 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 51 | | 82 | | 67 | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d09 - Söllingen, Bahnhofstraße 4

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|----------------|----------------|----------------|----------------|----------------------------------|----------------------------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:23 (WEA 11) 08:37 (WEA 11) | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:21 (WEA 11) 08:39 (WEA 11) | 08:03 16:08 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:19 18:52 | 07:14 16:46 | 08:20 (WEA 11) 08:41 (WEA 11) | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:19 (WEA 11) 08:42 (WEA 11) | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:18 (WEA 11) 08:43 (WEA 11) | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:18 (WEA 11) 08:44 (WEA 11) | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:52 | 07:26 18:43 | 07:21 16:39 | 08:17 (WEA 11) 08:44 (WEA 11) | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:17 (WEA 11) 08:45 (WEA 11) | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:17 (WEA 11) 08:45 (WEA 11) | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:17 (WEA 11) 08:46 (WEA 11) | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:17 (WEA 11) 08:46 (WEA 11) | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:17 (WEA 11) 08:46 (WEA 11) | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:18 (WEA 11) 08:46 (WEA 11) | 08:16 16:05 |
| 14 | 05:12 21:32 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:18 (WEA 11) 08:46 (WEA 11) | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 (WEA 11) 08:46 (WEA 11) | 08:18 16:05 |
| 16 | 05:14 21:30 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:19 (WEA 11) 08:46 (WEA 11) | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:19 (WEA 11) 08:45 (WEA 11) | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:20 (WEA 11) 08:45 (WEA 11) | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 (WEA 11) 08:44 (WEA 11) | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 (WEA 11) 08:44 (WEA 11) | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 (WEA 11) 08:44 (WEA 11) | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:25 (WEA 11) 08:43 (WEA 11) | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:26 (WEA 11) 08:42 (WEA 11) | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:27 (WEA 11) 08:40 (WEA 11) | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 06:58 17:04 | 07:52 16:14 | 08:30 (WEA 11) 08:38 (WEA 11) | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 06:59 17:02 | 07:54 16:13 | 08:31 (WEA 11) | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 17:00 | 07:56 16:12 | 08:32 (WEA 11) | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 16:12 | 08:33 (WEA 11) | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:34 (WEA 11) | 08:25 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 16:54 | 08:00 16:10 | 08:35 (WEA 11) | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:08 16:52 | 07:08 16:52 | 08:27 (WEA 11) 08:34 (WEA 11) | 08:36 (WEA 11) | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | 243 |
| astr.max.mögl.Beschattung | | | | 716 | 580 | | 611 |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | | 0,14 |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | | 0,96 |
| Reduktion Windrichtung | | | | 0,64 | 0,59 | | 0,57 |
| Gesamte Reduktion | | | | 0,19 | 0,12 | | 0,07 |
| Met.wahrsch.Beschattung | | | | 134 | 69 | | 45 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d12 - Söllingen, Bahnhofstraße 7

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Jun | | | |
|---------------------------|--------|-------------------|-------|-------------------|-------|-------------------|-------|-------|-------|
| 1 | 08:26 | 09:03 (WEA 12) | 07:59 | | 06:54 | 05:49 | 05:03 | | |
| | 16:15 | 24 09:27 (WEA 12) | 17:03 | | 17:55 | 19:49 | 21:27 | | |
| 2 | 08:26 | 09:03 (WEA 12) | 07:57 | | 07:03 | 06:52 | 05:47 | 05:02 | |
| | 16:16 | 24 09:27 (WEA 12) | 17:05 | | 17:57 | 19:51 | 20:42 | 21:28 | |
| 3 | 08:25 | 09:04 (WEA 12) | 07:55 | | 07:00 | 06:49 | 05:45 | 05:01 | |
| | 16:17 | 24 09:28 (WEA 12) | 17:07 | | 17:58 | 19:53 | 20:44 | 21:29 | |
| 4 | 08:25 | 09:04 (WEA 12) | 07:54 | | 06:58 | 06:47 | 05:43 | 05:01 | |
| | 16:18 | 24 09:28 (WEA 12) | 17:08 | | 18:00 | 19:54 | 20:46 | 21:30 | |
| 5 | 08:25 | 09:04 (WEA 12) | 07:52 | 08:22 (WEA 11) | 06:56 | 06:45 | 05:41 | 05:00 | |
| | 16:19 | 25 09:29 (WEA 12) | 17:10 | 11 08:33 (WEA 11) | 18:02 | 19:56 | 20:47 | 21:31 | |
| 6 | 08:25 | 09:04 (WEA 12) | 07:50 | 08:19 (WEA 11) | 06:54 | 06:42 | 05:39 | 04:59 | |
| | 16:21 | 26 09:30 (WEA 12) | 17:12 | 16 08:35 (WEA 11) | 18:04 | 19:58 | 20:49 | 21:32 | |
| | | | | 9 07:31 (WEA 10) | 19:58 | 20:49 | 21:32 | | |
| 7 | 08:24 | 09:05 (WEA 12) | 07:49 | 08:17 (WEA 11) | 06:52 | 07:19 (WEA 10) | 06:40 | 05:37 | 04:59 |
| | 16:22 | 26 09:31 (WEA 12) | 17:14 | 20 08:37 (WEA 11) | 18:06 | 16 07:35 (WEA 10) | 20:00 | 20:51 | 21:33 |
| 8 | 08:24 | 09:05 (WEA 12) | 07:47 | 08:16 (WEA 11) | 06:49 | 07:16 (WEA 10) | 06:38 | 05:36 | 04:58 |
| | 16:23 | 26 09:31 (WEA 12) | 17:16 | 22 08:38 (WEA 11) | 18:07 | 20 07:36 (WEA 10) | 20:01 | 20:52 | 21:34 |
| 9 | 08:23 | 09:06 (WEA 12) | 07:45 | 08:15 (WEA 11) | 06:47 | 07:14 (WEA 10) | 06:36 | 05:34 | 04:58 |
| | 16:24 | 26 09:32 (WEA 12) | 17:18 | 24 08:39 (WEA 11) | 18:09 | 23 07:37 (WEA 10) | 20:03 | 20:54 | 21:35 |
| 10 | 08:23 | 09:06 (WEA 12) | 07:43 | 08:14 (WEA 11) | 06:45 | 07:13 (WEA 10) | 06:33 | 05:32 | 04:57 |
| | 16:26 | 26 09:32 (WEA 12) | 17:20 | 26 08:40 (WEA 11) | 18:11 | 26 07:39 (WEA 10) | 20:05 | 20:55 | 21:35 |
| 11 | 08:22 | 09:06 (WEA 12) | 07:41 | 08:14 (WEA 11) | 06:42 | 07:11 (WEA 10) | 06:31 | 05:30 | 04:57 |
| | 16:27 | 27 09:33 (WEA 12) | 17:22 | 26 08:40 (WEA 11) | 18:13 | 28 07:39 (WEA 10) | 20:06 | 20:57 | 21:36 |
| 12 | 08:21 | 09:06 (WEA 12) | 07:40 | 08:14 (WEA 11) | 06:40 | 07:11 (WEA 10) | 06:29 | 05:29 | 04:56 |
| | 16:29 | 27 09:33 (WEA 12) | 17:23 | 28 08:42 (WEA 11) | 18:15 | 28 07:39 (WEA 10) | 20:08 | 20:59 | 21:37 |
| 13 | 08:21 | 09:06 (WEA 12) | 07:38 | 08:14 (WEA 11) | 06:38 | 07:10 (WEA 10) | 06:27 | 05:27 | 04:56 |
| | 16:30 | 27 09:33 (WEA 12) | 17:25 | 28 08:42 (WEA 11) | 18:16 | 30 07:40 (WEA 10) | 20:10 | 21:00 | 21:37 |
| 14 | 08:20 | 09:06 (WEA 12) | 07:36 | 08:14 (WEA 11) | 06:36 | 07:09 (WEA 10) | 06:24 | 05:26 | 04:56 |
| | 16:32 | 27 09:33 (WEA 12) | 17:27 | 28 08:42 (WEA 11) | 18:18 | 30 07:39 (WEA 10) | 20:12 | 21:02 | 21:38 |
| 15 | 08:19 | 09:07 (WEA 12) | 07:34 | 08:13 (WEA 11) | 06:33 | 07:09 (WEA 10) | 06:22 | 05:24 | 04:56 |
| | 16:33 | 27 09:34 (WEA 12) | 17:29 | 28 08:41 (WEA 11) | 18:20 | 30 07:39 (WEA 10) | 20:13 | 21:03 | 21:39 |
| 16 | 08:18 | 09:07 (WEA 12) | 07:32 | 08:13 (WEA 11) | 06:31 | 07:09 (WEA 10) | 06:20 | 05:22 | 04:56 |
| | 16:35 | 27 09:34 (WEA 12) | 17:31 | 28 08:41 (WEA 11) | 18:22 | 30 07:39 (WEA 10) | 20:15 | 21:05 | 21:39 |
| 17 | 08:17 | 09:08 (WEA 12) | 07:30 | 08:13 (WEA 11) | 06:29 | 07:08 (WEA 10) | 06:18 | 05:21 | 04:56 |
| | 16:37 | 26 09:34 (WEA 12) | 17:33 | 28 08:41 (WEA 11) | 18:23 | 30 07:38 (WEA 10) | 20:17 | 21:06 | 21:40 |
| 18 | 08:16 | 09:09 (WEA 12) | 07:28 | 08:13 (WEA 11) | 06:26 | 07:09 (WEA 10) | 06:16 | 05:19 | 04:56 |
| | 16:38 | 25 09:34 (WEA 12) | 17:35 | 28 08:41 (WEA 11) | 18:25 | 29 07:38 (WEA 10) | 20:18 | 21:08 | 21:40 |
| 19 | 08:15 | 09:10 (WEA 12) | 07:26 | 08:14 (WEA 11) | 06:24 | 07:09 (WEA 10) | 06:13 | 05:18 | 04:56 |
| | 16:40 | 24 09:34 (WEA 12) | 17:36 | 26 08:40 (WEA 11) | 18:27 | 28 07:37 (WEA 10) | 20:20 | 21:09 | 21:40 |
| 20 | 08:14 | 09:11 (WEA 12) | 07:24 | 08:15 (WEA 11) | 06:22 | 07:09 (WEA 10) | 06:11 | 05:17 | 04:56 |
| | 16:41 | 24 09:35 (WEA 12) | 17:38 | 25 08:40 (WEA 11) | 18:29 | 27 07:36 (WEA 10) | 20:22 | 21:11 | 21:41 |
| 21 | 08:13 | 09:11 (WEA 12) | 07:22 | 08:16 (WEA 11) | 06:19 | 07:10 (WEA 10) | 06:09 | 05:15 | 04:56 |
| | 16:43 | 23 09:34 (WEA 12) | 17:40 | 23 08:39 (WEA 11) | 18:30 | 25 07:35 (WEA 10) | 20:23 | 21:12 | 21:41 |
| 22 | 08:12 | 09:12 (WEA 12) | 07:20 | 08:17 (WEA 11) | 06:17 | 07:11 (WEA 10) | 06:07 | 05:14 | 04:56 |
| | 16:45 | 22 09:34 (WEA 12) | 17:42 | 20 08:37 (WEA 11) | 18:32 | 22 07:33 (WEA 10) | 20:25 | 21:14 | 21:41 |
| 23 | 08:11 | 09:13 (WEA 12) | 07:18 | 08:19 (WEA 11) | 06:15 | 07:12 (WEA 10) | 06:05 | 05:13 | 04:56 |
| | 16:47 | 20 09:33 (WEA 12) | 17:44 | 17 08:36 (WEA 11) | 18:34 | 18 07:30 (WEA 10) | 20:27 | 21:15 | 21:41 |
| 24 | 08:10 | 09:14 (WEA 12) | 07:16 | 08:21 (WEA 11) | 06:12 | 07:15 (WEA 10) | 06:03 | 05:11 | 04:57 |
| | 16:48 | 18 09:32 (WEA 12) | 17:46 | 11 08:32 (WEA 11) | 18:35 | 13 07:28 (WEA 10) | 20:29 | 21:17 | 21:41 |
| 25 | 08:09 | 09:16 (WEA 12) | 07:13 | | 06:10 | | 06:01 | 05:10 | 04:57 |
| | 16:50 | 15 09:31 (WEA 12) | 17:48 | | 18:37 | | 20:30 | 21:18 | 21:42 |
| 26 | 08:07 | 09:17 (WEA 12) | 07:11 | | 06:08 | | 05:59 | 05:09 | 04:57 |
| | 16:52 | 12 09:29 (WEA 12) | 17:49 | | 18:39 | | 20:32 | 21:19 | 21:42 |
| 27 | 08:06 | 09:21 (WEA 12) | 07:09 | | 06:05 | | 05:57 | 05:08 | 04:58 |
| | 16:54 | 6 09:27 (WEA 12) | 17:51 | | 18:41 | | 20:34 | 21:21 | 21:41 |
| 28 | 08:04 | | 07:07 | | 06:03 | | 05:55 | 05:07 | 04:58 |
| | 16:56 | | 17:53 | | 18:42 | | 20:35 | 21:22 | 21:41 |
| 29 | 08:03 | | | | 07:01 | | 05:53 | 05:06 | 04:59 |
| | 16:57 | | | | 19:44 | | 20:37 | 21:23 | 21:41 |
| 30 | 08:02 | | | | 06:58 | | 05:51 | 05:05 | 04:59 |
| | 16:59 | | | | 19:46 | | 20:39 | 21:24 | 21:41 |
| 31 | 08:00 | | | | 06:56 | | | 05:04 | |
| | 17:01 | | | | 19:47 | | | 21:25 | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 628 | | 463 | | 462 | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | |
| Reduktion Windrichtung | 0,56 | | 0,62 | | 0,66 | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | |
| Met.wahrsch.Beschattung | 61 | | 68 | | 83 | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d12 - Söllingen, Bahnhofstraße 7

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | | |
|---------------------------|-------|--------|-----------|---------|----------------|----------------|----------------|----------------|----------------|----------------|----|----------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:49 (WEA 10) | 07:10 | 07:44 (WEA 11) | 08:02 | 08:48 (WEA 12) | | | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 29 | 08:18 (WEA 10) | 16:50 | 25 | 08:09 (WEA 11) | 16:09 | 27 | 09:15 (WEA 12) |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:50 (WEA 10) | 07:12 | 07:45 (WEA 11) | 08:03 | 08:49 (WEA 12) | | | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 28 | 08:18 (WEA 10) | 16:48 | 24 | 08:09 (WEA 11) | 16:09 | 26 | 09:15 (WEA 12) |
| 3 | 05:01 | 05:40 | 06:30 | 07:19 | 07:51 (WEA 10) | 07:14 | 07:46 (WEA 11) | 08:04 | 08:49 (WEA 12) | | | |
| | 21:40 | 21:05 | 20:02 | 18:52 | 26 | 08:17 (WEA 10) | 16:46 | 22 | 08:08 (WEA 11) | 16:08 | 26 | 09:15 (WEA 12) |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:52 (WEA 10) | 07:16 | 07:47 (WEA 11) | 08:06 | 08:49 (WEA 12) | | | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 24 | 08:16 (WEA 10) | 16:44 | 19 | 08:06 (WEA 11) | 16:07 | 26 | 09:15 (WEA 12) |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 07:52 (WEA 10) | 07:18 | 07:49 (WEA 11) | 08:07 | 08:50 (WEA 12) | | | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 22 | 08:14 (WEA 10) | 16:43 | 16 | 08:05 (WEA 11) | 16:07 | 26 | 09:16 (WEA 12) |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 07:54 (WEA 10) | 07:19 | 07:52 (WEA 11) | 08:08 | 08:50 (WEA 12) | | | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 18 | 08:12 (WEA 10) | 16:41 | 10 | 08:02 (WEA 11) | 16:06 | 26 | 09:16 (WEA 12) |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 07:56 (WEA 10) | 07:21 | 08:10 | 08:10 | 08:51 (WEA 12) | | | |
| | 21:38 | 20:58 | 19:52 | 18:43 | 13 | 08:09 (WEA 10) | 16:39 | 16:06 | 26 | 09:17 (WEA 12) | | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:23 | 08:11 | 08:11 | 08:11 | 08:52 (WEA 12) | | | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 16:37 | 16:06 | 24 | 09:16 (WEA 12) | | | | |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:25 | 08:12 | 08:12 | 08:12 | 08:52 (WEA 12) | | | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 16:36 | 16:05 | 24 | 09:16 (WEA 12) | | | | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | 08:13 | 08:13 | 08:13 | 08:52 (WEA 12) | | | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | 16:05 | 25 | 09:17 (WEA 12) | | | | |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | 07:28 | 08:14 | 08:14 | 08:14 | 08:53 (WEA 12) | | | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | 16:05 | 24 | 09:17 (WEA 12) | | | | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | 08:15 | 08:15 | 08:15 | 08:53 (WEA 12) | | | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | 16:05 | 24 | 09:17 (WEA 12) | | | | |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | 08:16 | 08:16 | 08:16 | 08:55 (WEA 12) | | | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 16:30 | 16:05 | 23 | 09:18 (WEA 12) | | | | |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | 08:17 | 08:17 | 08:17 | 08:55 (WEA 12) | | | |
| | 21:32 | 20:45 | 19:36 | 18:27 | 16:28 | 16:05 | 22 | 09:17 (WEA 12) | | | | |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | 08:18 | 08:18 | 08:18 | 08:55 (WEA 12) | | | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 6 | 09:00 (WEA 12) | 16:05 | 23 | 09:18 (WEA 12) | | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | 08:19 | 08:19 | 08:19 | 08:56 (WEA 12) | | | |
| | 21:30 | 20:41 | 19:32 | 18:22 | 16:25 | 12 | 09:03 (WEA 12) | 16:05 | 22 | 09:18 (WEA 12) | | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | 08:19 | 08:19 | 08:19 | 08:57 (WEA 12) | | | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 5 | 09:01 (WEA 11) | 16:24 | 15 | 09:04 (WEA 12) | 16:05 | 22 | 09:19 (WEA 12) |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:19 | 08:19 | 08:19 | 08:58 (WEA 12) | | | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 13 | 09:05 (WEA 11) | 16:22 | 18 | 09:06 (WEA 12) | 16:05 | 21 | 09:19 (WEA 12) |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | 08:19 | 08:19 | 08:19 | 08:58 (WEA 12) | | | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 18 | 09:07 (WEA 11) | 16:21 | 20 | 09:07 (WEA 12) | 16:06 | 21 | 09:19 (WEA 12) |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | 08:19 | 08:19 | 08:19 | 08:59 (WEA 12) | | | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 21 | 09:08 (WEA 11) | 16:20 | 22 | 09:09 (WEA 12) | 16:06 | 21 | 09:20 (WEA 12) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | 08:19 | 08:19 | 08:19 | 09:00 (WEA 12) | | | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 23 | 09:09 (WEA 11) | 16:19 | 23 | 09:10 (WEA 12) | 16:06 | 21 | 09:21 (WEA 12) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | 08:19 | 08:19 | 08:19 | 09:00 (WEA 12) | | | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 25 | 09:10 (WEA 11) | 16:18 | 24 | 09:11 (WEA 12) | 16:07 | 21 | 09:21 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | 08:19 | 08:19 | 08:19 | 09:00 (WEA 12) | | | |
| | 21:22 | 20:26 | 19:15 | 18:08 | 27 | 09:11 (WEA 11) | 16:16 | 24 | 09:11 (WEA 12) | 16:07 | 21 | 09:21 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | 08:19 | 08:19 | 08:19 | 09:01 (WEA 12) | | | |
| | 21:21 | 20:24 | 19:13 | 18:06 | 27 | 09:11 (WEA 11) | 16:15 | 25 | 09:11 (WEA 12) | 16:08 | 21 | 09:22 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 07:57 | 07:52 | 08:19 | 08:19 | 08:19 | 09:01 (WEA 12) | | | |
| | 21:19 | 20:22 | 19:10 | 17:04 | 29 | 08:12 (WEA 11) | 16:14 | 26 | 09:12 (WEA 12) | 16:09 | 21 | 09:22 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:01 (WEA 12) | | | |
| | 21:18 | 20:20 | 19:08 | 17:02 | 29 | 08:12 (WEA 11) | 16:13 | 26 | 09:13 (WEA 12) | 16:09 | 22 | 09:23 (WEA 12) |
| 27 | 05:29 | 06:19 | 07:09 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:01 (WEA 12) | | | |
| | 21:16 | 20:17 | 19:06 | 17:00 | 29 | 08:12 (WEA 11) | 16:12 | 27 | 09:13 (WEA 12) | 16:10 | 22 | 09:23 (WEA 12) |
| 28 | 05:31 | 06:20 | 07:11 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:02 (WEA 12) | | | |
| | 21:15 | 20:15 | 19:03 | 16:58 | 29 | 08:11 (WEA 11) | 16:12 | 26 | 09:13 (WEA 12) | 16:11 | 23 | 09:25 (WEA 12) |
| 29 | 05:32 | 06:22 | 07:13 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:03 (WEA 12) | | | |
| | 21:13 | 20:13 | 19:01 | 16:56 | 29 | 08:11 (WEA 11) | 16:11 | 27 | 09:14 (WEA 12) | 16:12 | 22 | 09:25 (WEA 12) |
| 30 | 05:34 | 06:24 | 07:14 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:03 (WEA 12) | | | |
| | 21:12 | 20:11 | 18:59 | 16:54 | 27 | 08:10 (WEA 11) | 16:10 | 27 | 09:14 (WEA 12) | 16:13 | 23 | 09:26 (WEA 12) |
| 31 | 05:35 | 06:25 | 07:15 | 07:59 | 07:54 | 08:19 | 08:19 | 08:19 | 09:02 (WEA 12) | | | |
| | 21:10 | 20:08 | 18:57 | 16:52 | 27 | 08:10 (WEA 11) | 16:09 | 16:13 | 24 | 09:26 (WEA 12) | | |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | | | | | | |
| astr.max.mögl.Beschattung | | | 306 | 518 | 464 | 720 | | | | | | |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | 0,14 | | | | | | |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | 0,96 | | | | | | |
| Reduktion Windrichtung | | | 0,66 | 0,63 | 0,58 | 0,56 | | | | | | |
| Gesamte Reduktion | | | 0,23 | 0,18 | 0,12 | 0,07 | | | | | | |
| Met.wahrsch.Beschattung | | | 70 | 96 | 54 | 52 | | | | | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d14 - Söllingen, Gartenstraße 9

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | |
|---------------------------|----------------|--|--|--|--|--|----------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 09:02 (WEA 12) 17:55 | 07:05 17:55 | 07:54 (WEA 11) 19:49 | 06:54 27 08:10 (WEA 10) 20:40 | 05:09 21:27 |
| 2 | 08:26 16:16 | 07:57 17:05 | 09:03 (WEA 12) 17:57 | 07:03 17:57 | 07:55 (WEA 11) 19:51 | 06:52 25 08:09 (WEA 10) 20:42 | 05:47 21:28 |
| 3 | 08:25 16:17 | 07:55 17:07 | 09:04 (WEA 12) 17:58 | 07:00 17:58 | 07:56 (WEA 11) 19:53 | 06:49 23 08:08 (WEA 10) 20:44 | 05:45 21:29 |
| 4 | 08:25 16:18 | 09:02 (WEA 12) 07:54 09:05 (WEA 12) 17:08 | 09:07 (WEA 12) 17:58 09:19 (WEA 12) 18:00 | 06:58 18:00 06:56 | 07:58 (WEA 11) 19:54 08:19 (WEA 11) 19:54 | 06:47 19 08:06 (WEA 10) 20:46 | 05:43 21:30 |
| 5 | 08:25 16:19 | 09:01 (WEA 12) 07:52 09:08 (WEA 12) 17:10 | 07:52 17:10 | 06:56 18:02 | 07:59 (WEA 11) 19:56 | 06:45 15 08:03 (WEA 10) 20:47 | 05:41 21:31 |
| 6 | 08:25 16:21 | 08:59 (WEA 12) 07:50 09:10 (WEA 12) 17:12 | 07:50 17:12 | 08:16 (WEA 06) 06:54 08:22 (WEA 06) 18:04 | 06:54 18:04 06:51 | 06:42 11 08:13 (WEA 11) 19:58 | 05:39 20:49 |
| 7 | 08:24 16:22 | 08:59 (WEA 12) 07:49 09:12 (WEA 12) 17:14 | 07:49 17:14 | 08:14 (WEA 06) 06:51 08:23 (WEA 06) 18:06 | 06:40 18:06 06:49 | 06:40 19:59 06:38 | 05:37 20:50 |
| 8 | 08:24 16:23 | 08:58 (WEA 12) 07:47 09:13 (WEA 12) 17:16 | 07:47 17:16 | 08:12 (WEA 06) 06:49 08:25 (WEA 06) 18:07 | 06:38 18:07 06:47 | 20:01 06:36 | 05:36 20:52 |
| 9 | 08:23 16:24 | 08:58 (WEA 12) 07:45 09:15 (WEA 12) 17:18 | 07:45 17:18 | 08:10 (WEA 06) 06:47 08:26 (WEA 06) 18:09 | 06:36 18:09 06:45 | 20:03 06:33 | 05:34 20:54 |
| 10 | 08:23 16:26 | 08:57 (WEA 12) 07:43 09:16 (WEA 12) 17:20 | 07:43 17:20 | 08:08 (WEA 06) 06:45 08:26 (WEA 06) 18:11 | 06:33 18:11 06:42 | 20:05 06:31 | 05:32 20:55 |
| 11 | 08:22 16:27 | 08:57 (WEA 12) 07:41 09:17 (WEA 12) 17:22 | 07:41 17:22 | 08:06 (WEA 06) 06:42 08:27 (WEA 06) 18:13 | 06:42 18:13 06:40 | 20:06 06:29 | 05:30 20:57 |
| 12 | 08:21 16:29 | 08:56 (WEA 12) 07:40 09:18 (WEA 12) 17:23 | 07:40 17:23 | 08:07 (WEA 06) 06:40 08:28 (WEA 06) 18:15 | 06:40 18:15 06:38 | 20:08 06:27 | 05:29 20:59 |
| 13 | 08:21 16:30 | 08:56 (WEA 12) 07:38 09:19 (WEA 12) 17:25 | 07:38 17:25 | 08:07 (WEA 06) 06:38 08:28 (WEA 06) 18:16 | 06:27 18:16 06:36 | 07:01 (WEA 01) 06:27 07:06 (WEA 01) 20:10 | 05:27 21:00 |
| 14 | 08:20 16:32 | 08:56 (WEA 12) 07:36 09:19 (WEA 12) 17:27 | 07:36 17:27 | 08:07 (WEA 06) 06:36 08:28 (WEA 06) 18:18 | 06:36 18:18 06:33 | 06:24 10 07:08 (WEA 01) 20:12 | 05:26 21:02 |
| 15 | 08:19 16:33 | 08:56 (WEA 12) 07:34 09:20 (WEA 12) 17:29 | 07:34 17:29 | 08:04 (WEA 11) 06:33 08:27 (WEA 06) 18:20 | 06:33 18:20 06:31 | 06:22 13 07:09 (WEA 01) 20:13 | 05:24 21:03 |
| 16 | 08:18 16:35 | 08:55 (WEA 12) 07:32 09:21 (WEA 12) 17:31 | 07:32 17:31 | 08:01 (WEA 11) 06:31 08:27 (WEA 06) 18:22 | 06:31 18:22 06:29 | 20:15 06:18 | 05:22 21:05 |
| 17 | 08:17 16:37 | 08:55 (WEA 12) 07:30 09:22 (WEA 12) 17:33 | 07:30 17:33 | 07:59 (WEA 11) 06:29 08:26 (WEA 06) 18:23 | 06:29 18:23 06:26 | 06:18 19 07:10 (WEA 01) 20:17 | 05:21 21:06 |
| 18 | 08:16 16:38 | 08:56 (WEA 12) 07:28 09:23 (WEA 12) 17:35 | 07:28 17:35 | 07:58 (WEA 11) 06:26 08:25 (WEA 06) 18:25 | 06:26 18:25 06:24 | 06:16 21 07:10 (WEA 01) 20:18 | 05:19 21:08 |
| 19 | 08:15 16:40 | 08:56 (WEA 12) 07:26 09:24 (WEA 12) 17:36 | 07:26 17:36 | 07:57 (WEA 11) 06:24 08:24 (WEA 06) 18:27 | 06:24 18:27 06:22 | 06:13 22 07:11 (WEA 10) 20:20 | 05:18 21:09 |
| 20 | 08:14 16:41 | 08:56 (WEA 12) 07:24 09:24 (WEA 12) 17:38 | 07:24 17:38 | 07:56 (WEA 11) 06:22 08:23 (WEA 11) 18:28 | 06:22 18:28 06:19 | 06:11 24 07:12 (WEA 10) 20:22 | 05:17 21:11 |
| 21 | 08:13 16:43 | 08:55 (WEA 12) 07:22 09:24 (WEA 12) 17:40 | 07:22 17:40 | 07:55 (WEA 11) 06:19 08:24 (WEA 11) 18:30 | 06:19 18:30 06:17 | 06:09 26 07:14 (WEA 10) 20:23 | 05:16 21:12 |
| 22 | 08:12 16:45 | 08:56 (WEA 12) 07:20 09:25 (WEA 12) 17:42 | 07:20 17:42 | 07:55 (WEA 11) 06:17 08:25 (WEA 11) 18:32 | 06:17 18:32 06:15 | 06:07 28 07:15 (WEA 10) 20:25 | 05:14 21:14 |
| 23 | 08:11 16:47 | 08:57 (WEA 12) 07:18 09:26 (WEA 12) 17:44 | 07:18 17:44 | 07:55 (WEA 11) 06:15 08:25 (WEA 11) 18:34 | 06:15 18:34 06:12 | 06:05 29 07:14 (WEA 10) 20:27 | 05:13 21:15 |
| 24 | 08:10 16:48 | 08:56 (WEA 12) 07:16 09:25 (WEA 12) 17:46 | 07:16 17:46 | 07:54 (WEA 11) 06:12 08:24 (WEA 11) 18:35 | 06:12 18:35 06:10 | 06:03 30 07:15 (WEA 10) 20:29 | 05:11 21:17 |
| 25 | 08:08 16:50 | 08:57 (WEA 12) 07:13 09:26 (WEA 12) 17:48 | 07:13 17:48 | 07:54 (WEA 11) 06:10 08:24 (WEA 11) 18:37 | 06:10 18:37 06:08 | 06:01 31 07:15 (WEA 10) 20:30 | 05:10 21:18 |
| 26 | 08:07 16:52 | 08:57 (WEA 12) 07:11 09:25 (WEA 12) 17:49 | 07:11 17:49 | 07:54 (WEA 11) 06:08 08:24 (WEA 11) 18:39 | 06:08 18:39 06:05 | 05:59 32 07:15 (WEA 10) 20:32 | 05:09 21:19 |
| 27 | 08:06 16:54 | 08:58 (WEA 12) 07:09 09:26 (WEA 12) 17:51 | 07:09 17:51 | 07:54 (WEA 11) 06:05 08:24 (WEA 11) 18:41 | 06:05 18:41 06:03 | 05:57 32 07:15 (WEA 10) 20:34 | 05:08 21:21 |
| 28 | 08:04 16:56 | 08:58 (WEA 12) 07:07 09:25 (WEA 12) 17:53 | 07:07 17:53 | 07:55 (WEA 11) 06:03 08:24 (WEA 11) 18:42 | 06:03 18:42 07:01 | 05:55 32 07:15 (WEA 10) 20:35 | 05:07 21:22 |
| 29 | 08:03 16:57 | 08:59 (WEA 12) 07:05 09:26 (WEA 12) 17:54 | 07:05 17:54 | 07:56 (WEA 11) 06:02 08:25 (WEA 11) 18:43 | 06:02 18:43 06:58 | 05:53 31 08:13 (WEA 10) 20:37 | 05:06 21:23 |
| 30 | 08:02 16:59 | 09:00 (WEA 12) 07:03 09:25 (WEA 12) 17:55 | 07:03 17:55 | 07:57 (WEA 11) 06:01 09:26 (WEA 12) 17:56 | 06:01 17:56 06:56 | 05:51 30 08:13 (WEA 10) 20:39 | 05:05 21:24 |
| 31 | 08:00 17:01 | 09:01 (WEA 12) 07:01 09:25 (WEA 12) 17:56 | 07:01 17:56 | 07:58 (WEA 11) 06:00 09:27 (WEA 12) 17:57 | 06:00 17:57 06:57 | 05:49 29 08:12 (WEA 10) 20:40 | 05:04 21:25 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | |
| astr.max.mögl.Beschattung | 637 | 611 | 587 | 115 | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | | |
| Reduktion Windrichtung | 0,57 | 0,62 | 0,67 | 0,69 | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | 0,24 | | | |
| Met.wahrsch.Beschattung | 63 | 90 | 108 | 28 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d14 - Söllingen, Gartenstraße 9

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|-------|--------|-----------|---------|----------------|----------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:41 (WEA 01) | 08:02 |
| | 21:41 | 21:09 | 20:06 | 18:56 | 07:42 (WEA 01) | 16:09 |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | | 08:03 |
| | 21:40 | 21:07 | 20:04 | 18:54 | 15 | 16:09 |
| 3 | 05:01 | 05:40 | 06:30 | 07:19 | | 08:04 |
| | 21:40 | 21:05 | 20:02 | 18:52 | 12 | 16:08 |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | | 08:06 |
| | 21:40 | 21:04 | 19:59 | 18:49 | 9 | 16:07 |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | | 08:07 |
| | 21:39 | 21:02 | 19:57 | 18:47 | | 16:07 |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 5 | 16:07 |
| | 21:39 | 21:00 | 19:55 | 18:45 | | 16:06 |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 4 | 16:06 |
| | 21:38 | 20:58 | 19:52 | 18:43 | 7 | 16:39 |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | | 08:11 |
| | 21:37 | 20:56 | 19:50 | 18:40 | 15 | 16:37 |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | | 08:12 |
| | 21:37 | 20:54 | 19:48 | 18:38 | 19 | 16:36 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | | 08:13 |
| | 21:36 | 20:53 | 19:46 | 18:36 | 23 | 16:34 |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | | 08:14 |
| | 21:35 | 20:51 | 19:43 | 18:34 | 25 | 16:33 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | | 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | 27 | 16:31 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | | 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | 28 | 16:30 |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | | 08:17 |
| | 21:32 | 20:45 | 19:36 | 18:27 | 29 | 16:28 |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | | 08:18 |
| | 21:32 | 20:43 | 19:34 | 18:25 | 30 | 16:27 |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | | 08:19 |
| | 21:30 | 20:41 | 19:32 | 18:22 | 31 | 16:25 |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | | 08:20 |
| | 21:29 | 20:39 | 19:29 | 18:20 | 31 | 16:24 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | | 08:21 |
| | 21:28 | 20:37 | 19:27 | 18:18 | 30 | 16:22 |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | | 08:21 |
| | 21:27 | 20:35 | 19:24 | 18:16 | 30 | 16:21 |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18:14 | 30 | 16:20 |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | | 08:23 |
| | 21:25 | 20:30 | 19:20 | 18:12 | 28 | 16:19 |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | | 08:23 |
| | 21:23 | 20:28 | 19:17 | 18:10 | 26 | 16:18 |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | | 08:24 |
| | 21:22 | 20:26 | 19:15 | 18:08 | 26 | 16:16 |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | | 08:24 |
| | 21:21 | 20:24 | 19:13 | 18:06 | 27 | 16:15 |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 | | 08:25 |
| | 21:19 | 20:22 | 19:10 | 17:04 | 27 | 16:14 |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | | 08:25 |
| | 21:18 | 20:20 | 19:08 | 17:02 | 25 | 16:13 |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | | 08:25 |
| | 21:16 | 20:17 | 19:06 | 17:00 | 23 | 16:12 |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | | 08:25 |
| | 21:15 | 20:15 | 19:03 | 16:58 | 22 | 16:12 |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | | 08:25 |
| | 21:13 | 20:13 | 19:01 | 16:56 | 22 | 16:11 |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | | 08:26 |
| | 21:12 | 20:11 | 18:59 | 16:54 | 22 | 16:10 |
| 31 | 05:35 | 06:25 | | 07:08 | | 08:26 |
| | 21:10 | 20:08 | | 16:52 | 20 | 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | 583 | 624 | 664 | 107 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,68 | 0,63 | 0,58 | 0,57 |
| Gesamte Reduktion | | | 0,24 | 0,18 | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | 140 | 115 | 77 | 8 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d17 - Söllingen, Gartenstraße 18

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|------------------------|------------------------|------------------------|------------------------|-------|
| 1 | 08:26 | 10:03 (WEA 13) 07:59 | 08:44 (WEA 12) 07:05 | 07:36 (WEA 11) 06:54 | 07:22 (WEA 10) 05:49 | 05:03 |
| | 16:15 | 10:16 (WEA 13) 17:03 | 09:15 (WEA 12) 17:55 | 08:03 (WEA 11) 19:49 | 07:49 (WEA 10) 20:40 | 21:27 |
| 2 | 08:26 | 10:04 (WEA 13) 07:57 | 08:44 (WEA 12) 07:03 | 07:36 (WEA 11) 06:52 | 07:21 (WEA 10) 05:47 | 05:02 |
| | 16:16 | 10:16 (WEA 13) 17:05 | 09:15 (WEA 12) 17:57 | 08:04 (WEA 11) 19:51 | 07:50 (WEA 10) 20:42 | 21:28 |
| 3 | 08:25 | 10:06 (WEA 13) 07:55 | 08:44 (WEA 12) 07:00 | 07:35 (WEA 11) 06:49 | 07:21 (WEA 10) 05:45 | 05:01 |
| | 16:17 | 10:16 (WEA 13) 17:07 | 09:14 (WEA 12) 17:58 | 08:05 (WEA 11) 19:53 | 07:50 (WEA 10) 20:44 | 21:29 |
| 4 | 08:25 | 10:07 (WEA 13) 07:54 | 08:45 (WEA 12) 06:58 | 07:34 (WEA 11) 06:47 | 07:20 (WEA 10) 05:43 | 05:01 |
| | 16:18 | 10:14 (WEA 13) 17:08 | 09:15 (WEA 12) 18:00 | 08:06 (WEA 11) 19:54 | 07:51 (WEA 10) 20:46 | 21:30 |
| 5 | 08:25 | 10:07 (WEA 13) 07:52 | 08:45 (WEA 12) 06:56 | 07:33 (WEA 11) 06:45 | 07:18 (WEA 10) 05:41 | 05:00 |
| | 16:19 | 10:17 (WEA 13) 17:10 | 09:15 (WEA 12) 18:02 | 08:05 (WEA 11) 19:56 | 07:50 (WEA 10) 20:47 | 21:31 |
| 6 | 08:25 | 10:07 (WEA 13) 07:50 | 08:45 (WEA 12) 06:54 | 07:33 (WEA 11) 06:42 | 07:18 (WEA 10) 05:39 | 04:59 |
| | 16:21 | 10:17 (WEA 13) 17:12 | 09:14 (WEA 12) 18:04 | 08:05 (WEA 11) 19:58 | 07:51 (WEA 10) 20:49 | 21:32 |
| 7 | 08:24 | 10:07 (WEA 13) 07:49 | 08:46 (WEA 12) 06:51 | 07:33 (WEA 11) 06:40 | 07:18 (WEA 10) 05:37 | 04:59 |
| | 16:22 | 10:17 (WEA 13) 17:14 | 09:14 (WEA 12) 18:06 | 08:05 (WEA 11) 19:59 | 07:51 (WEA 10) 20:50 | 21:33 |
| 8 | 08:24 | 10:07 (WEA 13) 07:47 | 08:46 (WEA 12) 06:49 | 07:32 (WEA 11) 06:38 | 07:18 (WEA 10) 05:36 | 04:58 |
| | 16:23 | 10:17 (WEA 13) 17:16 | 09:13 (WEA 12) 18:07 | 08:04 (WEA 11) 20:01 | 07:50 (WEA 10) 20:52 | 21:34 |
| 9 | 08:23 | 10:07 (WEA 13) 07:45 | 08:47 (WEA 12) 06:47 | 07:33 (WEA 11) 06:36 | 07:17 (WEA 10) 05:34 | 04:58 |
| | 16:25 | 10:18 (WEA 13) 17:18 | 09:12 (WEA 12) 18:09 | 08:04 (WEA 11) 20:03 | 07:49 (WEA 10) 20:54 | 21:35 |
| 10 | 08:23 | 10:07 (WEA 13) 07:43 | 08:48 (WEA 12) 06:45 | 07:33 (WEA 11) 06:33 | 07:17 (WEA 10) 05:32 | 04:57 |
| | 16:26 | 10:18 (WEA 13) 17:20 | 09:11 (WEA 12) 18:11 | 08:04 (WEA 11) 20:05 | 07:49 (WEA 10) 20:55 | 21:35 |
| 11 | 08:22 | 10:07 (WEA 13) 07:41 | 08:50 (WEA 12) 06:42 | 07:33 (WEA 11) 06:31 | 07:18 (WEA 10) 05:30 | 04:57 |
| | 16:27 | 10:18 (WEA 13) 17:22 | 09:09 (WEA 12) 18:13 | 08:02 (WEA 11) 20:06 | 07:48 (WEA 10) 20:57 | 21:36 |
| 12 | 08:21 | 10:07 (WEA 13) 07:40 | 08:52 (WEA 12) 06:40 | 07:34 (WEA 11) 06:29 | 07:18 (WEA 10) 05:29 | 04:57 |
| | 16:29 | 10:18 (WEA 13) 17:23 | 09:08 (WEA 12) 18:15 | 08:01 (WEA 11) 20:08 | 07:48 (WEA 10) 20:59 | 21:37 |
| 13 | 08:21 | 10:07 (WEA 13) 07:38 | 08:03 (WEA 06) 06:38 | 07:35 (WEA 11) 06:27 | 07:18 (WEA 10) 05:27 | 04:56 |
| | 16:30 | 10:18 (WEA 13) 17:25 | 09:05 (WEA 12) 18:16 | 08:00 (WEA 11) 20:10 | 07:46 (WEA 10) 21:00 | 21:37 |
| 14 | 08:20 | 08:49 (WEA 07) 07:36 | 08:01 (WEA 06) 06:36 | 07:35 (WEA 11) 06:24 | 07:19 (WEA 10) 05:26 | 04:56 |
| | 16:32 | 08:52 (WEA 07) 17:27 | 08:12 (WEA 06) 18:18 | 07:58 (WEA 11) 20:12 | 07:44 (WEA 10) 21:02 | 21:38 |
| 15 | 08:19 | 08:48 (WEA 07) 07:34 | 07:58 (WEA 06) 06:33 | 07:37 (WEA 11) 06:22 | 07:20 (WEA 10) 05:24 | 04:56 |
| | 16:33 | 08:55 (WEA 07) 17:29 | 08:13 (WEA 06) 18:20 | 07:56 (WEA 11) 20:13 | 07:43 (WEA 10) 21:03 | 21:39 |
| 16 | 08:18 | 08:47 (WEA 07) 07:32 | 07:56 (WEA 06) 06:31 | 07:40 (WEA 11) 06:20 | 07:21 (WEA 10) 05:22 | 04:56 |
| | 16:35 | 08:57 (WEA 07) 17:31 | 08:14 (WEA 06) 18:22 | 07:53 (WEA 11) 20:15 | 07:41 (WEA 10) 21:05 | 21:39 |
| 17 | 08:17 | 08:46 (WEA 07) 07:30 | 07:54 (WEA 06) 06:29 | 07:39 (WEA 11) 06:18 | 07:23 (WEA 10) 05:21 | 04:56 |
| | 16:37 | 08:58 (WEA 07) 17:33 | 08:14 (WEA 06) 18:23 | 07:54 (WEA 11) 20:17 | 07:39 (WEA 10) 21:06 | 21:40 |
| 18 | 08:16 | 08:45 (WEA 07) 07:28 | 07:53 (WEA 06) 06:26 | 07:38 (WEA 11) 06:16 | 07:26 (WEA 10) 05:19 | 04:56 |
| | 16:38 | 09:00 (WEA 07) 17:35 | 08:15 (WEA 06) 18:25 | 07:54 (WEA 11) 20:18 | 07:36 (WEA 10) 21:08 | 21:40 |
| 19 | 08:15 | 08:44 (WEA 07) 07:26 | 07:53 (WEA 06) 06:24 | 07:38 (WEA 11) 06:13 | 07:26 (WEA 10) 05:18 | 04:56 |
| | 16:40 | 09:01 (WEA 07) 17:36 | 08:15 (WEA 06) 18:27 | 07:54 (WEA 11) 20:20 | 07:46 (WEA 10) 21:09 | 21:40 |
| 20 | 08:14 | 08:43 (WEA 07) 07:24 | 07:53 (WEA 06) 06:22 | 07:39 (WEA 11) 06:11 | 07:26 (WEA 10) 05:17 | 04:56 |
| | 16:41 | 09:04 (WEA 12) 17:38 | 08:15 (WEA 06) 18:28 | 07:54 (WEA 11) 20:22 | 07:44 (WEA 10) 21:11 | 21:41 |
| 21 | 08:13 | 08:42 (WEA 07) 07:22 | 07:53 (WEA 06) 06:19 | 07:39 (WEA 11) 06:09 | 07:26 (WEA 10) 05:15 | 04:56 |
| | 16:43 | 09:05 (WEA 12) 17:40 | 08:15 (WEA 06) 18:30 | 07:54 (WEA 11) 20:23 | 07:44 (WEA 10) 21:12 | 21:41 |
| 22 | 08:12 | 08:42 (WEA 07) 07:20 | 07:53 (WEA 06) 06:17 | 07:39 (WEA 11) 06:07 | 07:26 (WEA 10) 05:14 | 04:56 |
| | 16:45 | 09:07 (WEA 12) 17:42 | 08:15 (WEA 06) 18:32 | 07:54 (WEA 11) 20:25 | 07:44 (WEA 10) 21:14 | 21:41 |
| 23 | 08:11 | 08:42 (WEA 07) 07:18 | 07:54 (WEA 06) 06:15 | 07:39 (WEA 11) 06:05 | 07:26 (WEA 10) 05:13 | 04:56 |
| | 16:47 | 09:08 (WEA 12) 17:44 | 08:15 (WEA 06) 18:34 | 07:54 (WEA 11) 20:27 | 07:44 (WEA 10) 21:15 | 21:41 |
| 24 | 08:10 | 08:42 (WEA 07) 07:16 | 07:54 (WEA 06) 06:12 | 07:39 (WEA 11) 06:03 | 07:26 (WEA 10) 05:11 | 04:57 |
| | 16:48 | 09:09 (WEA 12) 17:46 | 08:13 (WEA 06) 18:35 | 07:54 (WEA 11) 20:29 | 07:44 (WEA 10) 21:17 | 21:41 |
| 25 | 08:08 | 08:42 (WEA 07) 07:13 | 07:45 (WEA 11) 06:10 | 06:33 (WEA 01) 06:01 | 07:26 (WEA 10) 05:10 | 04:57 |
| | 16:50 | 09:10 (WEA 12) 17:48 | 08:12 (WEA 06) 18:37 | 07:54 (WEA 11) 20:30 | 07:44 (WEA 10) 21:18 | 21:41 |
| 26 | 08:07 | 08:42 (WEA 07) 07:11 | 07:42 (WEA 11) 06:08 | 06:32 (WEA 01) 05:59 | 07:26 (WEA 10) 05:09 | 04:57 |
| | 16:52 | 09:11 (WEA 12) 17:49 | 08:10 (WEA 06) 18:39 | 07:54 (WEA 11) 20:32 | 07:44 (WEA 10) 21:19 | 21:41 |
| 27 | 08:06 | 08:43 (WEA 07) 07:09 | 07:40 (WEA 11) 06:05 | 06:32 (WEA 01) 05:57 | 07:26 (WEA 10) 05:08 | 04:58 |
| | 16:54 | 09:12 (WEA 12) 17:51 | 08:08 (WEA 06) 18:41 | 07:54 (WEA 11) 20:34 | 07:44 (WEA 10) 21:21 | 21:41 |
| 28 | 08:04 | 08:43 (WEA 07) 07:07 | 07:38 (WEA 11) 06:03 | 06:32 (WEA 01) 05:55 | 07:26 (WEA 10) 05:07 | 04:58 |
| | 16:56 | 09:12 (WEA 12) 17:53 | 08:03 (WEA 11) 18:42 | 07:54 (WEA 11) 20:35 | 07:44 (WEA 10) 21:22 | 21:41 |
| 29 | 08:03 | 08:44 (WEA 07) 07:05 | 07:01 (WEA 11) 06:00 | 06:32 (WEA 01) 05:53 | 07:26 (WEA 10) 05:06 | 04:59 |
| | 16:57 | 09:14 (WEA 12) 17:55 | 08:04 (WEA 11) 19:44 | 07:52 (WEA 11) 20:37 | 07:44 (WEA 10) 21:23 | 21:41 |
| 30 | 08:02 | 08:43 (WEA 12) 07:03 | 06:58 (WEA 11) 05:58 | 07:27 (WEA 10) 05:51 | 07:26 (WEA 10) 05:05 | 04:59 |
| | 16:59 | 09:14 (WEA 12) 17:57 | 08:04 (WEA 11) 19:46 | 07:51 (WEA 11) 20:39 | 07:44 (WEA 10) 21:24 | 21:41 |
| 31 | 08:00 | 08:44 (WEA 12) 07:01 | 06:56 (WEA 11) 05:56 | 07:25 (WEA 10) 05:49 | 07:26 (WEA 10) 05:04 | 04:59 |
| | 17:01 | 09:15 (WEA 12) 18:00 | 08:04 (WEA 11) 19:47 | 07:50 (WEA 11) 20:41 | 07:44 (WEA 10) 21:25 | 21:41 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 435 | 658 | 663 | 492 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,59 | 0,61 | 0,66 | 0,70 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 44 | 95 | 119 | 122 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d17 - Söllingen, Gartenstraße 18

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | | |
|---------------------------|-------|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------|----------------|----------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 (WEA 10) | 07:16 | 08:13 (WEA 11) | 07:10 | 08:18 (WEA 12) | 08:02 | | | |
| | 21:41 | 21:09 | 20:06 | 31 07:47 (WEA 10) | 18:56 | 27 08:40 (WEA 11) | 16:50 | 23 08:41 (WEA 12) | 16:09 | | | |
| 2 | 05:01 | 05:38 | 06:28 | 07:16 (WEA 10) | 07:18 | 08:12 (WEA 11) | 07:12 | 08:17 (WEA 12) | 08:03 | | | |
| | 21:40 | 21:07 | 20:04 | 32 07:48 (WEA 10) | 18:54 | 29 08:41 (WEA 11) | 16:48 | 25 08:42 (WEA 12) | 16:09 | | | |
| 3 | 05:01 | 05:40 | 06:30 | 07:15 (WEA 10) | 07:19 | 08:11 (WEA 11) | 07:14 | 08:16 (WEA 12) | 08:04 | | | |
| | 21:40 | 21:05 | 20:02 | 32 07:47 (WEA 10) | 18:52 | 30 08:41 (WEA 11) | 16:46 | 27 08:43 (WEA 12) | 16:08 | | | |
| 4 | 05:02 | 05:41 | 06:32 | 07:15 (WEA 10) | 07:21 | 08:11 (WEA 11) | 07:16 | 08:15 (WEA 12) | 08:06 | | | |
| | 21:40 | 21:04 | 19:59 | 32 07:47 (WEA 10) | 18:49 | 31 08:42 (WEA 11) | 16:44 | 28 08:43 (WEA 12) | 16:07 | | | |
| 5 | 05:03 | 05:43 | 06:33 | 07:14 (WEA 10) | 07:23 | 08:09 (WEA 11) | 07:18 | 08:15 (WEA 12) | 08:07 | | | |
| | 21:39 | 21:02 | 19:57 | 33 07:47 (WEA 10) | 18:47 | 32 08:41 (WEA 11) | 16:43 | 29 08:44 (WEA 12) | 16:07 | | | |
| 6 | 05:04 | 05:45 | 06:35 | 07:14 (WEA 10) | 07:25 | 08:09 (WEA 11) | 07:19 | 08:15 (WEA 12) | 08:08 | | | |
| | 21:39 | 21:00 | 19:55 | 33 07:47 (WEA 10) | 18:45 | 32 08:41 (WEA 11) | 16:41 | 30 08:45 (WEA 12) | 16:06 | | | |
| 7 | 05:05 | 05:46 | 06:37 | 07:14 (WEA 10) | 07:26 | 08:09 (WEA 11) | 07:21 | 08:14 (WEA 12) | 08:10 | | | |
| | 21:38 | 20:58 | 19:52 | 31 07:45 (WEA 10) | 18:43 | 32 08:41 (WEA 11) | 16:39 | 31 08:45 (WEA 12) | 16:06 | | | |
| 8 | 05:06 | 05:48 | 06:38 | 07:14 (WEA 10) | 07:28 | 08:08 (WEA 11) | 07:23 | 08:14 (WEA 12) | 08:11 | | | |
| | 21:37 | 20:56 | 19:50 | 31 07:45 (WEA 10) | 18:40 | 32 08:40 (WEA 11) | 16:37 | 31 08:45 (WEA 12) | 16:06 | 6 | 09:56 (WEA 13) | |
| 9 | 05:07 | 05:49 | 06:40 | 07:15 (WEA 10) | 07:30 | 08:08 (WEA 11) | 07:25 | 08:14 (WEA 12) | 08:12 | | 10:02 (WEA 13) | |
| | 21:37 | 20:54 | 19:48 | 30 07:45 (WEA 10) | 18:38 | 32 08:40 (WEA 11) | 16:36 | 31 08:45 (WEA 12) | 16:05 | 10 | 09:54 (WEA 13) | |
| 10 | 05:08 | 05:51 | 06:42 | 07:15 (WEA 10) | 07:31 | 08:09 (WEA 11) | 07:27 | 08:15 (WEA 12) | 08:13 | | 09:53 (WEA 13) | |
| | 21:36 | 20:53 | 19:46 | 28 07:43 (WEA 10) | 18:36 | 30 08:39 (WEA 11) | 16:34 | 31 08:46 (WEA 12) | 16:05 | 12 | 10:05 (WEA 13) | |
| 11 | 05:09 | 05:52 | 06:43 | 07:16 (WEA 10) | 07:33 | 08:09 (WEA 11) | 07:28 | 08:15 (WEA 12) | 08:14 | | 09:53 (WEA 13) | |
| | 21:35 | 20:51 | 19:43 | 26 07:42 (WEA 10) | 18:34 | 30 08:39 (WEA 11) | 16:33 | 31 08:46 (WEA 12) | 16:05 | 13 | 10:06 (WEA 13) | |
| 12 | 05:10 | 05:54 | 06:45 | 07:16 (WEA 10) | 07:35 | 08:10 (WEA 11) | 07:30 | 08:15 (WEA 12) | 08:15 | | 09:52 (WEA 13) | |
| | 21:34 | 20:49 | 19:41 | 25 07:41 (WEA 01) | 18:31 | 28 08:38 (WEA 11) | 16:31 | 31 08:46 (WEA 12) | 16:05 | 15 | 10:07 (WEA 13) | |
| 13 | 05:11 | 05:56 | 06:46 | 07:18 (WEA 10) | 07:37 | 08:10 (WEA 11) | 07:32 | 08:16 (WEA 12) | 08:16 | | 09:52 (WEA 13) | |
| | 21:33 | 20:47 | 19:39 | 24 07:42 (WEA 01) | 18:29 | 26 08:36 (WEA 11) | 16:30 | 29 08:45 (WEA 12) | 16:05 | 16 | 10:08 (WEA 13) | |
| 14 | 05:12 | 05:57 | 06:48 | 07:20 (WEA 10) | 07:38 | 08:11 (WEA 11) | 07:34 | 08:16 (WEA 12) | 08:17 | | 09:52 (WEA 13) | |
| | 21:32 | 20:45 | 19:36 | 23 07:43 (WEA 01) | 18:27 | 24 08:35 (WEA 11) | 16:28 | 29 08:45 (WEA 12) | 16:05 | 17 | 10:09 (WEA 13) | |
| 15 | 05:13 | 05:59 | 06:50 | 07:22 (WEA 01) | 07:40 | 08:13 (WEA 11) | 07:35 | 08:16 (WEA 12) | 08:18 | | 09:52 (WEA 13) | |
| | 21:31 | 20:43 | 19:34 | 21 07:43 (WEA 01) | 18:25 | 28 08:41 (WEA 06) | 16:27 | 29 08:45 (WEA 12) | 16:05 | 18 | 10:10 (WEA 13) | |
| 16 | 05:14 | 06:01 | 06:51 | 07:21 (WEA 01) | 07:42 | 08:15 (WEA 11) | 07:37 | 08:16 (WEA 12) | 08:19 | | 09:53 (WEA 13) | |
| | 21:30 | 20:41 | 19:32 | 22 07:43 (WEA 01) | 18:22 | 28 08:43 (WEA 06) | 16:25 | 29 08:45 (WEA 12) | 16:05 | 18 | 10:11 (WEA 13) | |
| 17 | 05:16 | 06:02 | 06:53 | 07:20 (WEA 01) | 07:44 | 08:18 (WEA 11) | 07:39 | 08:15 (WEA 12) | 08:20 | | 09:53 (WEA 13) | |
| | 21:29 | 20:39 | 19:29 | 22 07:42 (WEA 01) | 18:20 | 27 08:45 (WEA 06) | 16:24 | 28 08:43 (WEA 12) | 16:05 | 19 | 10:12 (WEA 13) | |
| 18 | 05:17 | 06:04 | 06:55 | 07:21 (WEA 01) | 07:45 | 08:25 (WEA 06) | 07:41 | 08:16 (WEA 12) | 08:21 | | 09:54 (WEA 13) | |
| | 21:28 | 20:37 | 19:27 | 21 07:42 (WEA 01) | 18:18 | 19 08:44 (WEA 06) | 16:22 | 27 08:43 (WEA 12) | 16:05 | 19 | 10:13 (WEA 13) | |
| 19 | 05:18 | 06:05 | 06:56 | 07:22 (WEA 01) | 07:47 | 08:24 (WEA 06) | 07:42 | 08:16 (WEA 12) | 08:21 | | 09:53 (WEA 13) | |
| | 21:27 | 20:35 | 19:24 | 20 07:42 (WEA 01) | 18:16 | 21 08:45 (WEA 06) | 16:21 | 26 08:42 (WEA 12) | 16:06 | 20 | 10:13 (WEA 13) | |
| 20 | 05:19 | 06:07 | 06:58 | 07:23 (WEA 01) | 07:49 | 08:24 (WEA 06) | 07:44 | 08:17 (WEA 12) | 08:22 | | 09:54 (WEA 13) | |
| | 21:26 | 20:32 | 19:22 | 17 07:40 (WEA 01) | 18:14 | 22 08:46 (WEA 06) | 16:20 | 25 08:42 (WEA 12) | 16:06 | 20 | 10:14 (WEA 13) | |
| 21 | 05:21 | 06:09 | 07:00 | 07:25 (WEA 01) | 07:51 | 08:23 (WEA 06) | 07:46 | 08:18 (WEA 12) | 08:23 | | 09:55 (WEA 13) | |
| | 21:25 | 20:30 | 19:20 | 14 07:39 (WEA 01) | 18:12 | 23 08:46 (WEA 06) | 16:19 | 23 08:41 (WEA 12) | 16:06 | 20 | 10:15 (WEA 13) | |
| 22 | 05:22 | 06:10 | 07:01 | 07:26 (WEA 01) | 07:52 | 08:23 (WEA 06) | 07:47 | 08:19 (WEA 12) | 08:23 | | 09:55 (WEA 13) | |
| | 21:23 | 20:28 | 19:17 | 11 07:37 (WEA 01) | 18:10 | 23 08:46 (WEA 06) | 16:18 | 21 08:40 (WEA 12) | 16:07 | 20 | 10:15 (WEA 13) | |
| 23 | 05:23 | 06:12 | 07:03 | 07:28 (WEA 01) | 07:54 | 08:23 (WEA 06) | 07:49 | 08:21 (WEA 12) | 08:24 | | 09:55 (WEA 13) | |
| | 21:22 | 20:26 | 19:15 | 6 07:34 (WEA 01) | 18:08 | 23 08:46 (WEA 06) | 16:16 | 17 08:38 (WEA 07) | 16:07 | 20 | 10:15 (WEA 13) | |
| 24 | 05:25 | 06:14 | 07:04 | | 07:56 | 08:24 (WEA 06) | 07:51 | 08:22 (WEA 07) | 08:24 | | 09:56 (WEA 13) | |
| | 21:21 | 20:24 | 19:13 | | 18:06 | 21 08:45 (WEA 06) | 16:15 | 15 08:37 (WEA 07) | 16:08 | 20 | 10:16 (WEA 13) | |
| 25 | 05:26 | 06:15 | 07:06 | 07:28 (WEA 10) | 07:06 | 06:58 | 07:25 (WEA 06) | 07:52 | 08:25 (WEA 07) | | 09:57 (WEA 13) | |
| | 21:19 | 20:22 | 11 07:39 (WEA 10) | 19:10 | | 17:04 | 20 07:45 (WEA 06) | 16:14 | 12 08:36 (WEA 07) | 16:09 | 19 | 10:16 (WEA 13) |
| 26 | 05:28 | 06:17 | 07:07 | 07:26 (WEA 10) | 07:08 | 06:59 | 07:27 (WEA 06) | 07:54 | 08:26 (WEA 07) | | 09:57 (WEA 13) | |
| | 21:18 | 20:20 | 16 07:42 (WEA 10) | 19:08 | | 17:02 | 17 07:44 (WEA 06) | 16:13 | 10 08:36 (WEA 07) | 16:09 | 19 | 10:16 (WEA 13) |
| 27 | 05:29 | 06:19 | 07:09 | 07:23 (WEA 10) | 07:09 | 08:23 (WEA 11) | 07:01 | 07:29 (WEA 06) | 07:56 | | 09:58 (WEA 13) | |
| | 21:16 | 20:17 | 20 07:43 (WEA 10) | 19:06 | 10 08:33 (WEA 11) | 17:00 | 14 07:43 (WEA 06) | 16:12 | 7 08:34 (WEA 07) | 16:10 | 18 | 10:16 (WEA 13) |
| 28 | 05:31 | 06:20 | 07:11 | 07:21 (WEA 10) | 07:11 | 08:19 (WEA 11) | 07:03 | 07:30 (WEA 06) | 07:57 | | 09:59 (WEA 13) | |
| | 21:15 | 20:15 | 24 07:45 (WEA 10) | 19:03 | 17 08:36 (WEA 11) | 16:58 | 10 07:40 (WEA 06) | 16:12 | 3 08:32 (WEA 07) | 16:11 | 18 | 10:17 (WEA 13) |
| 29 | 05:32 | 06:22 | 07:13 | 07:19 (WEA 10) | 07:13 | 08:17 (WEA 11) | 07:05 | 07:32 (WEA 06) | 07:59 | | 10:00 (WEA 13) | |
| | 21:13 | 20:13 | 26 07:45 (WEA 10) | 19:01 | 21 08:38 (WEA 11) | 16:56 | 18 08:35 (WEA 12) | 16:11 | | 16:12 | 17 | 10:17 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:14 | 07:19 (WEA 10) | 07:14 | 08:15 (WEA 11) | 07:07 | 08:21 (WEA 12) | 08:00 | | 10:01 (WEA 13) | |
| | 21:12 | 20:11 | 28 07:47 (WEA 10) | 18:59 | 24 08:39 (WEA 11) | 16:54 | 16 08:37 (WEA 12) | 16:10 | | 16:13 | 16 | 10:17 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:17 (WEA 10) | | | 07:08 | | 08:19 (WEA 12) | | 16:13 | | 10:01 (WEA 13) |
| | 21:10 | 20:08 | 29 07:46 (WEA 10) | | | 16:52 | 20 08:39 (WEA 12) | | | 16:13 | 15 | 10:16 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | 381 | | 331 | | 266 | | 243 | | | |
| astr.max.mögl.Beschattung | | 154 | 637 | | 765 | | 678 | | 405 | | | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | | 0,31 | | 0,21 | | 0,14 | | | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | | 0,96 | | 0,96 | | 0,96 | | | |
| Reduktion Windrichtung | | 0,70 | 0,69 | | 0,63 | | 0,59 | | 0,57 | | | |
| Gesamte Reduktion | | 0,30 | 0,24 | | 0,19 | | 0,12 | | 0,07 | | | |
| Met.wahrsch.Beschattung | | 45 | 155 | | 142 | | 80 | | 30 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d20 - Söllingen, Gartenstraße 22

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------|------------------------|------------------------|------------------------|------------------------|-------|
| 1 | 08:26 | 09:46 (WEA 13) 07:59 | 08:34 (WEA 07) 07:05 | 07:42 (WEA 06) 06:54 | 07:19 (WEA 01) 05:49 | 05:03 |
| 2 | 16:15 29 | 10:15 (WEA 13) 17:03 | 08:59 (WEA 12) 17:55 | 08:02 (WEA 06) 19:49 | 07:41 (WEA 01) 20:40 | 21:27 |
| 3 | 08:26 | 09:47 (WEA 13) 07:57 | 08:33 (WEA 12) 07:03 | 07:43 (WEA 06) 06:52 | 07:19 (WEA 01) 05:47 | 05:02 |
| 4 | 16:16 28 | 10:15 (WEA 13) 17:05 | 08:59 (WEA 12) 17:57 | 08:01 (WEA 06) 19:51 | 07:41 (WEA 01) 20:42 | 21:28 |
| 5 | 08:25 | 09:48 (WEA 13) 07:55 | 08:32 (WEA 12) 07:00 | 07:45 (WEA 06) 06:49 | 07:20 (WEA 01) 05:45 | 05:01 |
| 6 | 16:17 28 | 10:16 (WEA 13) 17:07 | 09:00 (WEA 12) 17:58 | 08:00 (WEA 06) 19:53 | 07:40 (WEA 01) 20:44 | 21:29 |
| 7 | 08:25 | 09:48 (WEA 13) 07:54 | 08:32 (WEA 12) 06:58 | 07:47 (WEA 06) 06:47 | 07:20 (WEA 01) 05:43 | 05:01 |
| 8 | 16:18 27 | 10:15 (WEA 13) 17:08 | 09:02 (WEA 12) 18:00 | 07:58 (WEA 06) 19:54 | 07:40 (WEA 01) 20:46 | 21:30 |
| 9 | 08:25 | 09:49 (WEA 13) 07:52 | 08:32 (WEA 12) 06:56 | 07:27 (WEA 11) 06:45 | 07:20 (WEA 01) 05:41 | 05:00 |
| 10 | 16:19 27 | 10:16 (WEA 13) 17:10 | 09:02 (WEA 12) 18:02 | 07:40 (WEA 11) 19:56 | 07:38 (WEA 01) 20:47 | 21:31 |
| 11 | 08:25 | 09:50 (WEA 13) 07:50 | 08:31 (WEA 12) 06:54 | 07:24 (WEA 11) 06:42 | 07:11 (WEA 10) 05:39 | 04:59 |
| 12 | 16:21 25 | 10:15 (WEA 13) 17:12 | 09:02 (WEA 12) 18:04 | 07:43 (WEA 11) 19:58 | 07:36 (WEA 01) 20:49 | 21:32 |
| 13 | 08:24 | 09:51 (WEA 13) 07:49 | 08:31 (WEA 12) 06:51 | 07:23 (WEA 11) 06:40 | 07:09 (WEA 10) 05:37 | 04:59 |
| 14 | 16:22 25 | 10:16 (WEA 13) 17:14 | 09:03 (WEA 12) 18:06 | 07:45 (WEA 11) 19:59 | 07:34 (WEA 01) 20:50 | 21:33 |
| 15 | 08:24 | 09:52 (WEA 13) 07:47 | 08:31 (WEA 12) 06:49 | 07:20 (WEA 11) 06:38 | 07:07 (WEA 10) 05:36 | 04:58 |
| 16 | 16:23 23 | 10:15 (WEA 13) 17:16 | 09:03 (WEA 12) 18:07 | 07:46 (WEA 11) 20:01 | 07:29 (WEA 10) 20:52 | 21:34 |
| 17 | 08:23 | 09:52 (WEA 13) 07:45 | 08:31 (WEA 12) 06:47 | 07:19 (WEA 11) 06:36 | 07:04 (WEA 10) 05:34 | 04:58 |
| 18 | 16:25 23 | 10:15 (WEA 13) 17:18 | 09:03 (WEA 12) 18:09 | 07:47 (WEA 11) 20:03 | 07:30 (WEA 10) 20:54 | 21:35 |
| 19 | 08:23 | 09:54 (WEA 13) 07:43 | 08:31 (WEA 12) 06:45 | 07:18 (WEA 11) 06:33 | 07:03 (WEA 10) 05:32 | 04:57 |
| 20 | 16:26 21 | 10:15 (WEA 13) 17:20 | 09:03 (WEA 12) 18:11 | 07:48 (WEA 11) 20:05 | 07:31 (WEA 10) 20:55 | 21:35 |
| 21 | 08:22 | 09:55 (WEA 13) 07:41 | 08:31 (WEA 12) 06:42 | 07:17 (WEA 11) 06:31 | 07:02 (WEA 10) 05:30 | 04:57 |
| 22 | 16:27 19 | 10:14 (WEA 13) 17:22 | 09:03 (WEA 12) 18:13 | 07:47 (WEA 11) 20:06 | 07:31 (WEA 10) 20:57 | 21:36 |
| 23 | 08:21 | 09:57 (WEA 13) 07:40 | 08:32 (WEA 12) 06:40 | 07:16 (WEA 11) 06:29 | 07:01 (WEA 10) 05:29 | 04:57 |
| 24 | 16:29 16 | 10:13 (WEA 13) 17:23 | 09:03 (WEA 12) 18:15 | 07:48 (WEA 11) 20:08 | 07:32 (WEA 10) 20:59 | 21:37 |
| 25 | 08:21 | 09:58 (WEA 13) 07:38 | 08:32 (WEA 12) 06:38 | 07:16 (WEA 11) 06:27 | 07:00 (WEA 10) 05:27 | 04:56 |
| 26 | 16:30 14 | 10:12 (WEA 13) 17:25 | 09:03 (WEA 12) 18:16 | 07:48 (WEA 11) 20:10 | 07:31 (WEA 10) 21:00 | 21:37 |
| 27 | 08:20 | 10:00 (WEA 13) 07:36 | 08:33 (WEA 12) 06:36 | 07:15 (WEA 11) 06:24 | 06:59 (WEA 10) 05:26 | 04:56 |
| 28 | 16:32 11 | 10:11 (WEA 13) 17:27 | 09:02 (WEA 12) 18:18 | 07:48 (WEA 11) 20:12 | 07:32 (WEA 10) 21:02 | 21:38 |
| 29 | 08:19 | 10:05 (WEA 13) 07:34 | 08:33 (WEA 12) 06:33 | 07:15 (WEA 11) 06:22 | 06:59 (WEA 10) 05:24 | 04:56 |
| 30 | 16:33 2 | 10:07 (WEA 13) 17:29 | 09:01 (WEA 12) 18:20 | 07:48 (WEA 11) 20:13 | 07:32 (WEA 10) 21:03 | 21:39 |
| 31 | 08:18 | 07:32 | 08:34 (WEA 12) 06:31 | 07:15 (WEA 11) 06:20 | 06:59 (WEA 10) 05:22 | 04:56 |
| 32 | 16:35 | 17:31 | 09:00 (WEA 12) 18:22 | 07:48 (WEA 11) 20:15 | 07:32 (WEA 10) 21:05 | 21:39 |
| 33 | 08:17 | 07:30 | 08:35 (WEA 12) 06:29 | 07:14 (WEA 11) 06:18 | 06:59 (WEA 10) 05:21 | 04:56 |
| 34 | 16:37 | 17:33 | 08:59 (WEA 12) 18:23 | 07:46 (WEA 11) 20:17 | 07:31 (WEA 10) 21:06 | 21:40 |
| 35 | 08:16 | 07:28 | 07:52 (WEA 06) 06:26 | 07:15 (WEA 11) 06:16 | 06:59 (WEA 10) 05:19 | 04:56 |
| 36 | 16:38 | 17:35 | 08:57 (WEA 12) 18:25 | 07:46 (WEA 11) 20:18 | 07:31 (WEA 10) 21:08 | 21:40 |
| 37 | 08:15 | 07:26 | 07:50 (WEA 06) 06:24 | 07:15 (WEA 11) 06:13 | 06:59 (WEA 10) 05:18 | 04:56 |
| 38 | 16:40 | 17:36 | 08:55 (WEA 12) 18:27 | 07:45 (WEA 11) 20:20 | 07:30 (WEA 10) 21:09 | 21:40 |
| 39 | 08:14 | 07:24 | 07:48 (WEA 06) 06:22 | 07:15 (WEA 11) 06:11 | 06:59 (WEA 10) 05:17 | 04:56 |
| 40 | 16:42 | 17:38 | 08:52 (WEA 12) 18:28 | 07:43 (WEA 11) 20:22 | 07:30 (WEA 10) 21:11 | 21:41 |
| 41 | 08:13 | 07:22 | 07:46 (WEA 06) 06:19 | 07:16 (WEA 11) 06:09 | 07:00 (WEA 10) 05:15 | 04:56 |
| 42 | 16:43 | 17:40 | 08:03 (WEA 06) 18:30 | 07:42 (WEA 11) 20:23 | 07:29 (WEA 10) 21:12 | 21:41 |
| 43 | 08:12 | 07:20 | 07:44 (WEA 06) 06:17 | 07:18 (WEA 11) 06:07 | 07:00 (WEA 10) 05:14 | 04:56 |
| 44 | 16:45 | 17:42 | 08:04 (WEA 06) 18:32 | 07:41 (WEA 11) 20:25 | 07:28 (WEA 10) 21:14 | 21:41 |
| 45 | 08:11 | 07:18 | 07:43 (WEA 06) 06:15 | 07:19 (WEA 11) 06:05 | 07:00 (WEA 10) 05:13 | 04:56 |
| 46 | 16:47 | 17:44 | 08:05 (WEA 06) 18:34 | 07:38 (WEA 11) 20:27 | 07:26 (WEA 10) 21:15 | 21:41 |
| 47 | 08:10 | 07:16 | 07:42 (WEA 06) 06:12 | 07:21 (WEA 11) 06:03 | 07:01 (WEA 10) 05:11 | 04:57 |
| 48 | 16:48 | 17:46 | 08:04 (WEA 06) 18:35 | 07:35 (WEA 11) 20:29 | 07:25 (WEA 10) 21:17 | 21:41 |
| 49 | 08:08 | 07:13 | 07:41 (WEA 06) 06:10 | 06:33 (WEA 01) 06:01 | 07:03 (WEA 10) 05:10 | 04:57 |
| 50 | 16:50 | 17:48 | 08:04 (WEA 06) 18:37 | 07:29 (WEA 11) 20:30 | 07:24 (WEA 10) 21:18 | 21:41 |
| 51 | 08:07 | 07:11 | 07:42 (WEA 06) 06:08 | 06:30 (WEA 01) 05:59 | 07:05 (WEA 10) 05:09 | 04:57 |
| 52 | 16:52 | 17:49 | 08:04 (WEA 06) 18:39 | 06:38 (WEA 01) 20:32 | 07:22 (WEA 10) 21:19 | 21:41 |
| 53 | 08:06 | 07:09 | 07:42 (WEA 06) 06:05 | 06:28 (WEA 01) 05:57 | 07:07 (WEA 10) 05:08 | 04:58 |
| 54 | 16:54 | 17:51 | 08:04 (WEA 06) 18:41 | 06:40 (WEA 01) 20:34 | 07:19 (WEA 10) 21:21 | 21:41 |
| 55 | 08:04 | 07:07 | 07:42 (WEA 06) 06:03 | 06:26 (WEA 01) 05:55 | 07:00 (WEA 10) 05:07 | 04:58 |
| 56 | 16:56 | 17:53 | 08:04 (WEA 06) 18:42 | 06:41 (WEA 01) 20:35 | 07:00 (WEA 10) 21:22 | 21:41 |
| 57 | 08:03 | 07:07 | 07:01 | 07:23 (WEA 01) 05:53 | 07:00 (WEA 10) 05:06 | 04:59 |
| 58 | 16:57 | 17:50 | 19:44 | 07:41 (WEA 01) 20:37 | 07:00 (WEA 10) 21:23 | 21:41 |
| 59 | 08:02 | 07:07 | 06:58 | 07:21 (WEA 01) 05:51 | 07:00 (WEA 10) 05:05 | 04:59 |
| 60 | 16:59 | 17:56 | 19:46 | 07:42 (WEA 01) 20:39 | 07:00 (WEA 10) 21:24 | 21:41 |
| 61 | 08:00 | 07:07 | 06:56 | 07:20 (WEA 01) 05:50 | 07:00 (WEA 10) 05:04 | 04:59 |
| 62 | 17:01 | 08:58 (WEA 12) 19:47 | 19:47 | 07:42 (WEA 01) 20:39 | 07:00 (WEA 10) 21:25 | 21:41 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 497 | 747 | 698 | 701 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,58 | 0,61 | 0,66 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 50 | 107 | 124 | 174 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d20 - Söllingen, Gartenstraße 22

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|-------------------------|-------------------------|-------------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:01 (WEA 10) 07:16 | 07:55 (WEA 11) 07:10 | 08:00 (WEA 12) 08:02 | 09:37 (WEA 13) |
| | 21:41 | 21:09 | 20:06 | 29 07:30 (WEA 10) 18:56 | 32 08:27 (WEA 11) 16:50 | 32 08:32 (WEA 12) 16:09 | 19 09:56 (WEA 13) |
| 2 | 05:01 | 05:38 | 06:28 | 07:02 (WEA 10) 07:18 | 07:55 (WEA 11) 07:12 | 08:00 (WEA 12) 08:03 | 09:36 (WEA 13) |
| | 21:40 | 21:07 | 20:04 | 28 07:30 (WEA 10) 18:54 | 32 08:27 (WEA 11) 16:48 | 32 08:32 (WEA 12) 16:09 | 21 09:57 (WEA 13) |
| 3 | 05:01 | 05:40 | 06:30 | 07:02 (WEA 10) 07:19 | 07:56 (WEA 11) 07:14 | 08:00 (WEA 12) 08:04 | 09:37 (WEA 13) |
| | 21:40 | 21:05 | 20:02 | 26 07:28 (WEA 10) 18:52 | 30 08:26 (WEA 11) 16:46 | 32 08:32 (WEA 12) 16:08 | 22 09:59 (WEA 13) |
| 4 | 05:02 | 05:41 | 06:32 | 07:04 (WEA 10) 07:21 | 07:57 (WEA 11) 07:16 | 08:01 (WEA 12) 08:06 | 09:36 (WEA 13) |
| | 21:40 | 21:04 | 19:59 | 22 07:26 (WEA 10) 18:49 | 28 08:25 (WEA 11) 16:44 | 31 08:32 (WEA 12) 16:07 | 23 09:59 (WEA 13) |
| 5 | 05:03 | 05:43 | 06:33 | 07:05 (WEA 10) 07:23 | 07:56 (WEA 11) 07:18 | 08:01 (WEA 12) 08:07 | 09:36 (WEA 13) |
| | 21:39 | 21:02 | 19:57 | 25 07:30 (WEA 10) 18:47 | 27 08:23 (WEA 11) 16:43 | 31 08:32 (WEA 12) 16:07 | 25 10:01 (WEA 13) |
| 6 | 05:04 | 05:45 | 06:35 | 07:07 (WEA 10) 07:25 | 07:58 (WEA 11) 07:19 | 08:02 (WEA 12) 08:08 | 09:36 (WEA 13) |
| | 21:39 | 21:00 | 19:55 | 25 07:32 (WEA 10) 18:45 | 24 08:22 (WEA 11) 16:41 | 30 08:32 (WEA 12) 16:06 | 25 10:01 (WEA 13) |
| 7 | 05:05 | 05:46 | 06:37 | 07:12 (WEA 10) 07:26 | 07:59 (WEA 11) 07:21 | 08:02 (WEA 12) 08:10 | 09:37 (WEA 13) |
| | 21:38 | 20:58 | 19:52 | 20 07:33 (WEA 10) 18:43 | 21 08:20 (WEA 11) 16:39 | 29 08:31 (WEA 12) 16:06 | 26 10:03 (WEA 13) |
| 8 | 05:06 | 05:48 | 06:38 | 07:14 (WEA 10) 07:28 | 08:01 (WEA 11) 07:23 | 08:03 (WEA 12) 08:11 | 09:36 (WEA 13) |
| | 21:37 | 20:56 | 19:50 | 20 07:34 (WEA 10) 18:40 | 16 08:17 (WEA 11) 16:37 | 28 08:31 (WEA 12) 16:06 | 27 10:03 (WEA 13) |
| 9 | 05:07 | 05:49 | 06:40 | 07:14 (WEA 10) 07:30 | 08:04 (WEA 11) 07:25 | 08:04 (WEA 12) 08:12 | 09:36 (WEA 13) |
| | 21:37 | 20:54 | 19:48 | 20 07:34 (WEA 10) 18:38 | 16 08:30 (WEA 11) 16:36 | 26 08:30 (WEA 12) 16:05 | 28 10:04 (WEA 13) |
| 10 | 05:08 | 05:51 | 06:42 | 07:12 (WEA 10) 07:31 | 08:20 (WEA 11) 07:27 | 08:05 (WEA 12) 08:13 | 09:36 (WEA 13) |
| | 21:36 | 20:53 | 19:46 | 22 07:34 (WEA 10) 18:36 | 13 08:33 (WEA 11) 16:34 | 24 08:29 (WEA 12) 16:05 | 28 10:04 (WEA 13) |
| 11 | 05:09 | 05:52 | 06:43 | 07:12 (WEA 10) 07:33 | 08:18 (WEA 11) 07:28 | 08:05 (WEA 12) 08:14 | 09:36 (WEA 13) |
| | 21:35 | 20:51 | 19:43 | 22 07:34 (WEA 10) 18:34 | 17 08:35 (WEA 11) 16:33 | 23 08:28 (WEA 12) 16:05 | 29 10:05 (WEA 13) |
| 12 | 05:10 | 05:54 | 06:45 | 07:11 (WEA 10) 07:35 | 08:17 (WEA 11) 07:30 | 08:05 (WEA 12) 08:15 | 09:36 (WEA 13) |
| | 21:34 | 20:49 | 19:41 | 22 07:33 (WEA 10) 18:31 | 19 08:36 (WEA 11) 16:31 | 23 08:28 (WEA 12) 16:05 | 29 10:05 (WEA 13) |
| 13 | 05:11 | 05:56 | 06:46 | 07:12 (WEA 10) 07:37 | 08:15 (WEA 11) 07:32 | 08:06 (WEA 12) 08:16 | 09:37 (WEA 13) |
| | 21:33 | 20:47 | 19:39 | 21 07:33 (WEA 10) 18:29 | 21 08:36 (WEA 11) 16:30 | 22 08:28 (WEA 12) 16:05 | 29 10:06 (WEA 13) |
| 14 | 05:12 | 05:57 | 06:48 | 07:14 (WEA 10) 07:38 | 08:14 (WEA 11) 07:34 | 08:07 (WEA 12) 08:17 | 09:37 (WEA 13) |
| | 21:32 | 20:45 | 19:36 | 18 07:32 (WEA 10) 18:27 | 22 08:36 (WEA 11) 16:28 | 21 08:28 (WEA 12) 16:05 | 30 10:07 (WEA 13) |
| 15 | 05:13 | 05:59 | 06:50 | 07:15 (WEA 10) 07:40 | 08:14 (WEA 11) 07:35 | 08:07 (WEA 12) 08:18 | 09:37 (WEA 13) |
| | 21:31 | 20:43 | 19:34 | 16 07:31 (WEA 10) 18:25 | 23 08:37 (WEA 11) 16:27 | 21 08:28 (WEA 12) 16:05 | 30 10:07 (WEA 13) |
| 16 | 05:14 | 06:01 | 06:51 | 07:17 (WEA 10) 07:42 | 08:14 (WEA 11) 07:37 | 08:08 (WEA 12) 08:19 | 09:38 (WEA 13) |
| | 21:30 | 20:41 | 19:32 | 13 07:30 (WEA 10) 18:22 | 23 08:37 (WEA 11) 16:25 | 19 08:27 (WEA 12) 16:05 | 30 10:08 (WEA 13) |
| 17 | 05:16 | 06:02 | 06:53 | 07:18 (WEA 10) 07:43 | 08:14 (WEA 11) 07:39 | 08:09 (WEA 12) 08:20 | 09:39 (WEA 13) |
| | 21:29 | 20:39 | 19:29 | 9 07:27 (WEA 10) 18:20 | 23 08:37 (WEA 11) 16:24 | 17 08:26 (WEA 12) 16:05 | 30 10:09 (WEA 13) |
| 18 | 05:17 | 06:04 | 06:55 | 07:20 (WEA 10) 07:45 | 08:13 (WEA 11) 07:41 | 08:11 (WEA 12) 08:21 | 09:39 (WEA 13) |
| | 21:28 | 20:37 | 19:27 | 4 07:24 (WEA 10) 18:18 | 22 08:35 (WEA 11) 16:22 | 14 08:25 (WEA 12) 16:05 | 31 10:10 (WEA 13) |
| 19 | 05:18 | 06:05 | 06:56 | 08:10 (WEA 10) 07:47 | 08:13 (WEA 11) 07:42 | 08:13 (WEA 12) 08:21 | 09:39 (WEA 13) |
| | 21:27 | 20:35 | 19:24 | 12 08:22 (WEA 10) 18:16 | 22 08:35 (WEA 11) 16:21 | 11 08:24 (WEA 12) 16:06 | 30 10:09 (WEA 13) |
| 20 | 05:19 | 06:07 | 06:58 | 08:06 (WEA 10) 07:49 | 08:15 (WEA 11) 07:44 | 08:15 (WEA 12) 08:22 | 09:40 (WEA 13) |
| | 21:26 | 20:32 | 19:22 | 18 08:24 (WEA 10) 18:14 | 19 08:34 (WEA 11) 16:20 | 7 08:22 (WEA 12) 16:06 | 30 10:10 (WEA 13) |
| 21 | 05:21 | 06:09 | 07:00 | 08:04 (WEA 10) 07:51 | 08:17 (WEA 11) 07:46 | 08:16 (WEA 12) 08:23 | 09:41 (WEA 13) |
| | 21:25 | 20:30 | 19:20 | 22 08:26 (WEA 10) 18:12 | 16 08:33 (WEA 11) 16:19 | 16:06 | 30 10:11 (WEA 13) |
| 22 | 05:22 | 06:10 | 07:01 | 08:01 (WEA 10) 07:52 | 08:19 (WEA 11) 07:47 | 08:17 (WEA 12) 08:23 | 09:41 (WEA 13) |
| | 21:23 | 20:28 | 19:17 | 25 08:26 (WEA 10) 18:10 | 26 09:24 (WEA 11) 16:18 | 16:07 | 30 10:11 (WEA 13) |
| 23 | 05:23 | 06:12 | 07:03 | 08:00 (WEA 10) 07:54 | 08:21 (WEA 11) 07:49 | 08:24 (WEA 12) 08:24 | 09:41 (WEA 13) |
| | 21:22 | 20:26 | 19:15 | 28 08:28 (WEA 10) 18:08 | 27 09:26 (WEA 11) 16:16 | 16:07 | 30 10:11 (WEA 13) |
| 24 | 05:25 | 06:14 | 07:04 | 07:59 (WEA 10) 07:56 | 08:23 (WEA 11) 07:51 | 08:24 (WEA 12) 08:24 | 09:42 (WEA 13) |
| | 21:21 | 20:24 | 19:13 | 30 08:29 (WEA 10) 18:06 | 24 09:28 (WEA 11) 16:15 | 16:08 | 30 10:12 (WEA 13) |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 (WEA 10) 06:58 | 08:05 (WEA 11) 07:52 | 08:25 (WEA 12) 08:25 | 09:42 (WEA 13) |
| | 21:19 | 20:22 | 19:10 | 30 08:28 (WEA 10) 17:04 | 24 08:29 (WEA 11) 16:14 | 16:09 | 30 10:12 (WEA 13) |
| 26 | 05:28 | 06:17 | 07:08 | 07:57 (WEA 10) 06:59 | 08:04 (WEA 11) 07:54 | 08:25 (WEA 12) 08:25 | 09:42 (WEA 13) |
| | 21:18 | 20:20 | 19:08 | 32 08:29 (WEA 10) 17:02 | 26 08:30 (WEA 11) 16:13 | 16:09 | 31 10:13 (WEA 13) |
| 27 | 05:29 | 06:19 | 07:09 | 07:57 (WEA 10) 07:01 | 08:03 (WEA 11) 07:56 | 08:25 (WEA 12) 08:25 | 09:43 (WEA 13) |
| | 21:16 | 20:17 | 19:06 | 32 08:29 (WEA 10) 17:00 | 28 08:31 (WEA 11) 16:12 | 16:10 | 30 10:13 (WEA 13) |
| 28 | 05:31 | 06:20 | 07:11 | 07:56 (WEA 10) 07:03 | 08:01 (WEA 11) 07:57 | 08:25 (WEA 12) 08:25 | 09:44 (WEA 13) |
| | 21:15 | 20:15 | 19:03 | 32 08:28 (WEA 10) 16:58 | 30 08:31 (WEA 11) 16:12 | 10 09:51 (WEA 12) 16:11 | 30 10:14 (WEA 13) |
| 29 | 05:32 | 06:22 | 07:13 | 07:55 (WEA 10) 07:05 | 08:01 (WEA 11) 07:59 | 09:39 (WEA 12) 08:25 | 09:45 (WEA 13) |
| | 21:13 | 20:13 | 19:01 | 33 08:28 (WEA 10) 16:56 | 31 08:32 (WEA 11) 16:11 | 14 09:53 (WEA 12) 16:12 | 29 10:14 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:14 | 07:56 (WEA 10) 07:07 | 08:01 (WEA 11) 08:00 | 09:38 (WEA 12) 08:26 | 09:44 (WEA 13) |
| | 21:12 | 20:11 | 18:59 | 32 08:28 (WEA 10) 16:54 | 31 08:32 (WEA 11) 16:10 | 16 09:54 (WEA 12) 16:13 | 30 10:14 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:00 | 07:08 | 08:00 (WEA 10) 07:08 | 08:26 (WEA 11) 08:26 | 09:45 (WEA 13) |
| | 21:10 | 20:08 | 19:01 | 16:52 | 32 08:32 (WEA 10) 16:12 | 16:13 | 29 10:14 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | |
| astr.max.mögl.Beschattung | | 450 | 688 | 745 | 513 | 871 | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | |
| Reduktion Windrichtung | | 0,71 | 0,68 | 0,63 | 0,60 | 0,57 | |
| Gesamte Reduktion | | 0,30 | 0,24 | 0,18 | 0,12 | 0,07 | |
| Met.wahrsch.Beschattung | | 134 | 163 | 136 | 61 | 64 | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
 DE-38384 Gevensleben
 +49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d23 - Söllingen, Hauptstraße 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
 1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
 226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------------|----------------------------------|----------------------------------|----------------|----------------|----------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 08:32 (WEA 10) 08:54 (WEA 10) | 07:05 17:55 | 06:54 19:49 | 05:49 20:41 |
| 2 | 08:26 16:16 | 07:57 17:05 | 08:31 (WEA 10) 08:55 (WEA 10) | 07:03 17:57 | 06:52 19:51 | 05:47 20:42 |
| 3 | 08:25 16:17 | 07:55 17:07 | 08:31 (WEA 10) 08:55 (WEA 10) | 07:00 17:58 | 06:49 19:53 | 05:45 20:44 |
| 4 | 08:25 16:18 | 07:54 17:08 | 08:31 (WEA 10) 08:56 (WEA 10) | 06:58 18:00 | 06:47 19:54 | 05:43 20:46 |
| 5 | 08:25 16:19 | 07:52 17:10 | 08:31 (WEA 10) 08:56 (WEA 10) | 06:56 18:02 | 06:45 19:56 | 05:41 20:47 |
| 6 | 08:25 16:21 | 07:50 17:12 | 08:31 (WEA 10) 08:56 (WEA 10) | 06:54 18:04 | 06:42 19:58 | 05:39 20:49 |
| 7 | 08:24 16:22 | 07:49 17:14 | 08:31 (WEA 10) 08:55 (WEA 10) | 06:52 18:06 | 06:40 20:00 | 05:37 20:51 |
| 8 | 08:24 16:23 | 07:47 17:16 | 08:32 (WEA 10) 08:55 (WEA 10) | 06:49 18:07 | 06:38 20:01 | 05:36 20:52 |
| 9 | 08:23 16:24 | 07:45 17:18 | 08:32 (WEA 10) 08:54 (WEA 10) | 06:47 18:09 | 06:35 20:03 | 05:34 20:54 |
| 10 | 08:23 16:26 | 07:43 17:20 | 08:33 (WEA 10) 08:54 (WEA 10) | 06:45 18:11 | 06:33 20:05 | 05:32 20:55 |
| 11 | 08:22 16:27 | 07:41 17:22 | 08:35 (WEA 10) 08:54 (WEA 10) | 06:42 18:13 | 06:31 20:06 | 05:30 20:57 |
| 12 | 08:22 16:29 | 07:40 17:23 | 08:36 (WEA 10) 08:52 (WEA 10) | 06:40 18:15 | 06:29 20:08 | 05:29 20:59 |
| 13 | 08:21 16:30 | 07:38 17:25 | 08:38 (WEA 10) 08:50 (WEA 10) | 06:38 18:16 | 06:27 20:10 | 05:27 21:00 |
| 14 | 08:20 16:32 | 07:36 17:27 | 08:43 (WEA 10) 08:46 (WEA 10) | 06:36 18:18 | 06:24 20:12 | 05:26 21:02 |
| 15 | 08:19 16:33 | 07:34 17:29 | 08:46 (WEA 10) | 06:33 18:20 | 06:22 20:13 | 05:24 21:03 |
| 16 | 08:18 16:35 | 07:32 17:31 | | 06:31 18:22 | 06:20 20:15 | 05:22 21:05 |
| 17 | 08:17 16:37 | 07:30 17:33 | | 06:29 18:23 | 06:18 20:17 | 05:21 21:06 |
| 18 | 08:17 16:38 | 07:28 17:35 | | 06:26 18:25 | 06:16 20:18 | 05:19 21:08 |
| 19 | 08:16 16:40 | 07:26 17:36 | | 06:24 18:27 | 06:13 20:20 | 05:18 21:09 |
| 20 | 08:14 16:41 | 07:24 17:38 | | 06:22 18:29 | 06:11 20:22 | 05:17 21:11 |
| 21 | 08:13 16:43 | 07:22 17:40 | | 06:19 18:30 | 06:09 20:24 | 05:15 21:12 |
| 22 | 08:12 16:45 | 07:20 17:42 | | 06:17 18:32 | 06:07 20:25 | 05:14 21:14 |
| 23 | 08:11 16:47 | 07:18 17:44 | | 06:15 18:34 | 06:05 20:27 | 05:13 21:15 |
| 24 | 08:10 16:48 | 07:16 17:46 | | 06:12 18:35 | 06:03 20:29 | 05:11 21:17 |
| 25 | 08:09 16:50 | 07:13 17:48 | | 06:10 18:37 | 06:01 20:30 | 05:10 21:18 |
| 26 | 08:07 16:52 | 08:37 (WEA 10) 08:46 (WEA 10) | 07:11 17:49 | 06:08 18:39 | 05:59 20:32 | 05:09 21:19 |
| 27 | 08:06 16:54 | 08:35 (WEA 10) 08:49 (WEA 10) | 07:09 17:51 | 06:05 18:41 | 05:57 20:34 | 05:08 21:21 |
| 28 | 08:04 16:56 | 08:34 (WEA 10) 08:50 (WEA 10) | 07:07 17:53 | 06:03 18:42 | 05:55 20:35 | 05:07 21:22 |
| 29 | 08:03 16:57 | 08:33 (WEA 10) 08:52 (WEA 10) | | 07:01 19:44 | 05:53 20:37 | 05:06 21:23 |
| 30 | 08:02 16:59 | 08:32 (WEA 10) 08:52 (WEA 10) | | 06:58 19:46 | 05:51 20:39 | 05:05 21:24 |
| 31 | 08:00 17:01 | 08:32 (WEA 10) 08:54 (WEA 10) | | 06:56 19:47 | 05:04 21:26 | 05:04 21:26 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 100 | 285 | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | | | | |
| Reduktion Windrichtung | 0,60 | 0,60 | | | | |
| Gesamte Reduktion | 0,11 | 0,15 | | | | |
| Met.wahrsch.Beschattung | 11 | 41 | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d23 - Söllingen, Hauptstraße 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Juli | August | September | Oktober | | November | | Dezember |
|---------------------------|-------|--------|-----------|-------------------|-------------------|----------|-------------------|----------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | | 07:10 | 08:03 (WEA 10) | 08:02 |
| | 21:41 | 21:09 | 20:06 | 18:56 | | 16:50 | 20 08:23 (WEA 10) | 16:09 |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | | 07:12 | 08:02 (WEA 10) | 08:03 |
| | 21:40 | 21:07 | 20:04 | 18:54 | | 16:48 | 22 08:24 (WEA 10) | 16:08 |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | | 07:14 | 08:01 (WEA 10) | 08:04 |
| | 21:40 | 21:05 | 20:02 | 18:52 | | 16:46 | 24 08:25 (WEA 10) | 16:08 |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | | 07:16 | 08:01 (WEA 10) | 08:06 |
| | 21:40 | 21:04 | 19:59 | 18:49 | | 16:44 | 24 08:25 (WEA 10) | 16:07 |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | | 07:18 | 08:01 (WEA 10) | 08:07 |
| | 21:39 | 21:02 | 19:57 | 18:47 | | 16:43 | 25 08:26 (WEA 10) | 16:07 |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | | 07:19 | 08:01 (WEA 10) | 08:08 |
| | 21:39 | 21:00 | 19:55 | 18:45 | | 16:41 | 25 08:26 (WEA 10) | 16:06 |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | | 07:21 | 08:01 (WEA 10) | 08:10 |
| | 21:38 | 20:58 | 19:53 | 18:43 | | 16:39 | 25 08:26 (WEA 10) | 16:06 |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | | 07:23 | 08:02 (WEA 10) | 08:11 |
| | 21:37 | 20:56 | 19:50 | 18:40 | | 16:37 | 24 08:26 (WEA 10) | 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | | 07:25 | 08:02 (WEA 10) | 08:12 |
| | 21:37 | 20:54 | 19:48 | 18:38 | | 16:36 | 24 08:26 (WEA 10) | 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | | 07:27 | 08:03 (WEA 10) | 08:13 |
| | 21:36 | 20:53 | 19:46 | 18:36 | | 16:34 | 22 08:25 (WEA 10) | 16:05 |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | | 07:28 | 08:03 (WEA 10) | 08:14 |
| | 21:35 | 20:51 | 19:43 | 18:34 | | 16:33 | 22 08:25 (WEA 10) | 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | | 07:30 | 08:04 (WEA 10) | 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | | 16:31 | 20 08:24 (WEA 10) | 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | | 07:32 | 08:05 (WEA 10) | 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | | 16:29 | 19 08:24 (WEA 10) | 16:05 |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | | 07:34 | 08:07 (WEA 10) | 08:17 |
| | 21:33 | 20:45 | 19:36 | 18:27 | | 16:28 | 16 08:23 (WEA 10) | 16:05 |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | | 07:35 | 08:08 (WEA 10) | 08:18 |
| | 21:32 | 20:43 | 19:34 | 18:25 | | 16:27 | 13 08:21 (WEA 10) | 16:05 |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | | 07:37 | 08:11 (WEA 10) | 08:19 |
| | 21:31 | 20:41 | 19:32 | 18:22 | | 16:25 | 8 08:19 (WEA 10) | 16:05 |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | | 07:39 | | 08:20 |
| | 21:29 | 20:39 | 19:29 | 18:20 | | 16:24 | | 16:05 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | | 07:41 | | 08:21 |
| | 21:28 | 20:37 | 19:27 | 18:18 | | 16:22 | | 16:05 |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | | 07:42 | | 08:21 |
| | 21:27 | 20:35 | 19:24 | 18:16 | | 16:21 | | 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | | 07:44 | | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18:14 | | 16:20 | | 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | | 07:46 | | 08:23 |
| | 21:25 | 20:30 | 19:20 | 18:12 | | 16:19 | | 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | | 07:47 | | 08:23 |
| | 21:23 | 20:28 | 19:17 | 18:10 | | 16:18 | | 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | | 07:49 | | 08:24 |
| | 21:22 | 20:26 | 19:15 | 18:08 | | 16:16 | | 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | | 07:51 | | 08:24 |
| | 21:21 | 20:24 | 19:13 | 18:06 | | 16:15 | | 16:08 |
| 25 | 05:26 | 06:15 | 07:06 | 06:58 | | 07:52 | | 08:25 |
| | 21:19 | 20:22 | 19:10 | 17:04 | | 16:14 | | 16:09 |
| 26 | 05:28 | 06:17 | 07:08 | 06:59 | | 07:54 | | 08:25 |
| | 21:18 | 20:20 | 19:08 | 17:02 | | 16:13 | | 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | | 07:56 | | 08:25 |
| | 21:16 | 20:17 | 19:06 | 17:00 | | 16:12 | | 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | 08:10 (WEA 10) | 07:57 | | 08:25 |
| | 21:15 | 20:15 | 19:03 | 16:58 | 6 08:16 (WEA 10) | 16:12 | | 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | 08:07 (WEA 10) | 07:59 | | 08:26 |
| | 21:13 | 20:13 | 19:01 | 16:56 | 12 08:19 (WEA 10) | 16:11 | | 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | 08:05 (WEA 10) | 08:00 | | 08:26 |
| | 21:12 | 20:11 | 18:59 | 16:54 | 16 08:21 (WEA 10) | 16:10 | | 16:13 |
| 31 | 05:35 | 06:25 | 07:08 | 07:08 | 08:03 (WEA 10) | | | 08:26 |
| | 21:10 | 20:08 | 16:52 | 19 08:22 (WEA 10) | | | | 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | | 266 | | 243 |
| astr.max.mögl.Beschattung | | | | 53 | | 333 | | |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | | 0,21 | | |
| Reduktion Betriebsdauer | | | | 0,96 | | 0,96 | | |
| Reduktion Windrichtung | | | | 0,60 | | 0,60 | | |
| Gesamte Reduktion | | | | 0,18 | | 0,12 | | |
| Met.wahrsch.Beschattung | | | | 10 | | 41 | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d25 - Söllingen, Hauptstraße 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | | |
|---------------------------|--------|-------------------|-------|-------------------|-------|-------|-------|-------|
| 1 | 08:26 | 08:57 (WEA 11) | 07:59 | 07:05 | 06:54 | 05:03 | | |
| | 16:15 | 14 09:11 (WEA 11) | 17:03 | 17:55 | 19:49 | 21:27 | | |
| 2 | 08:26 | 08:58 (WEA 11) | 07:57 | 08:26 (WEA 10) | 07:03 | 06:52 | 05:47 | 05:02 |
| | 16:16 | 14 09:12 (WEA 11) | 17:05 | 10 08:36 (WEA 10) | 17:57 | 19:51 | 20:42 | 21:28 |
| 3 | 08:25 | 08:58 (WEA 11) | 07:55 | 08:24 (WEA 10) | 07:00 | 06:49 | 05:45 | 05:01 |
| | 16:17 | 16 09:14 (WEA 11) | 17:07 | 14 08:38 (WEA 10) | 17:58 | 19:53 | 20:44 | 21:29 |
| 4 | 08:25 | 08:57 (WEA 11) | 07:54 | 08:23 (WEA 10) | 06:58 | 06:47 | 05:43 | 05:01 |
| | 16:18 | 17 09:14 (WEA 11) | 17:08 | 18 08:41 (WEA 10) | 18:00 | 19:54 | 20:46 | 21:30 |
| 5 | 08:25 | 08:58 (WEA 11) | 07:52 | 08:22 (WEA 10) | 06:56 | 06:45 | 05:41 | 05:00 |
| | 16:19 | 17 09:15 (WEA 11) | 17:10 | 20 08:42 (WEA 10) | 18:02 | 19:56 | 20:47 | 21:31 |
| 6 | 08:25 | 08:57 (WEA 11) | 07:50 | 08:21 (WEA 10) | 06:54 | 06:42 | 05:39 | 04:59 |
| | 16:21 | 18 09:15 (WEA 11) | 17:12 | 21 08:42 (WEA 10) | 18:04 | 19:58 | 20:49 | 21:32 |
| 7 | 08:24 | 08:58 (WEA 11) | 07:49 | 08:20 (WEA 10) | 06:52 | 06:40 | 05:37 | 04:59 |
| | 16:22 | 19 09:17 (WEA 11) | 17:14 | 23 08:43 (WEA 10) | 18:06 | 20:00 | 20:51 | 21:33 |
| 8 | 08:24 | 08:57 (WEA 11) | 07:47 | 08:20 (WEA 10) | 06:49 | 06:38 | 05:36 | 04:58 |
| | 16:23 | 20 09:17 (WEA 11) | 17:16 | 24 08:44 (WEA 10) | 18:07 | 20:01 | 20:52 | 21:34 |
| 9 | 08:23 | 08:58 (WEA 11) | 07:45 | 08:19 (WEA 10) | 06:47 | 06:35 | 05:34 | 04:58 |
| | 16:24 | 21 09:19 (WEA 11) | 17:18 | 25 08:44 (WEA 10) | 18:09 | 20:03 | 20:54 | 21:35 |
| 10 | 08:23 | 08:58 (WEA 11) | 07:43 | 08:19 (WEA 10) | 06:45 | 06:33 | 05:32 | 04:57 |
| | 16:26 | 21 09:19 (WEA 11) | 17:20 | 25 08:44 (WEA 10) | 18:11 | 20:05 | 20:55 | 21:35 |
| 11 | 08:22 | 08:58 (WEA 11) | 07:41 | 08:20 (WEA 10) | 06:42 | 06:31 | 05:30 | 04:57 |
| | 16:27 | 22 09:20 (WEA 11) | 17:22 | 25 08:45 (WEA 10) | 18:13 | 20:06 | 20:57 | 21:36 |
| 12 | 08:22 | 08:58 (WEA 11) | 07:40 | 08:20 (WEA 10) | 06:40 | 06:29 | 05:29 | 04:56 |
| | 16:29 | 22 09:20 (WEA 11) | 17:23 | 25 08:45 (WEA 10) | 18:15 | 20:08 | 20:59 | 21:37 |
| 13 | 08:21 | 08:58 (WEA 11) | 07:38 | 08:20 (WEA 10) | 06:38 | 06:27 | 05:27 | 04:56 |
| | 16:30 | 22 09:20 (WEA 11) | 17:25 | 25 08:45 (WEA 10) | 18:16 | 20:10 | 21:00 | 21:37 |
| 14 | 08:20 | 08:58 (WEA 11) | 07:36 | 08:20 (WEA 10) | 06:36 | 06:24 | 05:26 | 04:56 |
| | 16:32 | 23 09:21 (WEA 11) | 17:27 | 24 08:44 (WEA 10) | 18:18 | 20:12 | 21:02 | 21:38 |
| 15 | 08:19 | 08:58 (WEA 11) | 07:34 | 08:21 (WEA 10) | 06:33 | 06:22 | 05:24 | 04:56 |
| | 16:33 | 23 09:21 (WEA 11) | 17:29 | 23 08:44 (WEA 10) | 18:20 | 20:13 | 21:03 | 21:39 |
| 16 | 08:18 | 08:59 (WEA 11) | 07:32 | 08:21 (WEA 10) | 06:31 | 06:20 | 05:22 | 04:56 |
| | 16:35 | 23 09:22 (WEA 11) | 17:31 | 21 08:42 (WEA 10) | 18:22 | 20:15 | 21:05 | 21:39 |
| 17 | 08:17 | 08:59 (WEA 11) | 07:30 | 08:22 (WEA 10) | 06:29 | 06:18 | 05:21 | 04:56 |
| | 16:37 | 23 09:22 (WEA 11) | 17:33 | 19 08:41 (WEA 10) | 18:23 | 20:17 | 21:06 | 21:40 |
| 18 | 08:17 | 09:00 (WEA 11) | 07:28 | 08:23 (WEA 10) | 06:26 | 06:16 | 05:19 | 04:56 |
| | 16:38 | 23 09:23 (WEA 11) | 17:35 | 17 08:40 (WEA 10) | 18:25 | 20:18 | 21:08 | 21:40 |
| 19 | 08:15 | 09:00 (WEA 11) | 07:26 | 08:26 (WEA 10) | 06:24 | 06:13 | 05:18 | 04:56 |
| | 16:40 | 23 09:23 (WEA 11) | 17:36 | 11 08:37 (WEA 10) | 18:27 | 20:20 | 21:09 | 21:40 |
| 20 | 08:14 | 09:01 (WEA 11) | 07:24 | 06:22 | 06:11 | 05:17 | 04:56 | 04:56 |
| | 16:41 | 22 09:23 (WEA 11) | 17:38 | 18:29 | 20:22 | 21:11 | 21:41 | 21:41 |
| 21 | 08:13 | 09:01 (WEA 11) | 07:22 | 06:19 | 06:09 | 05:15 | 04:56 | 04:56 |
| | 16:43 | 22 09:23 (WEA 11) | 17:40 | 18:30 | 20:24 | 21:12 | 21:41 | 21:41 |
| 22 | 08:12 | 09:02 (WEA 11) | 07:20 | 06:17 | 06:07 | 05:14 | 04:56 | 04:56 |
| | 16:45 | 21 09:23 (WEA 11) | 17:42 | 18:32 | 20:25 | 21:14 | 21:41 | 21:41 |
| 23 | 08:11 | 09:03 (WEA 11) | 07:18 | 06:15 | 06:05 | 05:13 | 04:56 | 04:56 |
| | 16:47 | 20 09:23 (WEA 11) | 17:44 | 18:34 | 20:27 | 21:15 | 21:41 | 21:41 |
| 24 | 08:10 | 09:03 (WEA 11) | 07:16 | 06:12 | 06:03 | 05:11 | 04:56 | 04:56 |
| | 16:48 | 19 09:22 (WEA 11) | 17:46 | 18:35 | 20:29 | 21:17 | 21:41 | 21:41 |
| 25 | 08:09 | 09:05 (WEA 11) | 07:13 | 06:10 | 06:01 | 05:10 | 04:57 | 04:57 |
| | 16:50 | 17 09:22 (WEA 11) | 17:48 | 18:37 | 20:30 | 21:18 | 21:42 | 21:42 |
| 26 | 08:07 | 09:06 (WEA 11) | 07:11 | 06:08 | 05:59 | 05:09 | 04:57 | 04:57 |
| | 16:52 | 14 09:20 (WEA 11) | 17:49 | 18:39 | 20:32 | 21:19 | 21:42 | 21:42 |
| 27 | 08:06 | 09:08 (WEA 11) | 07:09 | 06:05 | 05:57 | 05:08 | 04:58 | 04:58 |
| | 16:54 | 11 09:19 (WEA 11) | 17:51 | 18:41 | 20:34 | 21:21 | 21:41 | 21:41 |
| 28 | 08:04 | 09:11 (WEA 11) | 07:07 | 06:03 | 05:55 | 05:07 | 04:58 | 04:58 |
| | 16:56 | 5 09:16 (WEA 11) | 17:53 | 18:42 | 20:35 | 21:22 | 21:41 | 21:41 |
| 29 | 08:03 | | | 07:01 | 05:53 | 05:06 | 04:59 | 04:59 |
| | 16:57 | | | 19:44 | 20:37 | 21:23 | 21:41 | 21:41 |
| 30 | 08:02 | | | 06:58 | 05:51 | 05:05 | 04:59 | 04:59 |
| | 16:59 | | | 19:46 | 20:39 | 21:24 | 21:41 | 21:41 |
| 31 | 08:00 | | | 06:56 | 05:54 | 05:04 | 04:59 | 04:59 |
| | 17:01 | | | 19:47 | 20:39 | 21:26 | 21:41 | 21:41 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | | |
| astr.max.mögl.Beschattung | 532 | 370 | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | | | | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | | | | | | |
| Reduktion Windrichtung | 0,56 | 0,62 | | | | | | |
| Gesamte Reduktion | 0,10 | 0,15 | | | | | | |
| Met.wahrsch.Beschattung | 53 | 54 | | | | | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d25 - Söllingen, Hauptstraße 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:08 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:16 16:05 |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 07:58 18:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:59 18:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 08:01 18:00 | 07:56 16:12 | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 08:03 17:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 08:05 17:56 | 07:59 16:11 | 08:26 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 08:07 17:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:16 18:57 | 08:09 17:52 | 08:02 16:10 | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | | 205 | 512 | 370 |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | | 0,62 | 0,58 | 0,56 |
| Gesamte Reduktion | | | | 0,18 | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | | 37 | 60 | 27 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d28 - Söllingen, Hauptstraße 12

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|-------|-------------------|-------|-------------------|-------|-------|-------|-------|--|------|--|
| 1 | 08:26 | | 07:59 | 08:53 (WEA 11) | 07:05 | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | | 17:03 | 19 09:12 (WEA 11) | 17:55 | 19:49 | 20:41 | 21:27 | | | |
| 2 | 08:26 | | 07:57 | 08:54 (WEA 11) | 07:03 | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | | 17:05 | 16 09:10 (WEA 11) | 17:57 | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | | 07:55 | 08:55 (WEA 11) | 07:00 | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | | 17:07 | 14 09:09 (WEA 11) | 17:58 | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | | 07:54 | 08:59 (WEA 11) | 06:58 | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | | 17:08 | 8 09:07 (WEA 11) | 18:00 | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | | 07:52 | | 06:56 | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | | 17:10 | | 18:02 | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | | 07:50 | | 06:54 | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | | 17:12 | | 18:04 | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | | 07:49 | | 06:52 | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | | 17:14 | | 18:06 | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | | 07:47 | | 06:49 | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | | 17:16 | | 18:07 | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | | 07:45 | | 06:47 | 06:36 | 05:34 | 04:58 | | | |
| | 16:24 | | 17:18 | | 18:09 | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | | 07:43 | 08:13 (WEA 10) | 06:45 | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | | 17:20 | 5 08:18 (WEA 10) | 18:11 | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | | 07:41 | 08:10 (WEA 10) | 06:42 | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | | 17:22 | 13 08:23 (WEA 10) | 18:13 | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 08:53 (WEA 11) | 07:40 | 08:08 (WEA 10) | 06:40 | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 7 09:00 (WEA 11) | 17:23 | 17 08:25 (WEA 10) | 18:15 | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 08:51 (WEA 11) | 07:38 | 08:07 (WEA 10) | 06:38 | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 11 09:02 (WEA 11) | 17:25 | 19 08:26 (WEA 10) | 18:16 | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 08:50 (WEA 11) | 07:36 | 08:06 (WEA 10) | 06:36 | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 14 09:04 (WEA 11) | 17:27 | 21 08:27 (WEA 10) | 18:18 | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 08:50 (WEA 11) | 07:34 | 08:04 (WEA 10) | 06:33 | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 15 09:05 (WEA 11) | 17:29 | 23 08:27 (WEA 10) | 18:20 | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 08:49 (WEA 11) | 07:32 | 08:03 (WEA 10) | 06:31 | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 17 09:06 (WEA 11) | 17:31 | 25 08:28 (WEA 10) | 18:22 | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | 08:49 (WEA 11) | 07:30 | 08:03 (WEA 10) | 06:29 | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 19 09:08 (WEA 11) | 17:33 | 25 08:28 (WEA 10) | 18:23 | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | 08:49 (WEA 11) | 07:28 | 08:03 (WEA 10) | 06:26 | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 20 09:09 (WEA 11) | 17:35 | 26 08:29 (WEA 10) | 18:25 | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | 08:49 (WEA 11) | 07:26 | 08:02 (WEA 10) | 06:24 | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 21 09:10 (WEA 11) | 17:36 | 27 08:29 (WEA 10) | 18:27 | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | 08:49 (WEA 11) | 07:24 | 08:03 (WEA 10) | 06:22 | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | 22 09:11 (WEA 11) | 17:38 | 26 08:29 (WEA 10) | 18:29 | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | 08:48 (WEA 11) | 07:22 | 08:03 (WEA 10) | 06:19 | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | 23 09:11 (WEA 11) | 17:40 | 26 08:29 (WEA 10) | 18:30 | 20:24 | 21:12 | 21:41 | | | |
| 22 | 08:12 | 08:48 (WEA 11) | 07:20 | 08:03 (WEA 10) | 06:17 | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | 24 09:12 (WEA 11) | 17:42 | 25 08:28 (WEA 10) | 18:32 | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | 08:49 (WEA 11) | 07:18 | 08:04 (WEA 10) | 06:15 | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 23 09:12 (WEA 11) | 17:44 | 24 08:28 (WEA 10) | 18:34 | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | 08:48 (WEA 11) | 07:16 | 08:04 (WEA 10) | 06:12 | 06:03 | 05:11 | 04:56 | | | |
| | 16:48 | 24 09:12 (WEA 11) | 17:46 | 22 08:26 (WEA 10) | 18:35 | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | 08:49 (WEA 11) | 07:13 | 08:05 (WEA 10) | 06:10 | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | 24 09:13 (WEA 11) | 17:48 | 20 08:25 (WEA 10) | 18:37 | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | 08:48 (WEA 11) | 07:11 | 08:06 (WEA 10) | 06:08 | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | 25 09:13 (WEA 11) | 17:49 | 18 08:24 (WEA 10) | 18:39 | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | 08:49 (WEA 11) | 07:09 | 08:09 (WEA 10) | 06:05 | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | 24 09:13 (WEA 11) | 17:51 | 13 08:22 (WEA 10) | 18:41 | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | 08:49 (WEA 11) | 07:07 | 08:13 (WEA 10) | 06:03 | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | 24 09:13 (WEA 11) | 17:53 | 4 08:17 (WEA 10) | 18:42 | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | 08:50 (WEA 11) | | | 07:01 | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | 23 09:13 (WEA 11) | | | 19:44 | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | 08:51 (WEA 11) | | | 06:58 | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | 22 09:13 (WEA 11) | | | 19:46 | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | 08:52 (WEA 11) | | | 06:56 | | 05:04 | | | | |
| | 17:01 | 21 09:13 (WEA 11) | | | 19:47 | | 21:26 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 403 | | 436 | | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | | | | | | | |
| Reduktion Windrichtung | 0,58 | | 0,62 | | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | | | | | | | |
| Met.wahrsch.Beschattung | 41 | | 65 | | | | | | | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d28 - Söllingen, Hauptstraße 12

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:08 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:16 16:05 |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 07:58 18:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:59 18:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 18:00 | 07:56 16:12 | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 17:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 17:56 | 07:59 16:11 | 08:26 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 17:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:08 18:52 | 07:08 17:52 | 08:01 16:09 | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | | 383 | 460 | |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | |
| Reduktion Windrichtung | | | | 0,63 | 0,58 | |
| Gesamte Reduktion | | | | 0,19 | 0,12 | |
| Met.wahrsch.Beschattung | | | | 71 | 54 | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d32 - Söllingen, Hauptstraße 24

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------------|----------------------------------|----------------------------------|----------------|----------------------------------|----------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 08:56 (WEA 12) 09:11 (WEA 12) | 07:05 17:55 | 06:54 19:49 | 05:49 20:41 |
| 2 | 08:26 16:16 | 07:57 17:05 | 08:58 (WEA 12) 09:09 (WEA 12) | 07:03 17:57 | 06:52 19:51 | 05:47 20:42 |
| 3 | 08:25 16:17 | 07:55 17:07 | 09:02 (WEA 12) 09:05 (WEA 12) | 07:00 17:58 | 06:49 19:53 | 05:45 20:44 |
| 4 | 08:25 16:18 | 07:54 17:08 | 09:05 (WEA 12) | 06:58 18:00 | 06:47 19:54 | 05:43 20:46 |
| 5 | 08:25 16:19 | 07:52 17:10 | | 06:56 18:02 | 06:45 19:56 | 05:41 20:47 |
| 6 | 08:25 16:21 | 07:50 17:12 | | 06:54 18:04 | 06:42 19:58 | 05:39 20:49 |
| 7 | 08:24 16:22 | 07:49 17:14 | | 06:52 18:06 | 06:40 20:00 | 05:37 20:51 |
| 8 | 08:24 16:23 | 07:47 17:16 | | 06:49 18:07 | 06:38 20:01 | 05:36 20:52 |
| 9 | 08:23 16:25 | 08:54 (WEA 12) 09:01 (WEA 12) | 07:45 17:18 | 06:47 18:09 | 07:12 (WEA 10) 07:21 (WEA 10) | 06:36 20:03 |
| 10 | 08:23 16:26 | 08:53 (WEA 12) 09:03 (WEA 12) | 07:43 17:20 | 06:45 18:11 | 07:09 (WEA 10) 07:24 (WEA 10) | 06:33 20:05 |
| 11 | 08:22 16:27 | 08:52 (WEA 12) 09:04 (WEA 12) | 07:41 17:22 | 06:42 18:13 | 07:06 (WEA 10) 07:25 (WEA 10) | 06:31 20:06 |
| 12 | 08:21 16:29 | 08:51 (WEA 12) 09:05 (WEA 12) | 07:40 17:23 | 06:40 18:15 | 07:05 (WEA 10) 07:26 (WEA 10) | 06:29 20:08 |
| 13 | 08:21 16:30 | 08:50 (WEA 12) 09:06 (WEA 12) | 07:38 17:25 | 06:38 18:16 | 07:04 (WEA 10) 07:27 (WEA 10) | 06:27 20:10 |
| 14 | 08:20 16:32 | 08:49 (WEA 12) 09:07 (WEA 12) | 07:36 17:27 | 06:36 18:18 | 07:02 (WEA 10) 07:27 (WEA 10) | 06:24 20:12 |
| 15 | 08:19 16:33 | 08:49 (WEA 12) 09:08 (WEA 12) | 07:34 17:29 | 06:33 18:20 | 07:02 (WEA 10) 07:28 (WEA 10) | 06:22 20:13 |
| 16 | 08:18 16:35 | 08:49 (WEA 12) 09:09 (WEA 12) | 07:32 17:31 | 06:31 18:22 | 07:02 (WEA 10) 07:28 (WEA 10) | 06:20 20:15 |
| 17 | 08:17 16:37 | 08:49 (WEA 12) 09:10 (WEA 12) | 07:30 17:33 | 06:29 18:23 | 07:01 (WEA 10) 07:27 (WEA 10) | 06:18 20:17 |
| 18 | 08:16 16:38 | 08:49 (WEA 12) 09:11 (WEA 12) | 07:28 17:35 | 06:26 18:25 | 07:01 (WEA 10) 07:27 (WEA 10) | 06:16 20:18 |
| 19 | 08:15 16:40 | 08:49 (WEA 12) 09:12 (WEA 12) | 07:26 17:36 | 06:24 18:27 | 07:01 (WEA 10) 07:27 (WEA 10) | 06:13 20:20 |
| 20 | 08:14 16:41 | 08:49 (WEA 12) 09:13 (WEA 12) | 07:24 17:38 | 06:22 18:29 | 07:01 (WEA 10) 07:25 (WEA 10) | 06:11 20:22 |
| 21 | 08:13 16:43 | 08:49 (WEA 12) 09:14 (WEA 12) | 07:22 17:40 | 06:19 18:30 | 07:02 (WEA 10) 07:24 (WEA 10) | 06:09 20:24 |
| 22 | 08:12 16:45 | 08:49 (WEA 12) 09:13 (WEA 12) | 07:20 17:42 | 06:17 18:32 | 07:03 (WEA 10) 07:23 (WEA 10) | 06:07 20:25 |
| 23 | 08:11 16:47 | 08:50 (WEA 12) 09:14 (WEA 12) | 07:18 17:44 | 06:15 18:34 | 07:03 (WEA 10) 07:21 (WEA 10) | 06:05 20:27 |
| 24 | 08:10 16:48 | 08:49 (WEA 12) 09:14 (WEA 12) | 07:16 17:46 | 06:12 18:35 | 07:05 (WEA 10) 07:19 (WEA 10) | 06:03 20:29 |
| 25 | 08:09 16:50 | 08:50 (WEA 12) 09:14 (WEA 12) | 07:13 17:48 | 06:10 18:37 | 07:09 (WEA 10) 07:15 (WEA 10) | 06:01 20:30 |
| 26 | 08:07 16:52 | 08:50 (WEA 12) 09:14 (WEA 12) | 07:11 17:49 | 06:08 18:39 | 05:59 20:32 | 05:09 21:19 |
| 27 | 08:06 16:54 | 08:51 (WEA 12) 09:14 (WEA 12) | 07:09 17:51 | 06:05 18:41 | 05:57 20:34 | 05:08 21:21 |
| 28 | 08:04 16:56 | 08:51 (WEA 12) 09:14 (WEA 12) | 07:07 17:53 | 06:03 18:42 | 05:55 20:35 | 05:07 21:22 |
| 29 | 08:03 16:57 | 08:53 (WEA 12) 09:14 (WEA 12) | 07:05 17:54 | 06:01 19:44 | 05:53 20:37 | 05:06 21:23 |
| 30 | 08:02 16:59 | 08:53 (WEA 12) 09:13 (WEA 12) | 07:03 17:55 | 06:58 19:46 | 05:51 20:39 | 05:05 21:24 |
| 31 | 08:00 17:01 | 08:55 (WEA 12) 09:13 (WEA 12) | 07:01 17:56 | 06:56 19:47 | 05:49 20:39 | 05:04 21:25 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 456 | 380 | 346 | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | | | |
| Reduktion Windrichtung | 0,58 | 0,63 | 0,67 | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | | | |
| Met.wahrsch.Beschattung | 46 | 56 | 64 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d32 - Söllingen, Hauptstraße 24

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | |
|---------------------------|-------|--------|-----------|---------|-------------------|----------|-------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:43 (WEA 10) | 07:10 | 08:02 | 08:34 (WEA 12) |
| | 21:41 | 21:09 | 20:06 | 18:56 | 23 08:06 (WEA 10) | 16:50 | 16:09 | 12 08:46 (WEA 12) |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:44 (WEA 10) | 07:12 | 08:03 | 08:36 (WEA 12) |
| | 21:40 | 21:07 | 20:04 | 18:54 | 21 08:05 (WEA 10) | 16:48 | 16:09 | 10 08:46 (WEA 12) |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 07:46 (WEA 10) | 07:14 | 08:04 | 08:37 (WEA 12) |
| | 21:40 | 21:05 | 20:02 | 18:52 | 17 08:03 (WEA 10) | 16:46 | 16:08 | 7 08:44 (WEA 12) |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:48 (WEA 10) | 07:16 | 08:06 | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 13 08:01 (WEA 10) | 16:44 | 16:07 | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | | 07:18 | 08:07 | |
| | 21:39 | 21:02 | 19:57 | 18:47 | | 16:43 | 16:07 | |
| 6 | 05:04 | 05:45 | 06:35 | 07:25 | | 07:19 | 08:08 | |
| | 21:39 | 21:00 | 19:55 | 18:45 | | 16:41 | 16:06 | |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | | 07:21 | 08:10 | |
| | 21:38 | 20:58 | 19:53 | 18:43 | | 16:39 | 16:06 | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | | 07:23 | 08:11 | |
| | 21:37 | 20:56 | 19:50 | 18:40 | | 16:37 | 5 08:37 (WEA 12) | 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | | 07:25 | 08:29 (WEA 12) | 08:12 |
| | 21:37 | 20:54 | 19:48 | 18:38 | | 16:36 | 11 08:40 (WEA 12) | 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | | 07:27 | 08:27 (WEA 12) | 08:13 |
| | 21:36 | 20:53 | 19:46 | 18:36 | | 16:34 | 15 08:42 (WEA 12) | 16:05 |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | | 07:28 | 08:26 (WEA 12) | 08:14 |
| | 21:35 | 20:51 | 19:43 | 18:34 | | 16:33 | 18 08:44 (WEA 12) | 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | | 07:30 | 08:25 (WEA 12) | 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | | 16:31 | 20 08:45 (WEA 12) | 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | | 07:32 | 08:25 (WEA 12) | 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | | 16:30 | 21 08:46 (WEA 12) | 16:05 |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | | 07:34 | 08:24 (WEA 12) | 08:17 |
| | 21:33 | 20:45 | 19:36 | 18:27 | 11 08:37 (WEA 11) | 16:28 | 22 08:46 (WEA 12) | 16:05 |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | | 07:35 | 08:24 (WEA 12) | 08:18 |
| | 21:32 | 20:43 | 19:34 | 18:25 | 15 08:50 (WEA 11) | 16:27 | 23 08:47 (WEA 12) | 16:05 |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | | 07:37 | 08:24 (WEA 12) | 08:19 |
| | 21:31 | 20:41 | 19:32 | 18:23 | 19 08:52 (WEA 11) | 16:25 | 24 08:48 (WEA 12) | 16:05 |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | | 07:39 | 08:23 (WEA 12) | 08:20 |
| | 21:29 | 20:39 | 19:29 | 18:20 | 21 08:53 (WEA 11) | 16:24 | 24 08:47 (WEA 12) | 16:05 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | | 07:41 | 08:23 (WEA 12) | 08:21 |
| | 21:28 | 20:37 | 19:27 | 18:18 | 23 08:54 (WEA 11) | 16:22 | 25 08:48 (WEA 12) | 16:05 |
| 19 | 05:18 | 06:06 | 06:56 | 07:47 | | 07:42 | 08:24 (WEA 12) | 08:21 |
| | 21:27 | 20:35 | 19:24 | 18:16 | 24 08:53 (WEA 11) | 16:21 | 24 08:48 (WEA 12) | 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | | 07:44 | 08:24 (WEA 12) | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18:14 | 25 08:54 (WEA 11) | 16:20 | 24 08:48 (WEA 12) | 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | | 07:46 | 08:25 (WEA 12) | 08:23 |
| | 21:25 | 20:30 | 19:20 | 18:12 | 25 08:54 (WEA 11) | 16:19 | 24 08:49 (WEA 12) | 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | | 07:47 | 08:25 (WEA 12) | 08:23 |
| | 21:23 | 20:28 | 19:17 | 18:10 | 25 08:54 (WEA 11) | 16:18 | 24 08:49 (WEA 12) | 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | | 07:49 | 08:26 (WEA 12) | 08:24 |
| | 21:22 | 20:26 | 19:15 | 18:08 | 25 08:54 (WEA 11) | 16:16 | 23 08:49 (WEA 12) | 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | | 07:51 | 08:26 (WEA 12) | 08:24 |
| | 21:21 | 20:24 | 19:13 | 18:06 | 25 08:54 (WEA 11) | 16:15 | 22 08:48 (WEA 12) | 16:08 |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 | | 07:52 | 08:27 (WEA 12) | 08:25 |
| | 21:19 | 20:22 | 19:10 | 17:04 | 24 07:53 (WEA 11) | 16:14 | 21 08:48 (WEA 12) | 16:09 |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | | 07:54 | 08:28 (WEA 12) | 08:25 |
| | 21:18 | 20:20 | 19:08 | 17:02 | 22 07:52 (WEA 11) | 16:13 | 20 08:48 (WEA 12) | 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | 07:59 | | 07:56 | 08:29 (WEA 12) | 08:25 |
| | 21:16 | 20:17 | 19:06 | 17:00 | 21 07:52 (WEA 11) | 16:12 | 19 08:48 (WEA 12) | 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | 07:59 | | 07:57 | 08:29 (WEA 12) | 08:25 |
| | 21:15 | 20:15 | 19:03 | 16:58 | 18 07:49 (WEA 11) | 16:12 | 18 08:47 (WEA 12) | 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | 07:59 | | 07:59 | 08:31 (WEA 12) | 08:25 |
| | 21:13 | 20:13 | 19:01 | 16:56 | 15 07:48 (WEA 11) | 16:11 | 16 08:47 (WEA 12) | 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | 07:59 | | 08:00 | 08:32 (WEA 12) | 08:26 |
| | 21:12 | 20:11 | 18:59 | 16:54 | 11 07:35 (WEA 11) | 16:10 | 14 08:46 (WEA 12) | 16:13 |
| 31 | 05:35 | 06:25 | | 07:08 | | | | 08:26 |
| | 21:10 | 20:08 | | 16:52 | | | | 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | | 266 | | 243 |
| astr.max.mögl.Beschattung | | | 277 | 423 | | 457 | | 29 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | | 0,21 | | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | | 0,96 | | 0,96 |
| Reduktion Windrichtung | | | 0,67 | 0,64 | | 0,58 | | 0,58 |
| Gesamte Reduktion | | | 0,24 | 0,19 | | 0,12 | | 0,08 |
| Met.wahrsch.Beschattung | | | 65 | 79 | | 53 | | 2 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d35 - Söllingen, Hauptstraße 30

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|------------------------|------------------------|------------------------|------------------------|-------|
| 1 | 08:26 | 09:46 (WEA 13) 07:59 | 08:41 (WEA 12) 07:05 | 07:42 (WEA 11) 06:54 | 07:42 (WEA 10) 05:49 | 05:03 |
| | 16:15 | 09:57 (WEA 13) 17:03 | 09:07 (WEA 12) 17:55 | 08:09 (WEA 11) 19:49 | 08:02 (WEA 10) 20:40 | 21:27 |
| 2 | 08:26 | 09:47 (WEA 13) 07:57 | 08:41 (WEA 12) 07:03 | 07:43 (WEA 11) 06:52 | 07:44 (WEA 10) 05:47 | 05:02 |
| | 16:16 | 09:57 (WEA 13) 17:05 | 09:06 (WEA 12) 17:57 | 08:09 (WEA 11) 19:51 | 08:00 (WEA 10) 20:42 | 21:28 |
| 3 | 08:25 | 09:49 (WEA 13) 07:55 | 08:41 (WEA 12) 07:00 | 07:43 (WEA 11) 06:49 | 07:47 (WEA 10) 05:45 | 05:01 |
| | 16:17 | 09:56 (WEA 13) 17:07 | 09:06 (WEA 12) 17:58 | 08:08 (WEA 11) 19:53 | 07:57 (WEA 10) 20:44 | 21:29 |
| 4 | 08:25 | 09:52 (WEA 13) 07:54 | 08:43 (WEA 12) 06:58 | 07:44 (WEA 11) 06:47 | | 05:43 |
| | 16:18 | 09:54 (WEA 13) 17:08 | 09:06 (WEA 12) 18:00 | 08:07 (WEA 11) 19:54 | | 20:46 |
| 5 | 08:25 | | 07:52 | 08:43 (WEA 12) 06:56 | 07:44 (WEA 11) 06:45 | 05:41 |
| | 16:19 | | 17:10 | 09:05 (WEA 12) 18:02 | 08:05 (WEA 11) 19:56 | 20:47 |
| 6 | 08:25 | | 07:50 | 08:44 (WEA 12) 06:54 | 07:46 (WEA 11) 06:42 | 05:39 |
| | 16:21 | | 17:12 | 09:04 (WEA 12) 18:04 | 08:04 (WEA 11) 19:58 | 20:49 |
| 7 | 08:24 | | 07:49 | 08:45 (WEA 12) 06:52 | 07:48 (WEA 11) 06:40 | 05:37 |
| | 16:22 | | 17:14 | 09:03 (WEA 12) 18:06 | 08:02 (WEA 11) 20:00 | 20:51 |
| 8 | 08:24 | | 07:47 | 08:47 (WEA 12) 06:49 | 07:51 (WEA 11) 06:38 | 05:36 |
| | 16:23 | | 17:16 | 09:01 (WEA 12) 18:07 | 07:57 (WEA 11) 20:01 | 20:52 |
| 9 | 08:23 | | 07:45 | 08:49 (WEA 12) 06:47 | | 06:36 |
| | 16:25 | | 17:18 | 08:59 (WEA 12) 18:09 | | 20:03 |
| 10 | 08:23 | | 07:43 | | 06:45 | 06:33 |
| | 16:26 | | 17:20 | | 18:11 | 20:05 |
| 11 | 08:22 | | 07:41 | | 06:42 | 06:31 |
| | 16:27 | | 17:22 | | 18:13 | 20:06 |
| 12 | 08:21 | | 07:40 | | 06:40 | 06:29 |
| | 16:29 | | 17:23 | | 18:15 | 20:08 |
| 13 | 08:21 | | 07:38 | | 06:38 | 06:27 |
| | 16:30 | | 17:25 | | 18:16 | 20:10 |
| 14 | 08:20 | | 07:36 | | 06:36 | 06:24 |
| | 16:32 | | 17:27 | | 18:18 | 20:12 |
| 15 | 08:19 | | 07:34 | | 06:33 | 06:22 |
| | 16:33 | | 17:29 | | 18:20 | 20:13 |
| 16 | 08:18 | | 07:32 | | 06:31 | 06:20 |
| | 16:35 | | 17:31 | | 18:22 | 20:15 |
| 17 | 08:17 | | 07:30 | | 06:29 | 06:18 |
| | 16:37 | | 17:33 | | 18:23 | 20:17 |
| 18 | 08:16 | 08:47 (WEA 12) 07:28 | | 06:26 | 06:51 (WEA 10) 06:16 | 06:16 |
| | 16:38 | 08:54 (WEA 12) 17:35 | | 18:25 | 07:03 (WEA 10) 20:18 | 21:08 |
| 19 | 08:15 | 08:45 (WEA 12) 07:26 | 07:53 (WEA 11) 06:24 | 06:48 (WEA 10) 06:13 | | 05:18 |
| | 16:40 | 08:56 (WEA 12) 17:36 | 08:01 (WEA 11) 18:27 | 07:05 (WEA 10) 20:20 | | 21:09 |
| 20 | 08:14 | 08:44 (WEA 12) 07:24 | 07:50 (WEA 11) 06:22 | 06:46 (WEA 10) 06:11 | | 05:17 |
| | 16:42 | 08:59 (WEA 12) 17:38 | 08:04 (WEA 11) 18:29 | 07:06 (WEA 10) 20:22 | | 21:11 |
| 21 | 08:13 | 08:42 (WEA 12) 07:22 | 07:48 (WEA 11) 06:19 | 06:45 (WEA 10) 06:09 | | 05:15 |
| | 16:43 | 08:59 (WEA 12) 17:40 | 08:06 (WEA 11) 18:30 | 07:07 (WEA 10) 20:23 | | 21:12 |
| 22 | 08:12 | 08:42 (WEA 12) 07:20 | 07:47 (WEA 11) 06:17 | 06:44 (WEA 10) 06:07 | | 05:14 |
| | 16:45 | 09:01 (WEA 12) 17:42 | 08:08 (WEA 11) 18:32 | 07:08 (WEA 10) 20:25 | | 21:14 |
| 23 | 08:11 | 08:42 (WEA 12) 07:18 | 07:46 (WEA 11) 06:15 | 06:42 (WEA 10) 06:05 | | 05:13 |
| | 16:47 | 09:02 (WEA 12) 17:44 | 08:09 (WEA 11) 18:34 | 07:08 (WEA 10) 20:27 | | 21:15 |
| 24 | 08:10 | 08:41 (WEA 12) 07:16 | 07:44 (WEA 11) 06:12 | 06:42 (WEA 10) 06:03 | | 05:11 |
| | 16:48 | 09:03 (WEA 12) 17:46 | 08:09 (WEA 11) 18:35 | 07:09 (WEA 10) 20:29 | | 21:17 |
| 25 | 08:09 | 08:41 (WEA 12) 07:13 | 07:43 (WEA 11) 06:10 | 06:41 (WEA 10) 06:01 | | 05:10 |
| | 16:50 | 09:04 (WEA 12) 17:48 | 08:09 (WEA 11) 18:37 | 07:09 (WEA 10) 20:30 | | 21:18 |
| 26 | 08:07 | 08:40 (WEA 12) 07:11 | 07:43 (WEA 11) 06:08 | 06:40 (WEA 10) 05:59 | | 05:09 |
| | 16:52 | 09:04 (WEA 12) 17:49 | 08:10 (WEA 11) 18:39 | 07:08 (WEA 10) 20:32 | | 21:19 |
| 27 | 08:06 | 08:40 (WEA 12) 07:09 | 07:43 (WEA 11) 06:05 | 06:40 (WEA 10) 05:57 | | 05:08 |
| | 16:54 | 09:05 (WEA 12) 17:51 | 08:10 (WEA 11) 18:41 | 07:08 (WEA 10) 20:34 | | 21:21 |
| 28 | 08:04 | 08:40 (WEA 12) 07:07 | 07:43 (WEA 11) 06:03 | 06:41 (WEA 10) 05:55 | | 05:07 |
| | 16:56 | 09:05 (WEA 12) 17:53 | 08:10 (WEA 11) 18:42 | 07:07 (WEA 10) 20:35 | | 21:22 |
| 29 | 08:03 | 08:40 (WEA 12) | | 07:01 | 07:40 (WEA 10) 05:53 | 05:06 |
| | 16:57 | 09:06 (WEA 12) | | 19:44 | 08:06 (WEA 10) 20:37 | 21:23 |
| 30 | 08:02 | 08:40 (WEA 12) | | 06:58 | 07:41 (WEA 10) 05:51 | 05:05 |
| | 16:59 | 09:06 (WEA 12) | | 19:46 | 08:05 (WEA 10) 20:39 | 21:24 |
| 31 | 08:00 | 08:41 (WEA 12) | | 06:56 | 07:42 (WEA 10) | 05:04 |
| | 17:01 | 09:07 (WEA 12) | | 19:47 | 08:04 (WEA 10) | 21:25 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 316 | 399 | 490 | 46 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,59 | 0,62 | 0,67 | 0,69 | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | 0,24 | | |
| Met.wahrsch.Beschattung | 32 | 58 | 90 | 11 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d35 - Söllingen, Hauptstraße 30

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:09 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:45 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:53 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:30 | 08:16 16:05 |
| 14 | 05:12 21:32 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 05:14 21:30 | 06:01 20:41 | 06:51 19:32 | 07:42 18:23 | 07:37 16:25 | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:06 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 07:58 18:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:59 18:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 08:01 18:00 | 07:56 16:12 | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 08:03 17:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 08:05 17:56 | 07:59 16:11 | 08:25 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 08:07 17:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | | 08:08 17:52 | | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | 385 | 380 | 472 | 345 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,69 | 0,64 | 0,59 | 0,57 |
| Gesamte Reduktion | | | 0,24 | 0,19 | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | 93 | 71 | 56 | 25 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d37 - Söllingen, Hauptstraße 36

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | [Januar] | | [Februar] | | [März] | | [April] | | [Mai] | | [Juni] | |
|---------------------------|----------|------|----------------|-------|----------------|-------|----------------|----------------|----------------|-------|----------------|-------|
| 1 | 08:26 | | 09:40 (WEA 13) | 07:59 | 08:34 (WEA 12) | 07:05 | 07:32 (WEA 11) | 06:54 | 07:21 (WEA 10) | 05:49 | 05:03 | |
| | 16:15 | 24 | 10:04 (WEA 13) | 17:03 | 09:00 (WEA 12) | 17:55 | 21 | 07:53 (WEA 11) | 19:49 | 26 | 07:47 (WEA 10) | 20:40 |
| 2 | 08:26 | | 09:41 (WEA 13) | 07:57 | 08:33 (WEA 12) | 07:03 | | 07:31 (WEA 11) | 06:52 | | 07:20 (WEA 10) | 05:47 |
| | 16:16 | 23 | 10:04 (WEA 13) | 17:05 | 09:00 (WEA 12) | 17:57 | 23 | 07:54 (WEA 11) | 19:51 | 28 | 07:48 (WEA 10) | 20:42 |
| 3 | 08:25 | | 09:42 (WEA 13) | 07:55 | 08:33 (WEA 12) | 07:00 | | 07:30 (WEA 11) | 06:49 | | 07:20 (WEA 10) | 05:45 |
| | 16:17 | 23 | 10:05 (WEA 13) | 17:07 | 09:01 (WEA 12) | 17:58 | 25 | 07:55 (WEA 11) | 19:53 | 28 | 07:48 (WEA 10) | 20:44 |
| 4 | 08:25 | | 09:42 (WEA 13) | 07:54 | 08:33 (WEA 12) | 06:58 | | 07:29 (WEA 11) | 06:47 | | 07:19 (WEA 10) | 05:43 |
| | 16:18 | 22 | 10:04 (WEA 13) | 17:08 | 09:02 (WEA 12) | 18:00 | 27 | 07:56 (WEA 11) | 19:54 | 29 | 07:48 (WEA 10) | 20:46 |
| 5 | 08:25 | | 09:43 (WEA 13) | 07:52 | 08:33 (WEA 12) | 06:56 | | 07:28 (WEA 11) | 06:45 | | 07:18 (WEA 10) | 05:41 |
| | 16:19 | 22 | 10:05 (WEA 13) | 17:10 | 09:02 (WEA 12) | 18:02 | 28 | 07:56 (WEA 11) | 19:56 | 30 | 07:48 (WEA 10) | 20:47 |
| 6 | 08:25 | | 09:44 (WEA 13) | 07:50 | 08:33 (WEA 12) | 06:54 | | 07:27 (WEA 11) | 06:42 | | 07:18 (WEA 10) | 05:39 |
| | 16:21 | 20 | 10:04 (WEA 13) | 17:12 | 09:02 (WEA 12) | 18:04 | 29 | 07:56 (WEA 11) | 19:58 | 30 | 07:48 (WEA 10) | 20:49 |
| 7 | 08:24 | | 09:45 (WEA 13) | 07:49 | 08:33 (WEA 12) | 06:52 | | 07:27 (WEA 11) | 06:40 | | 07:18 (WEA 10) | 05:37 |
| | 16:22 | 19 | 10:04 (WEA 13) | 17:14 | 09:02 (WEA 12) | 18:06 | 30 | 07:57 (WEA 11) | 20:00 | 29 | 07:47 (WEA 10) | 20:50 |
| 8 | 08:24 | | 09:46 (WEA 13) | 07:47 | 08:33 (WEA 12) | 06:49 | | 07:26 (WEA 11) | 06:38 | | 07:18 (WEA 10) | 05:36 |
| | 16:23 | 18 | 10:04 (WEA 13) | 17:16 | 09:01 (WEA 12) | 18:07 | 30 | 07:56 (WEA 11) | 20:01 | 29 | 07:47 (WEA 10) | 20:52 |
| 9 | 08:23 | | 09:47 (WEA 13) | 07:45 | 08:33 (WEA 12) | 06:47 | | 07:26 (WEA 11) | 06:36 | | 07:17 (WEA 10) | 05:34 |
| | 16:25 | 16 | 10:03 (WEA 13) | 17:18 | 09:01 (WEA 12) | 18:09 | 30 | 07:56 (WEA 11) | 20:03 | 29 | 07:46 (WEA 10) | 20:54 |
| 10 | 08:23 | | 09:49 (WEA 13) | 07:43 | 08:34 (WEA 12) | 06:45 | | 07:27 (WEA 11) | 06:33 | | 07:18 (WEA 10) | 05:32 |
| | 16:26 | 14 | 10:03 (WEA 13) | 17:20 | 09:00 (WEA 12) | 18:11 | 28 | 07:55 (WEA 11) | 20:05 | 27 | 07:45 (WEA 10) | 20:55 |
| 11 | 08:22 | | 09:51 (WEA 13) | 07:41 | 08:35 (WEA 12) | 06:42 | | 07:26 (WEA 11) | 06:31 | | 07:19 (WEA 10) | 05:30 |
| | 16:27 | 10 | 10:01 (WEA 13) | 17:22 | 09:00 (WEA 12) | 18:13 | 28 | 07:54 (WEA 11) | 20:06 | 25 | 07:44 (WEA 10) | 20:57 |
| 12 | 08:21 | | 09:54 (WEA 13) | 07:40 | 08:36 (WEA 12) | 06:40 | | 07:27 (WEA 11) | 06:29 | | 07:20 (WEA 10) | 05:29 |
| | 16:29 | 5 | 09:59 (WEA 13) | 17:23 | 09:00 (WEA 12) | 18:15 | 26 | 07:53 (WEA 11) | 20:08 | 23 | 07:43 (WEA 10) | 20:59 |
| 13 | 08:21 | | | 07:38 | 08:38 (WEA 12) | 06:38 | | 07:28 (WEA 11) | 06:27 | | 07:20 (WEA 10) | 05:27 |
| | 16:30 | | | 17:25 | 08:59 (WEA 12) | 18:16 | 25 | 07:53 (WEA 11) | 20:10 | 20 | 07:40 (WEA 10) | 21:00 |
| 14 | 08:20 | | | 07:36 | 08:39 (WEA 12) | 06:36 | | 07:28 (WEA 11) | 06:24 | | 07:22 (WEA 10) | 05:26 |
| | 16:32 | | | 17:27 | 08:57 (WEA 12) | 18:18 | 22 | 07:50 (WEA 11) | 20:12 | 16 | 07:38 (WEA 10) | 21:02 |
| 15 | 08:19 | | | 07:34 | 07:58 (WEA 06) | 06:33 | | 07:30 (WEA 11) | 06:22 | | 07:24 (WEA 10) | 05:24 |
| | 16:33 | | | 17:29 | 08:54 (WEA 12) | 18:20 | 19 | 07:49 (WEA 11) | 20:13 | 11 | 07:35 (WEA 10) | 21:03 |
| 16 | 08:18 | | | 07:32 | 07:56 (WEA 06) | 06:31 | | 07:32 (WEA 11) | 06:20 | | | 05:22 |
| | 16:35 | | | 17:31 | 08:50 (WEA 12) | 18:22 | 15 | 07:47 (WEA 11) | 20:15 | | | 21:05 |
| 17 | 08:17 | | | 07:30 | 07:54 (WEA 06) | 06:29 | | 07:35 (WEA 11) | 06:18 | | | 05:21 |
| | 16:37 | | | 17:33 | 08:06 (WEA 06) | 18:23 | 7 | 07:42 (WEA 11) | 20:17 | | | 21:06 |
| 18 | 08:16 | | | 07:28 | 07:52 (WEA 06) | 06:26 | | | 06:16 | | | 05:19 |
| | 16:38 | | | 17:35 | 08:07 (WEA 06) | 18:25 | | | 20:18 | | | 21:08 |
| 19 | 08:15 | | | 07:26 | 07:50 (WEA 06) | 06:24 | | | 06:13 | | | 05:18 |
| | 16:40 | | | 17:36 | 08:08 (WEA 06) | 18:27 | | | 20:20 | | | 21:09 |
| 20 | 08:14 | | | 07:24 | 07:48 (WEA 06) | 06:22 | | | 06:11 | | | 05:17 |
| | 16:42 | | | 17:38 | 08:08 (WEA 06) | 18:29 | | | 20:22 | | | 21:11 |
| 21 | 08:13 | | | 07:22 | 07:48 (WEA 06) | 06:19 | | | 06:09 | | | 05:15 |
| | 16:43 | | | 17:40 | 08:09 (WEA 06) | 18:30 | | | 20:23 | | | 21:12 |
| 22 | 08:12 | | | 07:20 | 07:48 (WEA 06) | 06:17 | | | 06:07 | | | 05:14 |
| | 16:45 | | | 17:42 | 08:09 (WEA 06) | 18:32 | | | 20:25 | | | 21:14 |
| 23 | 08:11 | | | 07:18 | 07:48 (WEA 06) | 06:15 | | | 06:05 | | | 05:13 |
| | 16:47 | | | 17:44 | 08:09 (WEA 06) | 18:34 | | | 20:27 | | | 21:15 |
| 24 | 08:10 | | | 07:16 | 07:47 (WEA 06) | 06:12 | | | 06:03 | | | 05:11 |
| | 16:48 | | | 17:46 | 08:07 (WEA 06) | 18:35 | | | 20:29 | | | 21:17 |
| 25 | 08:08 | | 08:41 (WEA 12) | 07:13 | 07:48 (WEA 06) | 06:10 | | | 06:01 | | | 05:10 |
| | 16:50 | 9 | 08:50 (WEA 12) | 17:48 | 08:07 (WEA 06) | 18:37 | | | 20:30 | | | 21:18 |
| 26 | 08:07 | | 08:38 (WEA 12) | 07:11 | 07:49 (WEA 06) | 06:08 | | | 05:59 | | | 05:09 |
| | 16:52 | 14 | 08:52 (WEA 12) | 17:49 | 08:06 (WEA 06) | 18:39 | | | 20:32 | | | 21:19 |
| 27 | 08:06 | | 08:37 (WEA 12) | 07:09 | 07:38 (WEA 11) | 06:05 | | | 05:57 | | | 05:08 |
| | 16:54 | 17 | 08:54 (WEA 12) | 17:51 | 08:05 (WEA 06) | 18:41 | | | 20:34 | | | 21:21 |
| 28 | 08:04 | | 08:36 (WEA 12) | 07:07 | 07:35 (WEA 11) | 06:03 | | 06:30 (WEA 10) | 05:55 | | | 05:07 |
| | 16:56 | 19 | 08:55 (WEA 12) | 17:53 | 08:03 (WEA 06) | 18:42 | 12 | 06:42 (WEA 10) | 20:35 | | | 21:22 |
| 29 | 08:03 | | 08:35 (WEA 12) | | | 07:01 | | 07:26 (WEA 10) | 05:53 | | | 05:06 |
| | 16:57 | 22 | 08:57 (WEA 12) | | | 19:44 | 18 | 07:44 (WEA 10) | 20:37 | | | 21:23 |
| 30 | 08:02 | | 08:34 (WEA 12) | | | 06:58 | | 07:24 (WEA 10) | 05:51 | | | 05:05 |
| | 16:59 | 24 | 08:58 (WEA 12) | | | 19:46 | 21 | 07:45 (WEA 10) | 20:39 | | | 21:24 |
| 31 | 08:00 | | 08:34 (WEA 12) | | | 06:56 | | 07:23 (WEA 10) | | | | 05:04 |
| | 17:01 | 26 | 09:00 (WEA 12) | | | 19:47 | 24 | 07:47 (WEA 10) | | | | 21:25 |
| Sonnenscheinstunden | 258 | | | 277 | | 367 | | 416 | | | 486 | 500 |
| astr.max.mögl.Beschattung | | 347 | | 636 | | 488 | | 380 | | | | |
| Red.Sonnenscheinwahrsch. | | 0,18 | | 0,25 | | 0,29 | | 0,37 | | | | |
| Reduktion Betriebsdauer | | 0,96 | | 0,96 | | 0,96 | | 0,96 | | | | |
| Reduktion Windrichtung | | 0,58 | | 0,61 | | 0,65 | | 0,70 | | | | |
| Gesamte Reduktion | | 0,10 | | 0,14 | | 0,18 | | 0,25 | | | | |
| Met.wahrsch.Beschattung | | 35 | | 92 | | 86 | | 94 | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d37 - Söllingen, Hauptstraße 36

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | | |
|----|---------------------------|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|------------------|-------------------|-------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:18 (WEA 10) | 07:16 | 08:06 (WEA 11) | 07:10 | 08:03 (WEA 12) | 08:02 | 09:33 (WEA 13) | | |
| | 21:41 | 21:09 | 20:06 | 25 07:43 (WEA 10) | 18:56 | 26 08:32 (WEA 11) | 16:50 | 27 08:30 (WEA 12) | 16:09 | 10 09:43 (WEA 13) | | |
| 2 | 05:01 | 05:38 | 06:28 | 07:17 (WEA 10) | 07:18 | 08:05 (WEA 11) | 07:12 | 08:03 (WEA 12) | 08:03 | 09:33 (WEA 13) | | |
| | 21:40 | 21:07 | 20:04 | 27 07:44 (WEA 10) | 18:54 | 28 08:33 (WEA 11) | 16:48 | 28 08:31 (WEA 12) | 16:09 | 13 09:46 (WEA 13) | | |
| 3 | 05:01 | 05:40 | 06:30 | 07:15 (WEA 10) | 07:19 | 08:05 (WEA 11) | 07:14 | 08:03 (WEA 12) | 08:04 | 09:31 (WEA 13) | | |
| | 21:40 | 21:05 | 20:02 | 29 07:44 (WEA 10) | 18:52 | 28 08:33 (WEA 11) | 16:46 | 28 08:31 (WEA 12) | 16:08 | 16 09:47 (WEA 13) | | |
| 4 | 05:02 | 05:41 | 06:32 | 07:15 (WEA 10) | 07:21 | 08:04 (WEA 11) | 07:16 | 08:03 (WEA 12) | 08:06 | 09:30 (WEA 13) | | |
| | 21:40 | 21:04 | 19:59 | 29 07:44 (WEA 10) | 18:49 | 30 08:34 (WEA 11) | 16:44 | 28 08:31 (WEA 12) | 16:07 | 18 09:48 (WEA 13) | | |
| 5 | 05:03 | 05:43 | 06:33 | 07:14 (WEA 10) | 07:23 | 08:03 (WEA 11) | 07:18 | 08:03 (WEA 12) | 08:07 | 09:31 (WEA 13) | | |
| | 21:39 | 21:02 | 19:57 | 29 07:43 (WEA 10) | 18:47 | 30 08:33 (WEA 11) | 16:43 | 28 08:31 (WEA 12) | 16:07 | 18 09:49 (WEA 13) | | |
| 6 | 05:04 | 05:45 | 06:35 | 07:14 (WEA 10) | 07:25 | 08:03 (WEA 11) | 07:19 | 08:03 (WEA 12) | 08:08 | 09:30 (WEA 13) | | |
| | 21:39 | 21:00 | 19:55 | 30 07:44 (WEA 10) | 18:45 | 30 08:33 (WEA 11) | 16:41 | 29 08:32 (WEA 12) | 16:06 | 20 09:50 (WEA 13) | | |
| 7 | 05:05 | 05:46 | 06:37 | 07:13 (WEA 10) | 07:26 | 08:03 (WEA 11) | 07:21 | 08:03 (WEA 12) | 08:10 | 09:31 (WEA 13) | | |
| | 21:38 | 20:58 | 19:52 | 30 07:43 (WEA 10) | 18:43 | 29 08:32 (WEA 11) | 16:39 | 28 08:31 (WEA 12) | 16:06 | 21 09:52 (WEA 13) | | |
| 8 | 05:06 | 05:48 | 06:38 | 07:13 (WEA 10) | 07:28 | 08:03 (WEA 11) | 07:23 | 08:03 (WEA 12) | 08:11 | 09:30 (WEA 13) | | |
| | 21:37 | 20:56 | 19:50 | 30 07:43 (WEA 10) | 18:40 | 28 08:31 (WEA 11) | 16:37 | 28 08:31 (WEA 12) | 16:06 | 22 09:52 (WEA 13) | | |
| 9 | 05:07 | 05:49 | 06:40 | 07:14 (WEA 10) | 07:30 | 08:03 (WEA 11) | 07:25 | 08:04 (WEA 12) | 08:12 | 09:30 (WEA 13) | | |
| | 21:37 | 20:54 | 19:48 | 28 07:42 (WEA 10) | 18:38 | 28 08:31 (WEA 11) | 16:36 | 27 08:31 (WEA 12) | 16:05 | 23 09:53 (WEA 13) | | |
| 10 | 05:08 | 05:51 | 06:42 | 07:13 (WEA 10) | 07:31 | 08:04 (WEA 11) | 07:27 | 08:05 (WEA 12) | 08:13 | 09:30 (WEA 13) | | |
| | 21:36 | 20:53 | 19:46 | 28 07:41 (WEA 10) | 18:36 | 26 08:30 (WEA 11) | 16:34 | 26 08:31 (WEA 12) | 16:05 | 23 09:53 (WEA 13) | | |
| 11 | 05:09 | 05:53 | 06:43 | 07:14 (WEA 10) | 07:33 | 08:05 (WEA 11) | 07:28 | 08:05 (WEA 12) | 08:14 | 09:30 (WEA 13) | | |
| | 21:35 | 20:51 | 19:43 | 26 07:40 (WEA 10) | 18:34 | 24 08:29 (WEA 11) | 16:33 | 25 08:30 (WEA 12) | 16:05 | 24 09:54 (WEA 13) | | |
| 12 | 05:10 | 05:54 | 06:45 | 07:14 (WEA 10) | 07:35 | 08:06 (WEA 11) | 07:30 | 08:06 (WEA 12) | 08:15 | 09:30 (WEA 13) | | |
| | 21:34 | 20:49 | 19:41 | 24 07:38 (WEA 10) | 18:31 | 22 08:28 (WEA 11) | 16:31 | 24 08:30 (WEA 12) | 16:05 | 25 09:55 (WEA 13) | | |
| 13 | 05:11 | 05:56 | 06:46 | 07:16 (WEA 10) | 07:37 | 08:06 (WEA 11) | 07:32 | 08:07 (WEA 12) | 08:16 | 09:30 (WEA 13) | | |
| | 21:33 | 20:47 | 19:39 | 21 07:37 (WEA 10) | 18:29 | 25 08:33 (WEA 06) | 16:30 | 22 08:29 (WEA 12) | 16:05 | 25 09:55 (WEA 13) | | |
| 14 | 05:12 | 05:57 | 06:48 | 07:17 (WEA 10) | 07:38 | 08:09 (WEA 11) | 07:34 | 08:09 (WEA 12) | 08:17 | 09:31 (WEA 13) | | |
| | 21:32 | 20:45 | 19:36 | 18 07:35 (WEA 10) | 18:27 | 26 08:36 (WEA 06) | 16:28 | 19 08:28 (WEA 12) | 16:05 | 25 09:56 (WEA 13) | | |
| 15 | 05:13 | 05:59 | 06:50 | 07:19 (WEA 10) | 07:40 | 08:13 (WEA 11) | 07:35 | 08:10 (WEA 12) | 08:18 | 09:31 (WEA 13) | | |
| | 21:32 | 20:43 | 19:34 | 13 07:32 (WEA 10) | 18:25 | 20 08:37 (WEA 06) | 16:27 | 17 08:27 (WEA 12) | 16:05 | 26 09:57 (WEA 13) | | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 (WEA 10) | 07:42 | 08:21 (WEA 06) | 07:37 | 08:12 (WEA 12) | 08:19 | 09:31 (WEA 13) | | |
| | 21:30 | 20:41 | 19:32 | 18:23 | 18 | 08:39 (WEA 06) | 16:25 | 14 08:26 (WEA 12) | 16:05 | 26 09:57 (WEA 13) | | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 (WEA 10) | 07:44 | 08:20 (WEA 06) | 07:39 | 08:14 (WEA 12) | 08:20 | 09:32 (WEA 13) | | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 19 | 08:39 (WEA 06) | 16:24 | 9 08:23 (WEA 12) | 16:05 | 26 09:58 (WEA 13) | | |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 (WEA 10) | 07:45 | 08:19 (WEA 06) | 07:41 | 08:21 (WEA 12) | 08:21 | 09:33 (WEA 13) | | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 21 | 08:40 (WEA 06) | 16:22 | 16:05 | 26 | 09:59 (WEA 13) | | |
| 19 | 05:18 | 06:06 | 06:56 | 07:47 (WEA 10) | 07:47 | 08:18 (WEA 06) | 07:42 | 08:21 (WEA 12) | 08:21 | 09:32 (WEA 13) | | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 21 | 08:39 (WEA 06) | 16:21 | 16:06 | 27 | 09:59 (WEA 13) | | |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 (WEA 10) | 07:49 | 08:18 (WEA 06) | 07:44 | 08:22 (WEA 12) | 08:22 | 09:33 (WEA 13) | | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 21 | 08:39 (WEA 06) | 16:20 | 16:06 | 27 | 10:00 (WEA 13) | | |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 (WEA 10) | 07:46 | 08:18 (WEA 06) | 07:46 | 08:23 (WEA 12) | 08:23 | 09:34 (WEA 13) | | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 21 | 08:39 (WEA 06) | 16:19 | 16:06 | 27 | 10:01 (WEA 13) | | |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 (WEA 10) | 07:47 | 08:19 (WEA 06) | 07:47 | 08:23 (WEA 12) | 08:23 | 09:34 (WEA 13) | | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 20 | 08:39 (WEA 06) | 16:18 | 16:07 | 27 | 10:01 (WEA 13) | | |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 (WEA 10) | 07:49 | 08:21 (WEA 06) | 07:49 | 08:24 (WEA 12) | 08:24 | 09:34 (WEA 13) | | |
| | 21:22 | 20:26 | 19:15 | 18:08 | 17 | 08:38 (WEA 06) | 16:16 | 16:07 | 27 | 10:01 (WEA 13) | | |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 (WEA 10) | 07:51 | 08:23 (WEA 06) | 07:51 | 08:24 (WEA 12) | 08:24 | 09:35 (WEA 13) | | |
| | 21:21 | 20:24 | 19:13 | 18:06 | 14 | 08:37 (WEA 06) | 16:15 | 16:08 | 27 | 10:02 (WEA 13) | | |
| 25 | 05:26 | 06:15 | 07:06 | 06:58 | 07:52 (WEA 10) | 07:52 | 07:52 | 08:25 (WEA 12) | 08:25 | 09:36 (WEA 13) | | |
| | 21:19 | 20:22 | 19:10 | 17:04 | 11 | 07:36 (WEA 06) | 16:14 | 16:09 | 26 | 10:02 (WEA 13) | | |
| 26 | 05:28 | 06:17 | 07:08 | 06:59 | 07:54 | 07:27 (WEA 06) | 07:54 | 08:25 (WEA 12) | 08:25 | 09:36 (WEA 13) | | |
| | 21:18 | 20:20 | 19:08 | 17:02 | 16 | 08:22 (WEA 12) | 16:13 | 16:09 | 26 | 10:02 (WEA 13) | | |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | 07:56 (WEA 10) | 07:29 (WEA 06) | 07:56 | 08:25 (WEA 12) | 08:25 | 09:36 (WEA 13) | | |
| | 21:16 | 20:17 | 19:06 | 13 08:14 (WEA 11) | 07:01 | 08:25 (WEA 12) | 16:12 | 16:10 | 26 | 10:02 (WEA 13) | | |
| 28 | 05:31 | 06:20 | 07:11 | 08:11 (WEA 11) | 07:03 | 08:07 (WEA 12) | 07:57 | 08:25 (WEA 12) | 08:25 | 09:38 (WEA 13) | | |
| | 21:15 | 20:15 | 12 07:26 (WEA 10) | 19:03 | 18 08:29 (WEA 11) | 16:58 | 19 08:26 (WEA 12) | 16:12 | 16:11 | 25 10:03 (WEA 13) | | |
| 29 | 05:32 | 06:22 | 07:13 | 08:09 (WEA 11) | 07:05 | 08:06 (WEA 12) | 07:59 | 08:25 (WEA 12) | 08:25 | 09:38 (WEA 13) | | |
| | 21:13 | 20:13 | 17 07:39 (WEA 10) | 19:01 | 22 08:31 (WEA 11) | 16:56 | 21 08:27 (WEA 12) | 16:11 | 16:12 | 26 10:04 (WEA 13) | | |
| 30 | 05:34 | 06:24 | 07:14 | 08:08 (WEA 11) | 07:07 | 08:05 (WEA 12) | 08:00 | 08:26 (WEA 12) | 08:26 | 09:39 (WEA 13) | | |
| | 21:12 | 20:11 | 20 07:41 (WEA 10) | 18:59 | 24 08:32 (WEA 11) | 16:54 | 24 08:29 (WEA 12) | 16:10 | 5 09:35 (WEA 13) | 08:26 | 16:13 | 25 10:04 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:19 (WEA 10) | 18:59 | 24 08:32 (WEA 11) | 16:54 | 24 08:29 (WEA 12) | 16:10 | 5 09:40 (WEA 13) | 08:26 | 16:13 | 25 10:04 (WEA 13) |
| | 21:10 | 20:08 | 23 07:42 (WEA 10) | 18:59 | 24 08:32 (WEA 11) | 16:54 | 24 08:29 (WEA 12) | 16:10 | 5 09:40 (WEA 13) | 08:26 | 16:13 | 25 10:04 (WEA 13) |
| | Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | 243 | 243 | 243 | 243 | 243 |
| | astr.max.mögl.Beschattung | | 72 | 464 | 705 | 412 | 727 | 727 | 727 | 727 | 727 | 727 |
| | Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 | 0,14 | 0,14 | 0,14 | 0,14 | 0,14 |
| | Reduktion Betriebsdauer | | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 |
| | Reduktion Windrichtung | | 0,70 | 0,69 | 0,63 | 0,60 | 0,57 | 0,57 | 0,57 | 0,57 | 0,57 | 0,57 |
| | Gesamte Reduktion | | 0,29 | 0,24 | 0,18 | 0,12 | 0,07 | 0,07 | 0,07 | 0,07 | 0,07 | 0,07 |
| | Met.wahrsch.Beschattung | | 21 | 112 | 130 | 50 | 53 | 53 | 53 | 53 | 53 | 53 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d39 - Söllingen, Hauptstraße 40

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|-----------------------------|-------|--------|-----------|---------|---------------------------|------------------------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 08:14 (WEA 11) 07:10 | 08:03 (WEA 12) 08:02 |
| | 21:41 | 21:09 | 20:06 | 18:56 | 15 08:29 (WEA 11) 16:50 | 24 08:27 (WEA 12) 16:09 |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 18:54 | 19 08:12 (WEA 11) 07:12 |
| | 21:40 | 21:07 | 20:04 | 18:54 | 19 08:31 (WEA 11) 16:48 | 24 08:27 (WEA 12) 16:09 |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 18:54 | 21 08:11 (WEA 11) 07:14 |
| | 21:40 | 21:05 | 20:02 | 18:52 | 21 08:32 (WEA 11) 16:46 | 26 08:28 (WEA 12) 16:08 |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 18:52 | 21 08:10 (WEA 11) 07:16 |
| | 21:40 | 21:04 | 19:59 | 18:49 | 23 08:33 (WEA 11) 16:44 | 26 08:28 (WEA 12) 16:07 |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 18:54 | 23 08:08 (WEA 11) 07:18 |
| | 21:39 | 21:02 | 19:57 | 18:47 | 25 08:33 (WEA 11) 16:43 | 27 08:29 (WEA 12) 16:07 |
| 6 | 05:04 | 05:45 | 06:35 | 07:25 | 18:54 | 23 08:07 (WEA 11) 07:19 |
| | 21:39 | 21:00 | 19:55 | 18:45 | 27 08:34 (WEA 11) 16:41 | 27 08:29 (WEA 12) 16:06 |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 18:54 | 23 08:07 (WEA 11) 07:21 |
| | 21:38 | 20:58 | 19:53 | 18:43 | 27 08:34 (WEA 11) 16:39 | 27 08:29 (WEA 12) 16:06 |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 18:54 | 23 08:06 (WEA 11) 07:23 |
| | 21:37 | 20:56 | 19:50 | 18:40 | 27 08:33 (WEA 11) 16:37 | 27 08:29 (WEA 12) 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 18:54 | 23 08:06 (WEA 11) 07:25 |
| | 21:37 | 20:54 | 19:48 | 18:38 | 27 08:33 (WEA 11) 16:36 | 26 08:29 (WEA 12) 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 18:54 | 23 08:06 (WEA 11) 07:27 |
| | 21:36 | 20:53 | 19:46 | 18:36 | 27 08:33 (WEA 11) 16:34 | 26 08:29 (WEA 12) 16:05 |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | 18:54 | 23 08:06 (WEA 11) 07:28 |
| | 21:35 | 20:51 | 19:43 | 18:34 | 27 08:33 (WEA 11) 16:33 | 24 08:28 (WEA 12) 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 18:54 | 23 08:07 (WEA 11) 07:30 |
| | 21:34 | 20:49 | 19:41 | 18:31 | 25 08:32 (WEA 11) 16:31 | 23 08:28 (WEA 12) 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 18:54 | 23 08:06 (WEA 11) 07:32 |
| | 21:33 | 20:47 | 19:39 | 18:29 | 24 08:30 (WEA 11) 16:30 | 21 08:27 (WEA 12) 16:05 |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 18:54 | 23 08:07 (WEA 11) 07:34 |
| | 21:32 | 20:45 | 19:36 | 18:27 | 22 08:29 (WEA 11) 16:28 | 20 08:27 (WEA 12) 16:05 |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 18:54 | 23 08:08 (WEA 11) 07:35 |
| | 21:32 | 20:43 | 19:34 | 18:25 | 19 08:28 (WEA 11) 16:27 | 18 08:26 (WEA 12) 16:05 |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 18:54 | 23 08:10 (WEA 11) 07:37 |
| | 21:30 | 20:41 | 19:32 | 18:23 | 16 08:26 (WEA 11) 16:25 | 15 08:25 (WEA 12) 16:05 |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 18:54 | 23 08:11 (WEA 11) 07:39 |
| | 21:29 | 20:39 | 19:29 | 18:20 | 10 08:23 (WEA 11) 16:24 | 11 08:22 (WEA 12) 16:05 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 18:54 | 23 08:07 (WEA 11) 07:41 |
| | 21:28 | 20:37 | 19:27 | 18:18 | 4 16:22 | 4 08:19 (WEA 12) 16:05 |
| 19 | 05:18 | 06:06 | 06:56 | 07:47 | 18:54 | 23 07:42 |
| | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 18:54 | 23 07:44 |
| | 21:26 | 20:32 | 19:22 | 18:14 | 16:20 | 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 18:54 | 23 07:46 |
| | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 18:54 | 23 07:47 |
| | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 18:54 | 23 07:49 |
| | 21:22 | 20:26 | 19:15 | 18:08 | 16:16 | 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 18:54 | 23 07:51 |
| | 21:21 | 20:24 | 19:13 | 18:06 | 16:15 | 16:08 |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 | 18:54 | 23 07:52 |
| | 21:19 | 20:22 | 19:10 | 17:04 | 16:14 | 16:09 |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | 18:54 | 23 07:54 |
| | 21:18 | 20:20 | 19:08 | 17:02 | 16:13 | 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | 18:54 | 23 07:56 |
| | 21:16 | 20:17 | 19:06 | 17:00 | 16:12 | 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | 18:54 | 23 08:09 (WEA 12) 07:57 |
| | 21:15 | 20:15 | 19:03 | 16:58 | 11 08:20 (WEA 12) 16:12 | 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | 18:54 | 23 08:07 (WEA 12) 07:59 |
| | 21:13 | 20:13 | 19:01 | 16:56 | 16 08:23 (WEA 12) 16:11 | 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | 18:54 | 23 08:05 (WEA 12) 08:00 |
| | 21:12 | 20:11 | 18:59 | 16:54 | 19 08:24 (WEA 12) 16:10 | 1 09:30 (WEA 13) 08:26 |
| 31 | 05:35 | 06:25 | | 07:08 | 18:54 | 23 08:04 (WEA 12) 08:26 |
| | 21:10 | 20:08 | | 16:52 | 22 08:26 (WEA 12) 16:13 | 23 09:33 (WEA 13) 09:56 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr. max.mögl. Beschattung | | | 405 | 449 | 397 | 683 |
| Red. Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,70 | 0,63 | 0,60 | 0,57 |
| Gesamte Reduktion | | | 0,24 | 0,18 | 0,12 | 0,07 |
| Met. wahrsch. Beschattung | | | 99 | 83 | 48 | 50 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d40 - Söllingen, Hauptstraße 52

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|-------------------|-------|-------------------|-------------------|-------|
| 1 | 08:26 | 08:57 (WEA 12) | 07:59 | | 06:54 | 05:03 |
| | 16:15 | 9 09:06 (WEA 12) | 17:03 | | 19:49 | 21:27 |
| 2 | 08:26 | 08:57 (WEA 12) | 07:57 | | 06:52 | 05:02 |
| | 16:16 | 10 09:07 (WEA 12) | 17:05 | | 19:51 | 21:28 |
| 3 | 08:25 | 08:57 (WEA 12) | 07:55 | | 07:00 | 05:01 |
| | 16:17 | 12 09:09 (WEA 12) | 17:07 | | 17:58 | 20:44 |
| 4 | 08:25 | 08:56 (WEA 12) | 07:54 | | 9 07:35 (WEA 10) | 19:53 |
| | 16:18 | 13 09:09 (WEA 12) | 17:08 | | 07:23 (WEA 10) | 19:53 |
| 5 | 08:25 | 08:56 (WEA 12) | 07:52 | | 15 07:38 (WEA 10) | 19:54 |
| | 16:19 | 15 09:11 (WEA 12) | 17:10 | | 07:21 (WEA 10) | 19:54 |
| 6 | 08:25 | 08:55 (WEA 12) | 07:50 | | 18 07:39 (WEA 10) | 19:56 |
| | 16:21 | 16 09:11 (WEA 12) | 17:12 | 8 08:17 (WEA 11) | 06:54 | 05:39 |
| 7 | 08:24 | 08:55 (WEA 12) | 07:49 | | 21 07:40 (WEA 10) | 19:58 |
| | 16:22 | 18 09:13 (WEA 12) | 17:14 | 13 08:25 (WEA 11) | 18:04 | 20:49 |
| 8 | 08:24 | 08:55 (WEA 12) | 07:47 | | 15 08:15 (WEA 11) | 18:06 |
| | 16:23 | 18 09:13 (WEA 12) | 17:16 | 16 08:28 (WEA 11) | 18:06 | 20:00 |
| 9 | 08:23 | 08:55 (WEA 12) | 07:45 | | 23 07:41 (WEA 10) | 20:00 |
| | 16:24 | 20 09:15 (WEA 12) | 17:18 | 19 08:13 (WEA 11) | 18:07 | 20:01 |
| 10 | 08:23 | 08:55 (WEA 12) | 07:43 | | 24 07:41 (WEA 10) | 20:01 |
| | 16:26 | 20 09:15 (WEA 12) | 17:20 | 21 08:29 (WEA 11) | 18:07 | 20:01 |
| 11 | 08:22 | 08:55 (WEA 12) | 07:41 | | 26 07:16 (WEA 10) | 19:56 |
| | 16:27 | 21 09:16 (WEA 12) | 17:22 | 22 08:12 (WEA 11) | 18:09 | 20:03 |
| 12 | 08:21 | 08:55 (WEA 12) | 07:40 | | 26 07:42 (WEA 10) | 20:03 |
| | 16:29 | 21 09:16 (WEA 12) | 17:23 | 24 08:31 (WEA 11) | 18:09 | 20:03 |
| 13 | 08:21 | 08:55 (WEA 12) | 07:38 | | 25 07:16 (WEA 10) | 19:56 |
| | 16:30 | 22 09:17 (WEA 12) | 17:25 | 24 08:10 (WEA 11) | 18:15 | 20:08 |
| 14 | 08:20 | 08:55 (WEA 12) | 07:36 | | 25 07:16 (WEA 10) | 19:56 |
| | 16:32 | 22 09:17 (WEA 12) | 17:27 | 24 08:34 (WEA 11) | 18:18 | 20:10 |
| 15 | 08:19 | 08:55 (WEA 12) | 07:34 | | 23 07:39 (WEA 10) | 20:12 |
| | 16:33 | 23 09:18 (WEA 12) | 17:29 | 24 08:09 (WEA 11) | 18:20 | 20:12 |
| 16 | 08:18 | 08:55 (WEA 12) | 07:32 | | 21 07:38 (WEA 10) | 20:13 |
| | 16:35 | 23 09:18 (WEA 12) | 17:31 | 24 08:33 (WEA 11) | 18:20 | 20:13 |
| 17 | 08:17 | 08:56 (WEA 12) | 07:30 | | 19 07:37 (WEA 10) | 20:15 |
| | 16:37 | 23 09:19 (WEA 12) | 17:33 | 24 08:09 (WEA 11) | 18:22 | 20:15 |
| 18 | 08:16 | 08:56 (WEA 12) | 07:28 | | 16 07:18 (WEA 10) | 19:56 |
| | 16:38 | 23 09:19 (WEA 12) | 17:35 | 23 08:33 (WEA 11) | 18:23 | 20:17 |
| 19 | 08:15 | 08:57 (WEA 12) | 07:26 | | 11 07:21 (WEA 10) | 19:56 |
| | 16:40 | 23 09:20 (WEA 12) | 17:36 | 21 08:10 (WEA 11) | 18:25 | 20:18 |
| 20 | 08:14 | 08:57 (WEA 12) | 07:24 | | 11 07:32 (WEA 10) | 20:18 |
| | 16:41 | 23 09:20 (WEA 12) | 17:38 | 19 08:11 (WEA 11) | 18:24 | 20:18 |
| 21 | 08:13 | 08:57 (WEA 12) | 07:22 | | | 06:13 |
| | 16:43 | 23 09:20 (WEA 12) | 17:40 | 16 08:32 (WEA 11) | 18:27 | 05:18 |
| 22 | 08:12 | 08:58 (WEA 12) | 07:20 | | | 05:18 |
| | 16:45 | 22 09:20 (WEA 12) | 17:42 | 12 08:12 (WEA 11) | 18:29 | 21:09 |
| 23 | 08:11 | 08:59 (WEA 12) | 07:18 | | | 21:09 |
| | 16:47 | 21 09:20 (WEA 12) | 17:44 | 3 08:13 (WEA 11) | 18:31 | 21:11 |
| 24 | 08:10 | 08:59 (WEA 12) | 07:16 | | | 21:11 |
| | 16:48 | 20 09:19 (WEA 12) | 17:46 | | | 05:15 |
| 25 | 08:09 | 09:01 (WEA 12) | 07:13 | | | 05:15 |
| | 16:50 | 18 09:19 (WEA 12) | 17:48 | | | 05:17 |
| 26 | 08:07 | 09:01 (WEA 12) | 07:11 | | | 21:11 |
| | 16:52 | 17 09:18 (WEA 12) | 17:49 | | | 21:11 |
| 27 | 08:06 | 09:03 (WEA 12) | 07:09 | | | 21:12 |
| | 16:54 | 15 09:18 (WEA 12) | 17:51 | | | 21:12 |
| 28 | 08:04 | 09:04 (WEA 12) | 07:07 | | | 21:14 |
| | 16:56 | 12 09:16 (WEA 12) | 17:53 | | | 21:14 |
| 29 | 08:03 | 09:08 (WEA 12) | | | | 21:14 |
| | 16:57 | 6 09:14 (WEA 12) | | | | 21:14 |
| 30 | 08:02 | | | | | 21:14 |
| | 16:59 | | | | | 21:14 |
| 31 | 08:00 | | | | | 21:14 |
| | 17:01 | | | | | 21:14 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 529 | 337 | 328 | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | | | |
| Reduktion Windrichtung | 0,57 | 0,62 | 0,65 | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | | | |
| Met.wahrsch.Beschattung | 53 | 50 | 58 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
 DE-38384 Gevensleben
 +49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d40 - Söllingen, Hauptstraße 52

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
 1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------------------------|---------------------------|---------------------------|---------------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:55 (WEA 10) 07:10 | 07:40 (WEA 11) 08:02 | 08:37 (WEA 12) |
| | 21:41 | 21:09 | 20:06 | 18:56 | 25 08:20 (WEA 10) 16:50 | 21 08:01 (WEA 11) 16:09 | 21 08:58 (WEA 12) |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:54 (WEA 10) 07:12 | 07:41 (WEA 11) 08:03 | 08:38 (WEA 12) |
| | 21:40 | 21:07 | 20:04 | 18:54 | 26 08:20 (WEA 10) 16:48 | 19 08:00 (WEA 11) 16:09 | 20 08:58 (WEA 12) |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 07:54 (WEA 10) 07:14 | 07:43 (WEA 11) 08:04 | 08:39 (WEA 12) |
| | 21:40 | 21:05 | 20:02 | 18:52 | 26 08:20 (WEA 10) 16:46 | 16 07:59 (WEA 11) 16:08 | 19 08:58 (WEA 12) |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:54 (WEA 10) 07:16 | 07:45 (WEA 11) 08:06 | 08:39 (WEA 12) |
| | 21:40 | 21:04 | 19:59 | 18:49 | 26 08:20 (WEA 10) 16:44 | 12 07:57 (WEA 11) 16:07 | 18 08:57 (WEA 12) |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 07:54 (WEA 10) 07:18 | 07:48 (WEA 11) 08:07 | 08:40 (WEA 12) |
| | 21:39 | 21:02 | 19:57 | 18:47 | 24 08:18 (WEA 10) 16:43 | 6 07:54 (WEA 11) 16:07 | 18 08:58 (WEA 12) |
| 6 | 05:04 | 05:45 | 06:35 | 07:25 | 07:54 (WEA 10) 07:19 | | 08:08 |
| | 21:39 | 21:00 | 19:55 | 18:45 | 24 08:18 (WEA 10) 16:41 | | 16:06 |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 07:55 (WEA 10) 07:21 | | 08:10 |
| | 21:38 | 20:58 | 19:53 | 18:43 | 22 08:17 (WEA 10) 16:39 | | 16:06 |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:55 (WEA 10) 07:23 | | 08:11 |
| | 21:37 | 20:56 | 19:50 | 18:40 | 20 08:15 (WEA 10) 16:37 | | 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:56 (WEA 10) 07:25 | | 08:12 |
| | 21:37 | 20:54 | 19:48 | 18:38 | 17 08:13 (WEA 10) 16:36 | | 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 07:58 (WEA 10) 07:27 | | 08:13 |
| | 21:36 | 20:53 | 19:46 | 18:36 | 13 08:11 (WEA 10) 16:34 | | 16:05 |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | 08:03 (WEA 10) 07:28 | | 08:14 |
| | 21:35 | 20:51 | 19:43 | 18:34 | 4 08:07 (WEA 10) 16:33 | | 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | | 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | | | 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | | 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | | 6 08:40 (WEA 12) 08:16 | 6 08:50 (WEA 12) |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | | 08:17 |
| | 21:33 | 20:45 | 19:36 | 18:27 | | 12 08:49 (WEA 12) 16:05 | 5 08:55 (WEA 12) |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | | 08:18 |
| | 21:32 | 20:43 | 19:34 | 18:25 | | 15 08:36 (WEA 12) 08:18 | 2 08:52 (WEA 12) |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | | 16:05 |
| | 21:31 | 20:41 | 19:32 | 18:23 | | 17 08:51 (WEA 12) 16:05 | 08:19 |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | | 16:05 |
| | 21:29 | 20:39 | 19:29 | 18:20 | | 17 08:52 (WEA 12) 16:05 | 08:20 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | | 16:05 |
| | 21:28 | 20:37 | 19:27 | 18:18 | | 18 08:33 (WEA 12) 08:21 | 08:21 |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | | 16:05 |
| | 21:27 | 20:35 | 19:24 | 18:16 | | 20 08:55 (WEA 12) 16:21 | 21 08:54 (WEA 12) 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18:14 | | 13 08:45 (WEA 11) 16:20 | 22 08:55 (WEA 12) 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | | 08:23 |
| | 21:25 | 20:30 | 19:20 | 18:12 | | 17 08:43 (WEA 11) 16:19 | 23 08:56 (WEA 12) 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | | 08:23 |
| | 21:23 | 20:28 | 19:17 | 18:10 | | 20 09:02 (WEA 11) 16:18 | 23 08:33 (WEA 12) 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | | 16:07 |
| | 21:22 | 20:26 | 19:15 | 18:08 | | 21 08:41 (WEA 11) 16:18 | 23 08:56 (WEA 12) 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | | 08:24 |
| | 21:21 | 20:24 | 19:13 | 18:06 | | 21 09:02 (WEA 11) 16:16 | 23 08:57 (WEA 12) 16:07 |
| 25 | 05:26 | 06:15 | 07:06 | 07:57 | 07:52 | | 08:24 |
| | 21:19 | 20:22 | 19:10 | 18:04 | | 23 09:03 (WEA 11) 16:15 | 24 08:57 (WEA 12) 16:08 |
| 26 | 05:28 | 06:17 | 07:08 | 08:02 (WEA 10) 06:59 | 07:40 (WEA 11) 07:54 | | 08:25 |
| | 21:18 | 20:20 | 19:08 | 14 08:16 (WEA 10) 17:02 | 24 08:04 (WEA 11) 16:13 | | 24 08:58 (WEA 12) 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | 08:00 (WEA 10) 07:01 | 07:39 (WEA 11) 07:56 | | 08:25 |
| | 21:16 | 20:17 | 19:06 | 18 08:18 (WEA 10) 17:00 | 25 08:04 (WEA 11) 16:12 | | 23 08:58 (WEA 12) 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | 07:58 (WEA 10) 07:03 | 07:39 (WEA 11) 07:57 | | 08:25 |
| | 21:15 | 20:15 | 19:03 | 21 08:19 (WEA 10) 16:58 | 24 08:03 (WEA 11) 16:12 | | 22 08:57 (WEA 12) 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | 07:57 (WEA 10) 07:05 | 07:39 (WEA 11) 07:59 | | 08:26 |
| | 21:13 | 20:13 | 19:01 | 22 08:19 (WEA 10) 16:56 | 24 08:03 (WEA 11) 16:11 | | 22 08:58 (WEA 12) 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | 07:56 (WEA 10) 07:07 | 07:39 (WEA 11) 08:00 | | 08:26 |
| | 21:12 | 20:11 | 18:59 | 24 08:20 (WEA 10) 16:54 | 23 08:02 (WEA 11) 16:10 | | 21 08:57 (WEA 12) 16:13 |
| 31 | 05:35 | 06:25 | | 07:08 | 07:40 (WEA 11) | | 08:26 |
| | 21:10 | 20:08 | | 16:52 | 22 08:02 (WEA 11) | | 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | | 243 |
| astr.max.mögl.Beschattung | | | 107 | 494 | 433 | | 210 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | | 0,96 |
| Reduktion Windrichtung | | | 0,65 | 0,63 | 0,58 | | 0,57 |
| Gesamte Reduktion | | | 0,23 | 0,19 | 0,12 | | 0,07 |
| Met.wahrsch.Beschattung | | | 24 | 92 | 50 | | 16 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d42 - Söllingen, Hauptstraße 56

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:00 (WEA 12) | 07:59 | 08:26 (WEA 11) | 07:05 | 07:31 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 20 09:20 (WEA 12) | 17:03 | 08:36 (WEA 11) | 17:55 | 20 07:51 (WEA 10) | 19:49 | 20:41 | 21:27 | | | |
| 2 | 08:26 | 09:01 (WEA 12) | 07:57 | 08:24 (WEA 11) | 07:03 | 07:30 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 20 09:21 (WEA 12) | 17:05 | 08:38 (WEA 11) | 17:57 | 23 07:53 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:01 (WEA 12) | 07:55 | 08:22 (WEA 11) | 07:00 | 07:29 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 21 09:22 (WEA 12) | 17:07 | 08:39 (WEA 11) | 17:58 | 24 07:53 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:01 (WEA 12) | 07:54 | 08:22 (WEA 11) | 06:58 | 07:29 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 21 09:22 (WEA 12) | 17:08 | 08:41 (WEA 11) | 18:00 | 25 07:54 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:02 (WEA 12) | 07:52 | 08:21 (WEA 11) | 06:56 | 07:28 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 21 09:23 (WEA 12) | 17:10 | 08:42 (WEA 11) | 18:02 | 25 07:53 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:01 (WEA 12) | 07:50 | 08:20 (WEA 11) | 06:54 | 07:28 (WEA 10) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 22 09:23 (WEA 12) | 17:12 | 08:43 (WEA 11) | 18:04 | 25 07:53 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:02 (WEA 12) | 07:49 | 08:20 (WEA 11) | 06:52 | 07:28 (WEA 10) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 23 09:25 (WEA 12) | 17:14 | 08:43 (WEA 11) | 18:06 | 25 07:53 (WEA 10) | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:02 (WEA 12) | 07:47 | 08:19 (WEA 11) | 06:49 | 07:27 (WEA 10) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 23 09:25 (WEA 12) | 17:16 | 08:43 (WEA 11) | 18:07 | 25 07:52 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:03 (WEA 12) | 07:45 | 08:19 (WEA 11) | 06:47 | 07:28 (WEA 10) | 06:36 | 05:34 | 04:58 | | | |
| | 16:24 | 23 09:26 (WEA 12) | 17:18 | 08:44 (WEA 11) | 18:09 | 24 07:52 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:03 (WEA 12) | 07:43 | 08:19 (WEA 11) | 06:45 | 07:28 (WEA 10) | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 23 09:26 (WEA 12) | 17:20 | 08:44 (WEA 11) | 18:11 | 23 07:51 (WEA 10) | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | 09:03 (WEA 12) | 07:41 | 08:20 (WEA 11) | 06:42 | 07:28 (WEA 10) | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | 23 09:26 (WEA 12) | 17:22 | 08:45 (WEA 11) | 18:13 | 21 07:49 (WEA 10) | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 09:03 (WEA 12) | 07:40 | 08:20 (WEA 11) | 06:40 | 07:30 (WEA 10) | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 23 09:26 (WEA 12) | 17:23 | 08:44 (WEA 11) | 18:15 | 18 07:48 (WEA 10) | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 09:04 (WEA 12) | 07:38 | 08:21 (WEA 11) | 06:38 | 07:32 (WEA 10) | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 23 09:27 (WEA 12) | 17:25 | 08:44 (WEA 11) | 18:16 | 14 07:46 (WEA 10) | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 09:04 (WEA 12) | 07:36 | 08:22 (WEA 11) | 06:36 | 07:35 (WEA 10) | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 23 09:27 (WEA 12) | 17:27 | 08:43 (WEA 11) | 18:18 | 6 07:41 (WEA 10) | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 09:05 (WEA 12) | 07:34 | 08:22 (WEA 11) | 06:33 | | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 22 09:27 (WEA 12) | 17:29 | 08:42 (WEA 11) | 18:20 | | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 09:05 (WEA 12) | 07:32 | 08:23 (WEA 11) | 06:31 | | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 22 09:27 (WEA 12) | 17:31 | 08:40 (WEA 11) | 18:22 | | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | 09:06 (WEA 12) | 07:30 | 08:24 (WEA 11) | 06:29 | | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 21 09:27 (WEA 12) | 17:33 | 08:39 (WEA 11) | 18:23 | | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | 09:07 (WEA 12) | 07:28 | 08:27 (WEA 11) | 06:26 | | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 20 09:27 (WEA 12) | 17:35 | 08:36 (WEA 11) | 18:25 | | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | 09:08 (WEA 12) | 07:26 | | 06:24 | | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 19 09:27 (WEA 12) | 17:36 | | 18:27 | | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | 09:09 (WEA 12) | 07:24 | | 06:22 | | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | 18 09:27 (WEA 12) | 17:38 | | 18:29 | | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | 09:09 (WEA 12) | 07:22 | | 06:19 | | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | 17 09:26 (WEA 12) | 17:40 | | 18:30 | | 20:24 | 21:12 | 21:41 | | | |
| 22 | 08:12 | 09:11 (WEA 12) | 07:20 | | 06:17 | | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | 15 09:26 (WEA 12) | 17:42 | | 18:32 | | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | 09:13 (WEA 12) | 07:18 | | 06:15 | | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 12 09:25 (WEA 12) | 17:44 | | 18:34 | | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | 09:15 (WEA 12) | 07:16 | | 06:12 | | 06:03 | 05:11 | 04:57 | | | |
| | 16:48 | 7 09:22 (WEA 12) | 17:46 | | 18:35 | | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | | 07:13 | | 06:10 | | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | | 17:48 | | 18:37 | | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | | 07:11 | 07:38 (WEA 10) | 06:08 | | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | | 17:49 | 8 07:46 (WEA 10) | 18:39 | | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | | 07:09 | 07:35 (WEA 10) | 06:05 | | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | | 17:51 | 14 07:49 (WEA 10) | 18:41 | | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | | 07:07 | 07:33 (WEA 10) | 06:03 | | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | | 17:53 | 18 07:51 (WEA 10) | 18:42 | | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | | | | 07:01 | | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | | | | 19:44 | | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | | | | 06:58 | | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | | | | 19:46 | | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | | | | 06:56 | | | 05:04 | | | | |
| | 17:01 | | | | 19:47 | | | 21:26 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 482 | | 395 | | 298 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,56 | | 0,62 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 47 | | 58 | | 52 | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d42 - Söllingen, Hauptstraße 56

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|----------------|----------------|----------------|----------------|-------------------------|---|---|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 08:10 (WEA 10) 16:50 | 07:10 07:49 (WEA 11) 08:02 | 08:45 (WEA 12) 09:08 (WEA 12) |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 08:08 (WEA 10) 16:48 | 07:12 07:49 (WEA 11) 08:03 | 08:46 (WEA 12) 09:09 (WEA 12) |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 08:07 (WEA 10) 16:46 | 07:14 07:49 (WEA 11) 08:04 | 08:46 (WEA 12) 09:09 (WEA 12) |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 08:06 (WEA 10) 16:44 | 07:16 07:50 (WEA 11) 08:06 | 08:46 (WEA 12) 09:09 (WEA 12) |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 08:04 (WEA 10) 16:43 | 07:18 08:12 (WEA 11) 16:07 | 08:07 08:47 (WEA 12) 09:10 (WEA 12) |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 08:29 (WEA 10) 16:41 | 07:19 08:12 (WEA 11) 16:06 | 08:08 09:10 (WEA 12) 09:10 (WEA 12) |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 08:04 (WEA 10) 16:39 | 07:21 07:52 (WEA 11) 08:10 | 08:49 (WEA 12) 09:10 (WEA 12) |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 08:03 (WEA 10) 16:37 | 07:23 07:53 (WEA 11) 08:11 | 08:49 (WEA 12) 09:10 (WEA 12) |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 08:03 (WEA 10) 16:36 | 07:25 07:55 (WEA 11) 08:12 | 08:49 (WEA 12) 09:10 (WEA 12) |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 08:03 (WEA 10) 16:34 | 07:27 08:06 (WEA 11) 16:05 | 08:50 (WEA 12) 09:10 (WEA 12) |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 08:04 (WEA 10) 16:33 | 07:28 08:06 (WEA 11) 16:05 | 08:50 (WEA 12) 09:11 (WEA 12) |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 08:04 (WEA 10) 16:31 | 07:30 08:26 (WEA 10) 16:31 | 08:52 (WEA 12) 09:12 (WEA 12) |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 08:05 (WEA 10) 16:30 | 07:32 08:24 (WEA 10) 16:30 | 08:52 (WEA 12) 09:12 (WEA 12) |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 08:06 (WEA 10) 16:28 | 07:34 08:23 (WEA 10) 16:28 | 08:52 (WEA 12) 09:11 (WEA 12) |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 08:08 (WEA 10) 16:27 | 07:35 08:20 (WEA 10) 16:27 | 08:53 (WEA 12) 09:12 (WEA 12) |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:23 | 07:37 16:25 | 07:37 16:25 | 08:54 (WEA 12) 09:12 (WEA 12) |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:44 16:24 | 07:39 16:24 | 08:54 (WEA 12) 09:13 (WEA 12) |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 07:41 08:49 (WEA 12) 16:05 | 08:55 (WEA 12) 09:13 (WEA 12) |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 7 08:47 (WEA 12) 16:06 | 08:55 (WEA 12) 09:13 (WEA 12) |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:46 (WEA 12) 09:01 (WEA 12) 16:06 | 08:56 (WEA 12) 09:14 (WEA 12) |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 15 08:45 (WEA 12) 09:02 (WEA 12) 16:06 | 08:57 (WEA 12) 09:15 (WEA 12) |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 17 08:45 (WEA 12) 09:03 (WEA 12) 16:07 | 08:57 (WEA 12) 09:15 (WEA 12) |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 18 08:45 (WEA 12) 09:04 (WEA 12) 16:07 | 08:57 (WEA 12) 09:15 (WEA 12) |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 19 08:44 (WEA 12) 09:04 (WEA 12) 16:08 | 08:58 (WEA 12) 09:16 (WEA 12) |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 06:58 17:04 | 07:52 16:14 | 20 08:44 (WEA 12) 09:05 (WEA 12) 16:09 | 08:58 (WEA 12) 09:16 (WEA 12) |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 06:59 17:02 | 07:53 (WEA 11) 16:13 | 21 08:44 (WEA 12) 09:06 (WEA 12) 16:09 | 08:58 (WEA 12) 09:16 (WEA 12) |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 17:00 | 07:54 (WEA 11) 16:12 | 22 08:45 (WEA 12) 09:07 (WEA 12) 16:10 | 08:58 (WEA 12) 09:17 (WEA 12) |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 (WEA 11) 16:12 | 22 08:44 (WEA 12) 09:07 (WEA 12) 16:11 | 09:00 (WEA 12) 09:18 (WEA 12) |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 (WEA 11) 16:11 | 23 08:45 (WEA 12) 09:08 (WEA 12) 16:12 | 09:00 (WEA 12) 09:19 (WEA 12) |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 16:54 | 08:13 (WEA 10) 16:10 | 23 08:45 (WEA 12) 09:08 (WEA 12) 16:13 | 09:00 (WEA 12) 09:20 (WEA 12) |
| 31 | 05:35 21:10 | 06:25 20:08 | | 07:08 16:52 | 07:49 (WEA 11) 16:13 | | 09:00 (WEA 12) 09:19 (WEA 12) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | 614 |
| astr.max.mögl.Beschattung | | | 11 | 482 | | 437 | 614 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,64 | 0,63 | | 0,58 | 0,56 |
| Gesamte Reduktion | | | 0,22 | 0,19 | | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | 2 | 89 | | 51 | 44 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d44 - Söllingen, Hauptstraße 60

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:09 (WEA 12) | 07:59 | 08:31 (WEA 11) | 07:05 | 07:40 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 23 09:32 (WEA 12) | 17:03 | 22 08:53 (WEA 11) | 17:55 | 26 08:06 (WEA 10) | 19:49 | 20:41 | 21:27 | | | |
| 2 | 08:26 | 09:10 (WEA 12) | 07:57 | 08:30 (WEA 11) | 07:03 | 07:40 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 22 09:32 (WEA 12) | 17:05 | 24 08:54 (WEA 11) | 17:57 | 26 08:06 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:10 (WEA 12) | 07:55 | 08:30 (WEA 11) | 07:00 | 07:40 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 23 09:33 (WEA 12) | 17:07 | 24 08:54 (WEA 11) | 17:58 | 26 08:06 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:10 (WEA 12) | 07:54 | 08:31 (WEA 11) | 06:58 | 07:41 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 23 09:33 (WEA 12) | 17:08 | 24 08:55 (WEA 11) | 18:00 | 24 08:05 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:11 (WEA 12) | 07:52 | 08:30 (WEA 11) | 06:56 | 07:41 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 23 09:34 (WEA 12) | 17:10 | 25 08:55 (WEA 11) | 18:02 | 22 08:03 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:11 (WEA 12) | 07:50 | 08:31 (WEA 11) | 06:54 | 07:42 (WEA 10) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 23 09:34 (WEA 12) | 17:12 | 24 08:55 (WEA 11) | 18:04 | 21 08:03 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:12 (WEA 12) | 07:49 | 08:31 (WEA 11) | 06:52 | 07:43 (WEA 10) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 22 09:34 (WEA 12) | 17:14 | 23 08:54 (WEA 11) | 18:06 | 18 08:01 (WEA 10) | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:12 (WEA 12) | 07:47 | 08:31 (WEA 11) | 06:49 | 07:44 (WEA 10) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 22 09:34 (WEA 12) | 17:16 | 23 08:54 (WEA 11) | 18:07 | 14 07:58 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:14 (WEA 12) | 07:45 | 08:32 (WEA 11) | 06:47 | 07:47 (WEA 10) | 06:36 | 05:34 | 04:58 | | | |
| | 16:24 | 21 09:35 (WEA 12) | 17:18 | 21 08:53 (WEA 11) | 18:09 | 8 07:55 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:14 (WEA 12) | 07:43 | 08:32 (WEA 11) | 06:45 | | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 21 09:35 (WEA 12) | 17:20 | 21 08:53 (WEA 11) | 18:11 | | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | 09:14 (WEA 12) | 07:41 | 08:34 (WEA 11) | 06:42 | | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | 21 09:35 (WEA 12) | 17:22 | 18 08:52 (WEA 11) | 18:13 | | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 09:15 (WEA 12) | 07:40 | 08:36 (WEA 11) | 06:40 | | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 20 09:35 (WEA 12) | 17:23 | 15 08:51 (WEA 11) | 18:15 | | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 09:16 (WEA 12) | 07:38 | 08:38 (WEA 11) | 06:38 | | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 19 09:35 (WEA 12) | 17:25 | 11 08:49 (WEA 11) | 18:16 | | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 09:17 (WEA 12) | 07:36 | | 06:36 | | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 17 09:34 (WEA 12) | 17:27 | | 18:18 | | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 09:18 (WEA 12) | 07:34 | | 06:33 | | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 16 09:34 (WEA 12) | 17:29 | | 18:20 | | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 09:19 (WEA 12) | 07:32 | | 06:31 | | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 15 09:34 (WEA 12) | 17:31 | | 18:22 | | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | 09:20 (WEA 12) | 07:30 | | 06:29 | | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 13 09:33 (WEA 12) | 17:33 | | 18:23 | | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | 09:22 (WEA 12) | 07:28 | | 06:26 | | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 10 09:32 (WEA 12) | 17:35 | | 18:25 | | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | 09:26 (WEA 12) | 07:26 | | 06:24 | | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 3 09:29 (WEA 12) | 17:36 | | 18:27 | | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | | 07:24 | | 06:22 | | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | | 17:38 | | 18:29 | | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | | 07:22 | 07:49 (WEA 10) | 06:19 | | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | | 17:40 | 10 07:59 (WEA 10) | 18:30 | | 20:24 | 21:12 | 21:41 | | | |
| 22 | 08:12 | | 07:20 | 07:47 (WEA 10) | 06:17 | | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | | 17:42 | 15 08:02 (WEA 10) | 18:32 | | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | | 07:18 | 07:45 (WEA 10) | 06:15 | | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | | 17:44 | 19 08:04 (WEA 10) | 18:34 | | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | | 07:16 | 07:43 (WEA 10) | 06:12 | | 06:03 | 05:11 | 04:57 | | | |
| | 16:48 | | 17:46 | 21 08:04 (WEA 10) | 18:35 | | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | | 07:13 | 07:42 (WEA 10) | 06:10 | | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | | 17:48 | 23 08:05 (WEA 10) | 18:37 | | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | 08:36 (WEA 11) | 07:11 | 07:41 (WEA 10) | 06:08 | | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | 9 08:45 (WEA 11) | 17:49 | 25 08:06 (WEA 10) | 18:39 | | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | 08:35 (WEA 11) | 07:09 | 07:41 (WEA 10) | 06:05 | | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | 13 08:48 (WEA 11) | 17:51 | 25 08:06 (WEA 10) | 18:41 | | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | 08:33 (WEA 11) | 07:07 | 07:41 (WEA 10) | 06:03 | | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | 16 08:49 (WEA 11) | 17:53 | 26 08:07 (WEA 10) | 18:42 | | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | 08:32 (WEA 11) | | | 07:01 | | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | 19 08:51 (WEA 11) | | | 19:44 | | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | 08:31 (WEA 11) | | | 06:58 | | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | 20 08:51 (WEA 11) | | | 19:46 | | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | 08:32 (WEA 11) | | | 06:56 | | | 05:04 | | | | |
| | 17:01 | 21 08:53 (WEA 11) | | | 19:47 | | | 21:26 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 455 | | 439 | | 185 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,57 | | 0,62 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 45 | | 64 | | 32 | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d44 - Söllingen, Hauptstraße 60

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | |
|---------------------------|----------------|----------------|----------------|----------------|----------------------------------|----------------------------------|----------------|----------------------------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 (WEA 11) 08:22 (WEA 11) | 08:02 16:09 | 08:57 (WEA 12) 09:17 (WEA 12) |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:01 (WEA 11) 08:23 (WEA 11) | 08:03 16:09 | 08:57 (WEA 12) 09:18 (WEA 12) |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 08:01 (WEA 11) 08:24 (WEA 11) | 08:04 16:08 | 08:57 (WEA 12) 09:18 (WEA 12) |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:00 (WEA 11) 08:24 (WEA 11) | 08:06 16:07 | 08:58 (WEA 12) 09:19 (WEA 12) |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:00 (WEA 11) 08:24 (WEA 11) | 08:07 16:07 | 08:57 (WEA 12) 09:20 (WEA 12) |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:00 (WEA 11) 08:25 (WEA 11) | 08:08 16:06 | 08:57 (WEA 12) 09:20 (WEA 12) |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:00 (WEA 11) 08:25 (WEA 11) | 08:10 16:06 | 08:58 (WEA 12) 09:21 (WEA 12) |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:01 (WEA 11) 08:25 (WEA 11) | 08:11 16:06 | 08:58 (WEA 12) 09:21 (WEA 12) |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:01 (WEA 11) 08:24 (WEA 11) | 08:12 16:05 | 08:59 (WEA 12) 09:21 (WEA 12) |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:02 (WEA 11) 08:24 (WEA 11) | 08:13 16:05 | 08:59 (WEA 12) 09:21 (WEA 12) |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:02 (WEA 11) 08:24 (WEA 11) | 08:14 16:05 | 08:59 (WEA 12) 09:22 (WEA 12) |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:03 (WEA 11) 08:23 (WEA 11) | 08:15 16:05 | 09:00 (WEA 12) 09:23 (WEA 12) |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:30 | 08:04 (WEA 11) 08:23 (WEA 11) | 08:16 16:05 | 09:01 (WEA 12) 09:24 (WEA 12) |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:06 (WEA 11) 08:22 (WEA 11) | 08:17 16:05 | 09:00 (WEA 12) 09:23 (WEA 12) |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:08 (WEA 11) 08:20 (WEA 11) | 08:18 16:05 | 09:01 (WEA 12) 09:24 (WEA 12) |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:10 (WEA 11) 08:19 (WEA 11) | 08:19 16:05 | 09:02 (WEA 12) 09:24 (WEA 12) |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:15 (WEA 11) 08:37 (WEA 11) | 08:20 16:05 | 09:02 (WEA 12) 09:25 (WEA 12) |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:16 (WEA 11) 08:36 (WEA 11) | 08:21 16:05 | 09:03 (WEA 12) 09:25 (WEA 12) |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:16 (WEA 11) 08:33 (WEA 11) | 08:21 16:06 | 09:03 (WEA 12) 09:25 (WEA 12) |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:18 (WEA 11) 08:31 (WEA 11) | 08:22 16:06 | 09:04 (WEA 12) 09:26 (WEA 12) |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:21 (WEA 11) 08:28 (WEA 11) | 08:23 16:06 | 09:05 (WEA 12) 09:27 (WEA 12) |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:28 (WEA 11) | 08:23 16:07 | 09:05 (WEA 12) 09:27 (WEA 12) |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 09:03 (WEA 12) 09:06 (WEA 12) | 08:24 16:07 | 09:05 (WEA 12) 09:27 (WEA 12) |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:59 (WEA 12) 09:09 (WEA 12) | 08:24 16:08 | 09:06 (WEA 12) 09:28 (WEA 12) |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 06:58 17:04 | 07:52 16:14 | 08:58 (WEA 12) 09:11 (WEA 12) | 08:25 16:09 | 09:06 (WEA 12) 09:28 (WEA 12) |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 06:59 17:02 | 07:54 16:13 | 08:58 (WEA 12) 09:13 (WEA 12) | 08:25 16:09 | 09:06 (WEA 12) 09:29 (WEA 12) |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 17:00 | 07:56 16:12 | 08:58 (WEA 12) 09:14 (WEA 12) | 08:25 16:10 | 09:06 (WEA 12) 09:29 (WEA 12) |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 16:12 | 08:57 (WEA 12) 09:14 (WEA 12) | 08:25 16:11 | 09:08 (WEA 12) 09:30 (WEA 12) |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:14 (WEA 11) 08:18 (WEA 11) | 08:26 16:12 | 09:08 (WEA 12) 09:31 (WEA 12) |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 16:54 | 08:00 16:10 | 08:04 (WEA 11) 08:20 (WEA 11) | 08:26 16:13 | 09:09 (WEA 12) 09:31 (WEA 12) |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:15 16:52 | 07:08 16:52 | 08:03 (WEA 11) 08:21 (WEA 11) | 08:03 (WEA 11) 08:21 (WEA 11) | 08:26 16:13 | 09:08 (WEA 12) 09:31 (WEA 12) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | | 243 | |
| astr.max.mögl.Beschattung | | | | 400 | 443 | | 691 | |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | | 0,14 | |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | | 0,96 | |
| Reduktion Windrichtung | | | | 0,63 | 0,59 | | 0,56 | |
| Gesamte Reduktion | | | | 0,19 | 0,12 | | 0,07 | |
| Met.wahrsch.Beschattung | | | | 74 | 53 | | 50 | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d45 - Söllingen, Hauptstraße 70

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------------|----------------------------------|----------------|----------------------------------|----------------|----------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 07:05 17:55 | 06:54 19:49 | 05:49 20:41 | 05:03 21:27 |
| 2 | 08:26 16:16 | 07:57 17:05 | 07:03 17:57 | 06:52 19:51 | 05:47 20:42 | 05:02 21:28 |
| 3 | 08:25 16:17 | 07:55 17:07 | 07:00 17:58 | 06:49 19:53 | 05:45 20:44 | 05:01 21:29 |
| 4 | 08:25 16:18 | 07:54 17:08 | 06:58 18:00 | 06:47 19:54 | 05:43 20:46 | 05:01 21:30 |
| 5 | 08:25 16:19 | 08:58 (WEA 11) 09:02 (WEA 11) | 07:52 17:10 | 06:56 18:02 | 06:45 19:56 | 05:41 20:47 |
| 6 | 08:25 16:21 | 08:56 (WEA 11) 09:04 (WEA 11) | 07:50 17:12 | 08:19 (WEA 10) 18:04 | 06:54 19:58 | 05:39 20:49 |
| 7 | 08:24 16:22 | 08:55 (WEA 11) 09:06 (WEA 11) | 07:49 17:14 | 08:16 (WEA 10) 08:32 (WEA 10) | 06:52 18:06 | 05:37 20:51 |
| 8 | 08:24 16:23 | 08:54 (WEA 11) 09:07 (WEA 11) | 07:47 17:16 | 08:15 (WEA 10) 08:33 (WEA 10) | 06:49 18:07 | 05:36 20:52 |
| 9 | 08:23 16:24 | 08:55 (WEA 11) 09:09 (WEA 11) | 07:45 17:18 | 08:14 (WEA 10) 08:34 (WEA 10) | 06:47 18:09 | 05:34 20:54 |
| 10 | 08:23 16:26 | 08:54 (WEA 11) 09:10 (WEA 11) | 07:43 17:20 | 08:13 (WEA 10) 08:35 (WEA 10) | 06:45 18:11 | 05:32 20:55 |
| 11 | 08:22 16:27 | 08:53 (WEA 11) 09:10 (WEA 11) | 07:41 17:22 | 08:13 (WEA 10) 08:37 (WEA 10) | 06:42 18:13 | 05:30 20:57 |
| 12 | 08:21 16:29 | 08:53 (WEA 11) 09:11 (WEA 11) | 07:40 17:23 | 08:13 (WEA 10) 08:37 (WEA 10) | 06:40 18:15 | 05:29 20:59 |
| 13 | 08:21 16:30 | 08:53 (WEA 11) 09:12 (WEA 11) | 07:38 17:25 | 08:12 (WEA 10) 08:37 (WEA 10) | 06:38 18:16 | 05:27 21:00 |
| 14 | 08:20 16:32 | 08:53 (WEA 11) 09:13 (WEA 11) | 07:36 17:27 | 08:12 (WEA 10) 08:38 (WEA 10) | 06:36 18:18 | 05:26 21:02 |
| 15 | 08:19 16:33 | 08:53 (WEA 11) 09:14 (WEA 11) | 07:34 17:29 | 08:12 (WEA 10) 08:38 (WEA 10) | 06:33 18:20 | 05:24 21:03 |
| 16 | 08:18 16:35 | 08:53 (WEA 11) 09:14 (WEA 11) | 07:32 17:31 | 08:11 (WEA 10) 08:36 (WEA 10) | 06:31 18:22 | 05:22 21:05 |
| 17 | 08:17 16:37 | 08:53 (WEA 11) 09:15 (WEA 11) | 07:30 17:33 | 08:12 (WEA 10) 08:36 (WEA 10) | 06:29 18:23 | 05:21 21:06 |
| 18 | 08:17 16:38 | 08:53 (WEA 11) 09:16 (WEA 11) | 07:28 17:35 | 08:12 (WEA 10) 08:36 (WEA 10) | 06:26 18:25 | 05:19 21:08 |
| 19 | 08:15 16:40 | 08:53 (WEA 11) 09:16 (WEA 11) | 07:26 17:36 | 08:13 (WEA 10) 08:35 (WEA 10) | 06:24 18:27 | 05:18 21:09 |
| 20 | 08:14 16:41 | 08:54 (WEA 11) 09:17 (WEA 11) | 07:24 17:38 | 08:14 (WEA 10) 08:34 (WEA 10) | 06:22 18:29 | 05:17 21:11 |
| 21 | 08:13 16:43 | 08:53 (WEA 11) 09:17 (WEA 11) | 07:22 17:40 | 08:15 (WEA 10) 08:33 (WEA 10) | 06:19 18:30 | 05:15 21:12 |
| 22 | 08:12 16:45 | 08:54 (WEA 11) 09:17 (WEA 11) | 07:20 17:42 | 08:17 (WEA 10) 08:31 (WEA 10) | 06:17 18:32 | 05:14 21:14 |
| 23 | 08:11 16:47 | 08:55 (WEA 11) 09:18 (WEA 11) | 07:18 17:44 | 08:21 (WEA 10) 08:27 (WEA 10) | 06:15 18:34 | 05:13 21:15 |
| 24 | 08:10 16:48 | 08:55 (WEA 11) 09:17 (WEA 11) | 07:16 17:46 | 06:12 18:35 | 06:03 20:29 | 05:11 21:17 |
| 25 | 08:09 16:50 | 08:56 (WEA 11) 09:17 (WEA 11) | 07:13 17:48 | 06:10 18:37 | 06:01 20:30 | 05:10 21:18 |
| 26 | 08:07 16:52 | 08:56 (WEA 11) 09:17 (WEA 11) | 07:11 17:49 | 06:08 18:39 | 05:59 20:32 | 05:09 21:19 |
| 27 | 08:06 16:54 | 08:57 (WEA 11) 09:17 (WEA 11) | 07:09 17:51 | 06:05 18:41 | 05:57 20:34 | 05:08 21:21 |
| 28 | 08:04 16:56 | 08:58 (WEA 11) 09:16 (WEA 11) | 07:07 17:53 | 06:03 18:42 | 05:55 20:35 | 05:07 21:22 |
| 29 | 08:03 16:57 | 09:00 (WEA 11) 09:15 (WEA 11) | | 07:01 19:44 | 05:53 20:37 | 05:06 21:23 |
| 30 | 08:02 16:59 | 09:01 (WEA 11) 09:14 (WEA 11) | | 06:58 19:46 | 05:51 20:39 | 05:05 21:24 |
| 31 | 08:00 17:01 | 09:04 (WEA 11) 09:12 (WEA 11) | | 06:56 19:47 | 05:04 21:26 | 05:04 21:26 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 481 | 364 | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | | | | |
| Reduktion Windrichtung | 0,57 | 0,62 | | | | |
| Gesamte Reduktion | 0,10 | 0,15 | | | | |
| Met.wahrsch.Beschattung | 48 | 54 | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d45 - Söllingen, Hauptstraße 70

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------------------------|----------------|----------------------------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 07:43 (WEA 10) 08:04 (WEA 10) | 08:02 16:09 | 08:35 (WEA 11) 08:53 (WEA 11) |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 07:44 (WEA 10) 08:04 (WEA 10) | 08:03 16:08 | 08:37 (WEA 11) 08:53 (WEA 11) |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:20 18:52 | 07:14 16:46 | 07:45 (WEA 10) 08:02 (WEA 10) | 08:04 16:08 | 08:38 (WEA 11) 08:52 (WEA 11) |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 07:46 (WEA 10) 08:01 (WEA 10) | 08:06 16:07 | 08:39 (WEA 11) 08:52 (WEA 11) |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 07:49 (WEA 10) 07:59 (WEA 10) | 08:07 16:07 | 08:40 (WEA 11) 08:51 (WEA 11) |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:01 (WEA 10) 08:02 (WEA 10) | 08:08 16:06 | 08:42 (WEA 11) 08:50 (WEA 11) |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:03 (WEA 10) 08:04 (WEA 10) | 08:10 16:06 | 08:44 (WEA 11) 08:49 (WEA 11) |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:05 (WEA 10) 08:06 (WEA 10) | 08:11 16:06 | 08:45 (WEA 11) 08:50 (WEA 11) |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:07 (WEA 10) 08:08 (WEA 10) | 08:12 16:05 | 08:51 (WEA 11) 08:56 (WEA 11) |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:09 (WEA 10) 08:10 (WEA 10) | 08:13 16:05 | 08:52 (WEA 11) 08:57 (WEA 11) |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:11 (WEA 10) 08:12 (WEA 10) | 08:14 16:05 | 08:53 (WEA 11) 08:58 (WEA 11) |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:13 (WEA 10) 08:14 (WEA 10) | 08:15 16:05 | 08:54 (WEA 11) 08:59 (WEA 11) |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:15 (WEA 10) 08:16 (WEA 10) | 08:16 16:05 | 08:55 (WEA 11) 09:00 (WEA 11) |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 (WEA 10) 08:18 (WEA 10) | 08:17 16:05 | 08:56 (WEA 11) 09:01 (WEA 11) |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:19 (WEA 10) 08:20 (WEA 10) | 08:18 16:05 | 08:57 (WEA 11) 09:02 (WEA 11) |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:21 (WEA 10) 08:22 (WEA 10) | 08:19 16:05 | 08:58 (WEA 11) 09:03 (WEA 11) |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:23 (WEA 10) 08:24 (WEA 10) | 08:20 16:05 | 08:59 (WEA 11) 09:04 (WEA 11) |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:25 (WEA 10) 08:26 (WEA 10) | 08:21 16:05 | 09:05 (WEA 11) 09:10 (WEA 11) |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:27 (WEA 10) 08:28 (WEA 10) | 08:21 16:06 | 09:06 (WEA 11) 09:11 (WEA 11) |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:29 (WEA 10) 08:30 (WEA 10) | 08:22 16:06 | 09:07 (WEA 11) 09:12 (WEA 11) |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:31 (WEA 10) 08:32 (WEA 10) | 08:23 16:06 | 09:08 (WEA 11) 09:13 (WEA 11) |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:33 (WEA 10) 08:34 (WEA 10) | 08:23 16:07 | 09:09 (WEA 11) 09:14 (WEA 11) |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:35 (WEA 10) 08:36 (WEA 10) | 08:24 16:07 | 09:10 (WEA 11) 09:15 (WEA 11) |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:37 (WEA 10) 08:38 (WEA 10) | 08:24 16:08 | 09:11 (WEA 11) 09:16 (WEA 11) |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 06:58 17:04 | 07:52 16:14 | 08:39 (WEA 10) 08:40 (WEA 10) | 08:25 16:09 | 09:12 (WEA 11) 09:17 (WEA 11) |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 06:59 17:02 | 07:54 16:13 | 08:41 (WEA 10) 08:42 (WEA 10) | 08:25 16:09 | 09:13 (WEA 11) 09:18 (WEA 11) |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 17:00 | 07:56 16:12 | 08:43 (WEA 10) 08:44 (WEA 10) | 08:25 16:10 | 09:14 (WEA 11) 09:19 (WEA 11) |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 16:12 | 08:45 (WEA 10) 08:46 (WEA 10) | 08:25 16:11 | 09:15 (WEA 11) 09:20 (WEA 11) |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:47 (WEA 10) 08:48 (WEA 10) | 08:26 16:12 | 09:16 (WEA 11) 09:21 (WEA 11) |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 16:54 | 08:00 16:10 | 08:49 (WEA 10) 08:50 (WEA 10) | 08:26 16:13 | 09:17 (WEA 11) 09:22 (WEA 11) |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:08 16:52 | 07:08 16:52 | 08:01 16:09 | 08:51 (WEA 10) 08:52 (WEA 10) | 08:26 16:13 | 09:18 (WEA 11) 09:23 (WEA 11) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | | 243 | |
| astr.max.mögl.Beschattung | | | | 283 | | 481 | | 85 |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | | 0,21 | | 0,14 |
| Reduktion Betriebsdauer | | | | 0,96 | | 0,96 | | 0,96 |
| Reduktion Windrichtung | | | | 0,62 | | 0,58 | | 0,57 |
| Gesamte Reduktion | | | | 0,18 | | 0,12 | | 0,07 |
| Met.wahrsch.Beschattung | | | | 52 | | 57 | | 6 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d46 - Söllingen, Hauptstraße 72

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | Juli | August | September | Oktober | November | Dezember | | |
|---------------------------|--------|---------|-------------------|-------|-------|-------|-------|--------|-----------|---------|----------|-------------------|-------------------|-------|
| 1 | 08:26 | 07:59 | 08:29 (WEA 10) | 07:05 | 06:54 | 05:49 | 05:03 | 05:00 | 05:37 | 06:27 | 07:16 | 07:10 | 07:48 (WEA 10) | 08:02 |
| | 16:15 | 17:03 | 2 08:31 (WEA 10) | 17:55 | 19:49 | 20:41 | 21:27 | 21:41 | 21:09 | 20:06 | 18:56 | 16:50 | 24 08:12 (WEA 10) | 16:09 |
| 2 | 08:26 | 07:57 | 08:25 (WEA 10) | 07:03 | 06:52 | 05:47 | 05:02 | 05:01 | 05:38 | 06:28 | 07:18 | 07:12 | 07:48 (WEA 10) | 08:03 |
| | 16:16 | 17:05 | 10 08:35 (WEA 10) | 17:57 | 19:51 | 20:42 | 21:28 | 21:40 | 21:07 | 20:04 | 18:54 | 16:48 | 24 08:12 (WEA 10) | 16:08 |
| 3 | 08:25 | 07:55 | 08:22 (WEA 10) | 07:00 | 06:49 | 05:45 | 05:01 | 05:01 | 05:40 | 06:30 | 07:20 | 07:14 | 23 07:49 (WEA 10) | 08:04 |
| | 16:17 | 17:07 | 15 08:37 (WEA 10) | 17:58 | 19:53 | 20:44 | 21:29 | 21:40 | 21:05 | 20:02 | 18:52 | 16:46 | 23 08:12 (WEA 10) | 16:08 |
| 4 | 08:25 | 07:54 | 08:22 (WEA 10) | 06:58 | 06:47 | 05:43 | 05:01 | 05:02 | 05:41 | 06:32 | 07:21 | 07:16 | 07:49 (WEA 10) | 08:06 |
| | 16:18 | 17:08 | 18 08:40 (WEA 10) | 18:00 | 19:54 | 20:46 | 21:30 | 21:40 | 21:04 | 19:59 | 18:49 | 16:44 | 22 08:11 (WEA 10) | 16:07 |
| 5 | 08:25 | 07:52 | 08:21 (WEA 10) | 06:56 | 06:45 | 05:41 | 05:00 | 05:03 | 05:43 | 06:33 | 07:23 | 07:18 | 07:50 (WEA 10) | 08:07 |
| | 16:19 | 17:10 | 19 08:40 (WEA 10) | 18:02 | 19:56 | 20:47 | 21:31 | 21:39 | 21:02 | 19:57 | 18:47 | 16:43 | 21 08:11 (WEA 10) | 16:07 |
| 6 | 08:25 | 07:50 | 08:20 (WEA 10) | 06:54 | 06:42 | 05:39 | 04:59 | 05:04 | 05:44 | 06:35 | 07:25 | 07:19 | 07:51 (WEA 10) | 08:08 |
| | 16:21 | 17:12 | 21 08:41 (WEA 10) | 18:04 | 19:58 | 20:49 | 21:32 | 21:39 | 21:00 | 19:55 | 18:45 | 16:41 | 19 08:10 (WEA 10) | 16:06 |
| 7 | 08:24 | 07:49 | 08:19 (WEA 10) | 06:52 | 06:40 | 05:37 | 04:59 | 05:05 | 05:46 | 06:37 | 07:26 | 07:21 | 07:52 (WEA 10) | 08:10 |
| | 16:22 | 17:14 | 23 08:42 (WEA 10) | 18:06 | 20:00 | 20:51 | 21:33 | 21:38 | 20:58 | 19:53 | 18:43 | 16:39 | 17 08:09 (WEA 10) | 16:06 |
| 8 | 08:24 | 07:47 | 08:19 (WEA 10) | 06:49 | 06:38 | 05:36 | 04:58 | 05:06 | 05:48 | 06:38 | 07:28 | 07:23 | 07:53 (WEA 10) | 08:11 |
| | 16:23 | 17:16 | 23 08:42 (WEA 10) | 18:07 | 20:01 | 20:52 | 21:34 | 21:37 | 20:56 | 19:50 | 18:40 | 16:37 | 15 08:08 (WEA 10) | 16:06 |
| 9 | 08:23 | 07:45 | 08:19 (WEA 10) | 06:47 | 06:36 | 05:34 | 04:58 | 05:07 | 05:49 | 06:40 | 07:30 | 07:25 | 07:56 (WEA 10) | 08:12 |
| | 16:24 | 17:18 | 23 08:42 (WEA 10) | 18:09 | 20:03 | 20:54 | 21:35 | 21:37 | 20:54 | 19:48 | 18:38 | 16:36 | 10 08:06 (WEA 10) | 16:05 |
| 10 | 08:23 | 07:43 | 08:18 (WEA 10) | 06:45 | 06:33 | 05:32 | 04:57 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | | 08:13 |
| | 16:26 | 17:20 | 25 08:43 (WEA 10) | 18:11 | 20:05 | 20:55 | 21:35 | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | | 16:05 |
| 11 | 08:22 | 07:41 | 08:19 (WEA 10) | 06:42 | 06:31 | 05:30 | 04:57 | 05:09 | 05:52 | 06:43 | 07:33 | 07:28 | | 08:14 |
| | 16:27 | 17:22 | 25 08:44 (WEA 10) | 18:13 | 20:06 | 20:57 | 21:36 | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | | 16:05 |
| 12 | 08:22 | 07:40 | 08:20 (WEA 10) | 06:40 | 06:29 | 05:29 | 04:56 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | | 08:15 |
| | 16:29 | 17:23 | 23 08:43 (WEA 10) | 18:15 | 20:08 | 20:59 | 21:37 | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | | 16:05 |
| 13 | 08:21 | 07:38 | 08:20 (WEA 10) | 06:38 | 06:27 | 05:27 | 04:56 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | | 08:16 |
| | 16:30 | 17:25 | 23 08:43 (WEA 10) | 18:16 | 20:10 | 21:00 | 21:38 | 21:33 | 20:47 | 19:39 | 18:29 | 16:29 | | 16:05 |
| 14 | 08:20 | 07:36 | 08:20 (WEA 10) | 06:36 | 06:24 | 05:26 | 04:56 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | | 08:17 |
| | 16:32 | 17:27 | 22 08:42 (WEA 10) | 18:18 | 20:12 | 21:02 | 21:38 | 21:33 | 20:45 | 19:36 | 18:27 | 16:28 | | 16:05 |
| 15 | 08:19 | 07:34 | 08:21 (WEA 10) | 06:33 | 06:22 | 05:24 | 04:56 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | | 08:18 |
| | 16:33 | 17:29 | 21 08:42 (WEA 10) | 18:20 | 20:13 | 21:03 | 21:39 | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | | 16:05 |
| 16 | 08:18 | 07:32 | 08:21 (WEA 10) | 06:31 | 06:20 | 05:22 | 04:56 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | | 08:19 |
| | 16:35 | 17:31 | 19 08:40 (WEA 10) | 18:22 | 20:15 | 21:05 | 21:39 | 21:31 | 20:41 | 19:32 | 18:22 | 16:25 | | 16:05 |
| 17 | 08:17 | 07:30 | 08:23 (WEA 10) | 06:29 | 06:18 | 05:21 | 04:56 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | | 08:20 |
| | 16:37 | 17:33 | 15 08:38 (WEA 10) | 18:23 | 20:17 | 21:06 | 21:40 | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | | 16:05 |
| 18 | 08:17 | 07:28 | 08:25 (WEA 10) | 06:26 | 06:16 | 05:19 | 04:56 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | | 08:21 |
| | 16:38 | 17:35 | 11 08:36 (WEA 10) | 18:25 | 20:18 | 21:08 | 21:40 | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | | 16:05 |
| 19 | 08:16 | 07:26 | 08:30 (WEA 10) | 06:24 | 06:13 | 05:18 | 04:56 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | | 08:21 |
| | 16:40 | 17:36 | 1 08:31 (WEA 10) | 18:27 | 20:20 | 21:09 | 21:40 | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | | 16:06 |
| 20 | 08:14 | 07:24 | | 06:22 | 06:11 | 05:17 | 04:56 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | | 08:22 |
| | 16:41 | 17:38 | | 18:29 | 20:22 | 21:11 | 21:41 | 21:26 | 20:33 | 19:22 | 18:14 | 16:20 | | 16:06 |
| 21 | 08:13 | 07:22 | | 06:19 | 06:09 | 05:15 | 04:56 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | | 08:23 |
| | 16:43 | 17:40 | | 18:30 | 20:24 | 21:12 | 21:41 | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | | 16:06 |
| 22 | 08:12 | 07:20 | | 06:17 | 06:07 | 05:14 | 04:56 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | | 08:23 |
| | 16:45 | 17:42 | | 18:32 | 20:25 | 21:14 | 21:41 | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | | 16:07 |
| 23 | 08:11 | 07:18 | | 06:15 | 06:05 | 05:13 | 04:56 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | | 08:24 |
| | 16:47 | 17:44 | | 18:34 | 20:27 | 21:15 | 21:41 | 21:22 | 20:26 | 19:15 | 18:08 | 6 08:58 (WEA 10) | 07:49 | 16:07 |
| 24 | 08:10 | 07:16 | | 06:12 | 06:03 | 05:11 | 04:56 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | | 08:24 |
| | 16:48 | 17:46 | | 18:35 | 20:29 | 21:17 | 21:42 | 21:21 | 20:24 | 19:13 | 18:06 | 12 09:07 (WEA 10) | 07:51 | 16:08 |
| 25 | 08:09 | 07:13 | | 06:10 | 06:01 | 05:10 | 04:57 | 05:26 | 06:15 | 07:06 | 07:58 | 07:52 | | 08:25 |
| | 16:50 | 17:48 | | 18:37 | 20:30 | 21:18 | 21:42 | 21:19 | 20:22 | 19:10 | 18:04 | 16 08:09 (WEA 10) | 07:52 | 16:09 |
| 26 | 08:07 | 07:11 | | 06:08 | 05:59 | 05:09 | 04:57 | 05:28 | 06:17 | 07:08 | 07:59 | 07:51 (WEA 10) | 07:54 | 08:25 |
| | 16:52 | 17:49 | | 18:39 | 20:32 | 21:19 | 21:42 | 21:18 | 20:20 | 19:08 | 17:02 | 20 08:11 (WEA 10) | 07:54 | 16:09 |
| 27 | 08:06 | 07:09 | | 06:05 | 05:57 | 05:08 | 04:58 | 05:29 | 06:19 | 07:09 | 07:01 | 07:50 (WEA 10) | 07:56 | 08:25 |
| | 16:54 | 17:51 | | 18:41 | 20:34 | 21:21 | 21:41 | 21:17 | 20:17 | 19:06 | 17:00 | 21 08:11 (WEA 10) | 07:56 | 16:10 |
| 28 | 08:04 | 07:07 | | 06:03 | 05:55 | 05:07 | 04:58 | 05:31 | 06:20 | 07:11 | 07:03 | 07:49 (WEA 10) | 07:57 | 08:25 |
| | 16:56 | 17:53 | | 18:42 | 20:35 | 21:22 | 21:41 | 21:15 | 20:15 | 19:03 | 16:58 | 22 08:11 (WEA 10) | 07:57 | 16:11 |
| 29 | 08:03 | | | 07:01 | 05:53 | 05:06 | 04:59 | 05:32 | 06:22 | 07:13 | 07:05 | 07:48 (WEA 10) | 07:59 | 08:26 |
| | 16:57 | | | 19:44 | 20:37 | 21:23 | 21:41 | 21:13 | 20:13 | 19:01 | 16:56 | 24 08:12 (WEA 10) | 07:59 | 16:12 |
| 30 | 08:02 | | | 06:58 | 05:51 | 05:05 | 04:59 | 05:34 | 06:24 | 07:14 | 07:07 | 07:48 (WEA 10) | 08:00 | 08:26 |
| | 16:59 | | | 19:46 | 20:39 | 21:24 | 21:41 | 21:12 | 20:11 | 18:59 | 16:54 | 24 08:12 (WEA 10) | 08:00 | 16:13 |
| 31 | 08:00 | | | 06:56 | | 05:04 | | 05:35 | 06:25 | | 07:08 | 07:48 (WEA 10) | | 08:26 |
| | 17:01 | | | 19:47 | | 21:26 | | 21:10 | 20:08 | | 16:52 | 24 08:12 (WEA 10) | | 16:13 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | 503 | 454 | 381 | 331 | 266 | 175 | 243 | |
| astr.max.mögl.Beschattung | | | 339 | | | | | | | | 169 | 175 | | |
| Red.Sonnenscheinwahrsch. | | | 0,25 | | | | | | | | 0,31 | 0,21 | | |
| Reduktion Betriebsdauer | | | 0,96 | | | | | | | | 0,96 | 0,96 | | |
| Reduktion Windrichtung | | | 0,62 | | | | | | | | 0,62 | 0,62 | | |
| Gesamte Reduktion | | | 0,15 | | | | | | | | 0,18 | 0,13 | | |
| Met.wahrsch.Beschattung | | | 50 | | | | | | | | 31 | 22 | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d48 - Söllingen, Mühlenhof 3

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d48 - Söllingen, Mühlenhof 3

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:08 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:19 18:52 | 07:14 16:46 | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:52 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:16 16:05 |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 07:58 18:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 07:59 18:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 18:00 | 07:56 16:12 | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 17:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 17:56 | 07:59 16:11 | 08:25 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 17:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:15 18:57 | 07:08 17:52 | 08:01 16:09 | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | | 459 | 536 | 367 |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | | 0,63 | 0,58 | 0,57 |
| Gesamte Reduktion | | | | 0,19 | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | | 85 | 63 | 27 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d51 - Söllingen, Pabstorfer Weg 10

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------------|--|--|--|--|----------------|
| 1 | 08:26 16:15 | 09:32 (WEA 13) 07:59 10:04 (WEA 13) 17:03 | 08:28 (WEA 07) 07:05 08:49 (WEA 07) 17:55 | 07:35 (WEA 06) 06:54 07:57 (WEA 06) 19:49 | 07:16 (WEA 01) 05:49 07:37 (WEA 01) 20:40 | 05:03 21:27 |
| 2 | 08:26 16:16 | 09:33 (WEA 13) 07:57 10:04 (WEA 13) 17:05 | 08:27 (WEA 07) 07:03 08:49 (WEA 07) 17:57 | 07:36 (WEA 06) 06:52 07:57 (WEA 06) 19:51 | 07:16 (WEA 01) 05:47 07:37 (WEA 01) 20:42 | 05:02 21:28 |
| 3 | 08:25 16:17 | 09:34 (WEA 13) 07:55 10:05 (WEA 13) 17:07 | 08:27 (WEA 07) 07:00 08:49 (WEA 07) 17:58 | 07:37 (WEA 06) 06:49 07:56 (WEA 06) 19:53 | 07:16 (WEA 01) 05:45 07:37 (WEA 01) 20:44 | 05:01 21:29 |
| 4 | 08:25 16:18 | 09:34 (WEA 13) 07:54 10:05 (WEA 13) 17:08 | 08:27 (WEA 07) 06:58 08:50 (WEA 07) 18:00 | 07:38 (WEA 06) 06:47 07:55 (WEA 06) 19:54 | 07:17 (WEA 01) 05:43 07:37 (WEA 01) 20:46 | 05:01 21:30 |
| 5 | 08:25 16:19 | 09:35 (WEA 13) 07:52 10:05 (WEA 13) 17:10 | 08:25 (WEA 12) 06:56 08:50 (WEA 07) 18:02 | 07:38 (WEA 06) 06:45 07:53 (WEA 06) 19:56 | 07:16 (WEA 01) 05:41 07:35 (WEA 01) 20:47 | 05:00 21:31 |
| 6 | 08:25 16:21 | 09:35 (WEA 13) 07:50 10:05 (WEA 13) 17:12 | 08:24 (WEA 12) 06:54 08:50 (WEA 07) 18:04 | 07:40 (WEA 06) 06:42 07:51 (WEA 06) 19:58 | 07:17 (WEA 01) 05:39 07:34 (WEA 01) 20:49 | 04:59 21:32 |
| 7 | 08:24 16:22 | 09:36 (WEA 13) 07:49 10:06 (WEA 13) 17:14 | 08:23 (WEA 12) 06:52 08:50 (WEA 07) 18:06 | 07:40 (WEA 06) 06:40 08:50 (WEA 07) 19:59 | 07:09 (WEA 10) 05:37 07:33 (WEA 01) 20:50 | 04:59 21:33 |
| 8 | 08:24 16:23 | 09:36 (WEA 13) 07:47 10:06 (WEA 13) 17:16 | 08:23 (WEA 12) 06:49 08:51 (WEA 12) 18:07 | 07:19 (WEA 11) 06:38 07:32 (WEA 11) 20:01 | 07:05 (WEA 10) 05:36 07:30 (WEA 01) 20:52 | 04:58 21:34 |
| 9 | 08:23 16:25 | 09:36 (WEA 13) 07:45 10:05 (WEA 13) 17:18 | 08:22 (WEA 12) 06:47 08:51 (WEA 12) 18:09 | 07:16 (WEA 11) 06:36 07:35 (WEA 11) 20:03 | 07:02 (WEA 10) 05:34 07:23 (WEA 10) 20:54 | 04:58 21:35 |
| 10 | 08:23 16:26 | 09:38 (WEA 13) 07:43 10:06 (WEA 13) 17:20 | 08:22 (WEA 12) 06:45 08:52 (WEA 12) 18:11 | 07:14 (WEA 11) 06:33 07:37 (WEA 11) 20:05 | 07:01 (WEA 10) 05:32 07:24 (WEA 10) 20:55 | 04:57 21:35 |
| 11 | 08:22 16:27 | 09:38 (WEA 13) 07:41 10:06 (WEA 13) 17:22 | 08:21 (WEA 12) 06:42 08:52 (WEA 12) 18:13 | 07:12 (WEA 11) 06:31 07:37 (WEA 11) 20:06 | 07:00 (WEA 10) 05:30 07:26 (WEA 10) 20:57 | 04:57 21:36 |
| 12 | 08:21 16:29 | 09:39 (WEA 13) 07:40 10:06 (WEA 13) 17:23 | 08:22 (WEA 12) 06:40 08:53 (WEA 12) 18:15 | 07:11 (WEA 11) 06:29 07:38 (WEA 11) 20:08 | 06:59 (WEA 10) 05:29 07:26 (WEA 10) 20:59 | 04:57 21:37 |
| 13 | 08:21 16:30 | 09:40 (WEA 13) 07:38 10:05 (WEA 13) 17:25 | 08:22 (WEA 12) 06:38 08:53 (WEA 12) 18:16 | 07:10 (WEA 11) 06:27 07:39 (WEA 11) 20:10 | 06:57 (WEA 10) 05:27 07:26 (WEA 10) 21:00 | 04:56 21:37 |
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| 15 | 08:19 16:33 | 09:42 (WEA 13) 07:34 10:05 (WEA 13) 17:29 | 08:21 (WEA 12) 06:33 08:52 (WEA 12) 18:20 | 07:08 (WEA 11) 06:22 07:39 (WEA 11) 20:13 | 06:56 (WEA 10) 05:24 07:26 (WEA 10) 21:03 | 04:56 21:39 |
| 16 | 08:18 16:35 | 09:43 (WEA 13) 07:32 10:04 (WEA 13) 17:31 | 08:22 (WEA 12) 06:31 08:52 (WEA 12) 18:22 | 07:08 (WEA 11) 06:20 07:39 (WEA 11) 20:15 | 06:56 (WEA 10) 05:22 07:26 (WEA 10) 21:05 | 04:56 21:39 |
| 17 | 08:17 16:37 | 09:45 (WEA 13) 07:30 10:03 (WEA 13) 17:33 | 08:22 (WEA 12) 06:29 08:51 (WEA 12) 18:23 | 07:07 (WEA 11) 06:18 07:39 (WEA 11) 20:17 | 06:55 (WEA 10) 05:21 07:26 (WEA 10) 21:06 | 04:56 21:40 |
| 18 | 08:16 16:38 | 09:47 (WEA 13) 07:28 10:02 (WEA 13) 17:35 | 08:23 (WEA 12) 06:26 08:50 (WEA 12) 18:25 | 07:07 (WEA 11) 06:16 07:38 (WEA 11) 20:18 | 06:55 (WEA 10) 05:19 07:26 (WEA 10) 21:08 | 04:56 21:40 |
| 19 | 08:15 16:40 | 09:49 (WEA 13) 07:26 10:01 (WEA 13) 17:36 | 08:24 (WEA 12) 06:24 08:50 (WEA 12) 18:27 | 07:07 (WEA 11) 06:13 07:38 (WEA 11) 20:20 | 06:55 (WEA 10) 05:18 07:26 (WEA 10) 21:09 | 04:56 21:40 |
| 20 | 08:14 16:42 | 09:53 (WEA 13) 07:24 09:58 (WEA 13) 17:38 | 08:25 (WEA 12) 06:22 08:49 (WEA 12) 18:29 | 07:07 (WEA 11) 06:11 07:37 (WEA 11) 20:22 | 06:56 (WEA 10) 05:17 07:25 (WEA 10) 21:11 | 04:56 21:41 |
| 21 | 08:13 16:43 | 09:58 (WEA 13) 07:22 17:40 | 08:26 (WEA 12) 06:20 08:47 (WEA 12) 18:30 | 07:07 (WEA 11) 06:09 07:36 (WEA 11) 20:23 | 06:56 (WEA 10) 05:15 07:24 (WEA 10) 21:12 | 04:56 21:41 |
| 22 | 08:12 16:45 | 09:59 (WEA 13) 07:20 17:42 | 08:27 (WEA 12) 06:17 08:45 (WEA 12) 18:32 | 07:08 (WEA 11) 06:07 07:35 (WEA 11) 20:25 | 06:56 (WEA 10) 05:14 07:24 (WEA 10) 21:14 | 04:56 21:41 |
| 23 | 08:11 16:47 | 09:59 (WEA 13) 07:18 17:44 | 08:28 (WEA 12) 06:15 08:43 (WEA 12) 18:34 | 07:08 (WEA 11) 06:05 07:33 (WEA 11) 20:27 | 06:57 (WEA 10) 05:13 07:23 (WEA 10) 21:15 | 04:56 21:41 |
| 24 | 08:10 16:48 | 09:59 (WEA 13) 07:16 17:46 | 08:29 (WEA 12) 06:12 07:39 (WEA 06) 18:35 | 07:10 (WEA 11) 06:03 07:32 (WEA 11) 20:29 | 06:58 (WEA 10) 05:11 07:21 (WEA 10) 21:17 | 04:57 21:41 |
| 25 | 08:08 16:50 | 09:59 (WEA 13) 07:13 17:48 | 08:30 (WEA 12) 06:10 07:37 (WEA 06) 18:37 | 07:11 (WEA 11) 06:01 07:30 (WEA 11) 20:30 | 06:59 (WEA 10) 05:10 07:20 (WEA 10) 21:18 | 04:57 21:41 |
| 26 | 08:07 16:52 | 08:34 (WEA 07) 07:11 08:40 (WEA 07) 17:49 | 08:31 (WEA 12) 06:08 07:36 (WEA 06) 18:39 | 07:13 (WEA 11) 05:59 07:27 (WEA 11) 20:32 | 07:00 (WEA 10) 05:09 07:18 (WEA 10) 21:19 | 04:57 21:41 |
| 27 | 08:06 16:54 | 08:33 (WEA 07) 07:09 08:43 (WEA 07) 17:51 | 08:32 (WEA 12) 06:05 07:36 (WEA 06) 18:41 | 06:28 (WEA 01) 05:57 06:34 (WEA 01) 20:34 | 07:02 (WEA 10) 05:08 07:15 (WEA 10) 21:21 | 04:58 21:41 |
| 28 | 08:04 16:56 | 08:31 (WEA 07) 07:07 08:44 (WEA 07) 17:53 | 08:33 (WEA 12) 06:03 07:36 (WEA 06) 18:42 | 06:26 (WEA 01) 05:55 06:36 (WEA 01) 20:35 | 07:06 (WEA 10) 05:07 07:11 (WEA 10) 21:22 | 04:58 21:41 |
| 29 | 08:03 16:57 | 08:30 (WEA 07) 07:05 08:46 (WEA 07) 17:54 | 08:34 (WEA 12) 06:01 07:37 (WEA 06) 18:43 | 07:01 (WEA 11) 05:53 07:36 (WEA 01) 20:37 | 07:07 (WEA 10) 05:06 07:22 (WEA 10) 21:23 | 04:59 21:41 |
| 30 | 08:02 16:59 | 08:28 (WEA 07) 07:03 08:47 (WEA 07) 17:55 | 08:35 (WEA 12) 05:58 07:38 (WEA 06) 18:44 | 07:02 (WEA 11) 05:51 07:37 (WEA 01) 20:39 | 07:08 (WEA 10) 05:05 07:23 (WEA 10) 21:24 | 04:59 21:41 |
| 31 | 08:00 17:01 | 08:28 (WEA 07) 07:01 08:49 (WEA 07) 17:56 | 08:36 (WEA 12) 05:56 07:39 (WEA 06) 18:45 | 07:03 (WEA 11) 05:50 07:38 (WEA 01) 20:40 | 07:09 (WEA 10) 05:04 07:24 (WEA 10) 21:25 | 04:59 21:41 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 585 | 729 | 657 | 668 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,57 | 0,62 | 0,66 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 58 | 105 | 118 | 166 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d51 - Söllingen, Pabstorfer Weg 10

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|---------------------------|---------------------------|---------------------------|---------------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 06:59 (WEA 10) 07:16 | 07:50 (WEA 11) 07:10 | 07:51 (WEA 12) 08:02 | 09:21 (WEA 13) |
| | 21:41 | 21:09 | 20:06 | 25 07:24 (WEA 10) 18:56 | 27 08:17 (WEA 11) 16:50 | 30 08:21 (WEA 12) 16:09 | 27 09:48 (WEA 13) |
| 2 | 05:01 | 05:38 | 06:28 | 07:00 (WEA 10) 07:18 | 07:50 (WEA 11) 07:12 | 07:52 (WEA 12) 08:03 | 09:20 (WEA 13) |
| | 21:40 | 21:07 | 20:04 | 23 07:23 (WEA 10) 18:54 | 26 08:16 (WEA 11) 16:48 | 29 08:21 (WEA 12) 16:09 | 28 09:48 (WEA 13) |
| 3 | 05:01 | 05:40 | 06:30 | 07:00 (WEA 10) 07:19 | 07:52 (WEA 11) 07:14 | 07:52 (WEA 12) 08:04 | 09:21 (WEA 13) |
| | 21:40 | 21:05 | 20:02 | 21 07:21 (WEA 10) 18:52 | 23 08:15 (WEA 11) 16:46 | 28 08:20 (WEA 12) 16:08 | 28 09:49 (WEA 13) |
| 4 | 05:02 | 05:41 | 06:32 | 07:02 (WEA 10) 07:21 | 07:53 (WEA 11) 07:16 | 07:53 (WEA 12) 08:06 | 09:20 (WEA 13) |
| | 21:40 | 21:04 | 19:59 | 25 07:27 (WEA 10) 18:49 | 21 08:14 (WEA 11) 16:44 | 26 08:19 (WEA 12) 16:07 | 30 09:50 (WEA 13) |
| 5 | 05:03 | 05:43 | 06:33 | 07:04 (WEA 10) 07:23 | 07:54 (WEA 11) 07:18 | 07:54 (WEA 12) 08:07 | 09:21 (WEA 13) |
| | 21:39 | 21:02 | 19:57 | 25 07:29 (WEA 10) 18:47 | 16 08:10 (WEA 11) 16:43 | 26 08:20 (WEA 12) 16:07 | 30 09:51 (WEA 13) |
| 6 | 05:04 | 05:45 | 06:35 | 07:13 (WEA 01) 07:25 | 07:58 (WEA 11) 07:19 | 07:55 (WEA 12) 08:08 | 09:21 (WEA 13) |
| | 21:39 | 21:00 | 19:55 | 17 07:30 (WEA 01) 18:45 | 9 08:07 (WEA 11) 16:41 | 25 08:20 (WEA 12) 16:06 | 30 09:51 (WEA 13) |
| 7 | 05:05 | 05:46 | 06:37 | 07:11 (WEA 01) 07:26 | 08:18 (WEA 06) 07:21 | 07:57 (WEA 07) 08:10 | 09:22 (WEA 13) |
| | 21:38 | 20:58 | 19:52 | 19 07:30 (WEA 01) 18:43 | 7 08:25 (WEA 06) 16:39 | 23 08:20 (WEA 07) 16:06 | 30 09:52 (WEA 13) |
| 8 | 05:06 | 05:48 | 06:38 | 07:11 (WEA 01) 07:28 | 08:14 (WEA 06) 07:23 | 07:57 (WEA 07) 08:11 | 09:22 (WEA 13) |
| | 21:37 | 20:56 | 19:50 | 20 07:31 (WEA 01) 18:40 | 13 08:27 (WEA 06) 16:37 | 23 08:20 (WEA 07) 16:06 | 31 09:53 (WEA 13) |
| 9 | 05:07 | 05:49 | 06:40 | 07:11 (WEA 01) 07:30 | 08:12 (WEA 06) 07:25 | 07:58 (WEA 07) 08:12 | 09:22 (WEA 13) |
| | 21:37 | 20:54 | 19:48 | 20 07:31 (WEA 01) 18:38 | 17 08:29 (WEA 06) 16:36 | 22 08:20 (WEA 07) 16:05 | 31 09:53 (WEA 13) |
| 10 | 05:08 | 05:51 | 06:42 | 07:09 (WEA 01) 07:31 | 08:11 (WEA 06) 07:27 | 07:58 (WEA 07) 08:13 | 09:22 (WEA 13) |
| | 21:36 | 20:53 | 19:46 | 21 07:30 (WEA 01) 18:36 | 19 08:30 (WEA 06) 16:34 | 22 08:20 (WEA 07) 16:05 | 31 09:53 (WEA 13) |
| 11 | 05:09 | 05:53 | 06:43 | 07:10 (WEA 01) 07:33 | 08:10 (WEA 06) 07:28 | 07:59 (WEA 07) 08:14 | 09:22 (WEA 13) |
| | 21:35 | 20:51 | 19:43 | 20 07:30 (WEA 01) 18:34 | 21 08:31 (WEA 06) 16:33 | 20 08:19 (WEA 07) 16:05 | 32 09:54 (WEA 13) |
| 12 | 05:10 | 05:54 | 06:45 | 07:10 (WEA 01) 07:35 | 08:10 (WEA 06) 07:30 | 08:00 (WEA 07) 08:15 | 09:22 (WEA 13) |
| | 21:34 | 20:49 | 19:41 | 19 07:29 (WEA 01) 18:31 | 21 08:31 (WEA 06) 16:31 | 19 08:19 (WEA 07) 16:05 | 32 09:54 (WEA 13) |
| 13 | 05:11 | 05:56 | 06:46 | 07:12 (WEA 01) 07:37 | 08:08 (WEA 06) 07:32 | 08:02 (WEA 07) 08:16 | 09:23 (WEA 13) |
| | 21:33 | 20:47 | 19:39 | 17 07:29 (WEA 01) 18:29 | 22 08:30 (WEA 06) 16:30 | 16 08:18 (WEA 07) 16:05 | 32 09:55 (WEA 13) |
| 14 | 05:12 | 05:57 | 06:48 | 07:14 (WEA 01) 07:38 | 08:08 (WEA 06) 07:34 | 08:04 (WEA 07) 08:17 | 09:23 (WEA 13) |
| | 21:32 | 20:45 | 19:36 | 14 07:28 (WEA 01) 18:27 | 23 08:31 (WEA 06) 16:28 | 13 08:17 (WEA 07) 16:05 | 32 09:55 (WEA 13) |
| 15 | 05:13 | 05:59 | 06:50 | 07:15 (WEA 01) 07:40 | 08:08 (WEA 06) 07:35 | 08:06 (WEA 07) 08:18 | 09:24 (WEA 13) |
| | 21:31 | 20:43 | 8 07:20 (WEA 10) 19:34 | 11 07:26 (WEA 01) 18:25 | 22 08:30 (WEA 06) 16:27 | 10 08:16 (WEA 07) 16:05 | 32 09:56 (WEA 13) |
| 16 | 05:14 | 06:01 | 07:08 (WEA 10) 06:51 | 07:17 (WEA 01) 07:42 | 08:09 (WEA 06) 07:37 | 08:08 (WEA 07) 08:19 | 09:24 (WEA 13) |
| | 21:30 | 20:41 | 15 07:23 (WEA 10) 19:32 | 7 07:24 (WEA 01) 18:22 | 21 08:30 (WEA 06) 16:25 | 6 08:14 (WEA 07) 16:05 | 32 09:56 (WEA 13) |
| 17 | 05:16 | 06:02 | 07:06 (WEA 10) 06:53 | 08:02 (WEA 11) 07:44 | 08:10 (WEA 06) 07:39 | 08:20 (WEA 07) 08:20 | 09:25 (WEA 13) |
| | 21:29 | 20:39 | 19 07:25 (WEA 10) 19:29 | 12 08:14 (WEA 11) 18:20 | 19 08:29 (WEA 06) 16:24 | 16:05 | 32 09:57 (WEA 13) |
| 18 | 05:17 | 06:04 | 07:04 (WEA 10) 06:55 | 07:59 (WEA 11) 07:45 | 08:12 (WEA 06) 07:41 | 08:21 (WEA 07) 08:21 | 09:26 (WEA 13) |
| | 21:28 | 20:37 | 22 07:26 (WEA 10) 19:27 | 18 08:17 (WEA 11) 18:18 | 23 09:11 (WEA 12) 16:22 | 16:05 | 32 09:58 (WEA 13) |
| 19 | 05:18 | 06:06 | 07:03 (WEA 10) 06:56 | 07:58 (WEA 11) 07:47 | 08:13 (WEA 06) 07:42 | 08:21 (WEA 07) 08:21 | 09:25 (WEA 13) |
| | 21:27 | 20:35 | 24 07:27 (WEA 10) 19:24 | 21 08:19 (WEA 11) 18:16 | 27 09:14 (WEA 12) 16:21 | 16:06 | 33 09:58 (WEA 13) |
| 20 | 05:19 | 06:07 | 07:01 (WEA 10) 06:58 | 07:55 (WEA 11) 07:49 | 08:15 (WEA 06) 07:44 | 08:22 (WEA 07) 08:22 | 09:26 (WEA 13) |
| | 21:26 | 20:32 | 26 07:27 (WEA 10) 19:22 | 25 08:20 (WEA 11) 18:14 | 28 09:16 (WEA 12) 16:20 | 16:06 | 33 09:59 (WEA 13) |
| 21 | 05:21 | 06:09 | 07:01 (WEA 10) 07:00 | 07:54 (WEA 11) 07:51 | 08:17 (WEA 06) 07:46 | 08:23 (WEA 07) 08:23 | 09:27 (WEA 13) |
| | 21:25 | 20:30 | 27 07:28 (WEA 10) 19:20 | 27 08:21 (WEA 11) 18:12 | 27 09:18 (WEA 12) 16:19 | 16:06 | 32 09:59 (WEA 13) |
| 22 | 05:22 | 06:10 | 07:00 (WEA 10) 07:01 | 07:52 (WEA 11) 07:52 | 08:55 (WEA 12) 07:47 | 09:29 (WEA 13) 08:23 | 09:27 (WEA 13) |
| | 21:23 | 20:28 | 28 07:28 (WEA 10) 19:17 | 29 08:21 (WEA 11) 18:10 | 24 09:19 (WEA 12) 16:18 | 5 09:34 (WEA 13) 16:07 | 32 09:59 (WEA 13) |
| 23 | 05:23 | 06:12 | 06:59 (WEA 10) 07:03 | 07:52 (WEA 11) 07:54 | 08:54 (WEA 12) 07:49 | 09:26 (WEA 13) 08:24 | 09:27 (WEA 13) |
| | 21:22 | 20:26 | 30 07:29 (WEA 10) 19:15 | 29 08:21 (WEA 11) 18:08 | 26 09:20 (WEA 12) 16:16 | 12 09:38 (WEA 13) 16:07 | 33 10:00 (WEA 13) |
| 24 | 05:25 | 06:14 | 06:59 (WEA 10) 07:04 | 07:51 (WEA 11) 07:56 | 08:53 (WEA 12) 07:51 | 09:24 (WEA 13) 08:24 | 09:28 (WEA 13) |
| | 21:21 | 20:24 | 31 07:30 (WEA 10) 19:13 | 31 08:22 (WEA 11) 18:06 | 28 09:21 (WEA 12) 16:15 | 15 09:39 (WEA 13) 16:08 | 33 10:01 (WEA 13) |
| 25 | 05:26 | 06:15 | 06:58 (WEA 10) 07:06 | 07:50 (WEA 11) 06:58 | 07:52 (WEA 12) 07:52 | 09:23 (WEA 13) 08:25 | 09:28 (WEA 13) |
| | 21:19 | 20:22 | 31 07:29 (WEA 10) 19:10 | 31 08:21 (WEA 11) 17:04 | 30 08:22 (WEA 12) 16:14 | 18 09:41 (WEA 13) 16:09 | 33 10:01 (WEA 13) |
| 26 | 05:28 | 06:17 | 06:58 (WEA 10) 07:08 | 07:50 (WEA 11) 06:59 | 07:52 (WEA 12) 07:54 | 09:22 (WEA 13) 08:25 | 09:29 (WEA 13) |
| | 21:18 | 20:20 | 31 07:29 (WEA 10) 19:08 | 31 08:21 (WEA 11) 17:02 | 30 08:22 (WEA 12) 16:13 | 21 09:43 (WEA 13) 16:09 | 32 10:01 (WEA 13) |
| 27 | 05:29 | 06:19 | 06:57 (WEA 10) 07:09 | 07:50 (WEA 11) 07:01 | 07:52 (WEA 12) 07:56 | 09:21 (WEA 13) 08:25 | 09:29 (WEA 13) |
| | 21:16 | 20:17 | 31 07:28 (WEA 10) 19:06 | 31 08:21 (WEA 11) 17:00 | 30 08:22 (WEA 12) 16:12 | 23 09:44 (WEA 13) 16:10 | 32 10:01 (WEA 13) |
| 28 | 05:31 | 06:20 | 06:58 (WEA 10) 07:11 | 07:49 (WEA 11) 07:03 | 07:51 (WEA 12) 07:57 | 09:21 (WEA 13) 08:25 | 09:30 (WEA 13) |
| | 21:15 | 20:15 | 30 07:28 (WEA 10) 19:03 | 31 08:20 (WEA 11) 16:58 | 31 08:22 (WEA 12) 16:12 | 24 09:45 (WEA 13) 16:11 | 33 10:03 (WEA 13) |
| 29 | 05:32 | 06:22 | 06:57 (WEA 10) 07:13 | 07:49 (WEA 11) 07:05 | 07:51 (WEA 12) 07:59 | 09:21 (WEA 13) 08:25 | 09:31 (WEA 13) |
| | 21:13 | 20:13 | 30 07:27 (WEA 10) 19:01 | 31 08:20 (WEA 11) 16:56 | 31 08:22 (WEA 12) 16:11 | 25 09:46 (WEA 13) 16:12 | 32 10:03 (WEA 13) |
| 30 | 05:34 | 06:24 | 06:58 (WEA 10) 07:14 | 07:50 (WEA 11) 07:07 | 07:51 (WEA 12) 08:00 | 09:20 (WEA 13) 08:26 | 09:30 (WEA 13) |
| | 21:12 | 20:11 | 29 07:27 (WEA 10) 18:59 | 29 08:19 (WEA 11) 16:54 | 31 08:22 (WEA 12) 16:10 | 27 09:47 (WEA 13) 16:13 | 33 10:03 (WEA 13) |
| 31 | 05:35 | 06:25 | 06:58 (WEA 10) 07:15 | 07:51 (WEA 11) 07:08 | 07:51 (WEA 12) 08:00 | 09:20 (WEA 13) 08:26 | 09:31 (WEA 13) |
| | 21:10 | 20:08 | 27 07:25 (WEA 10) 18:57 | 27 08:17 (WEA 11) 16:52 | 30 08:21 (WEA 12) 16:09 | 16:13 | 32 10:03 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | |
| astr.max.mögl.Beschattung | | 439 | 680 | 723 | 508 | 975 | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | |
| Reduktion Windrichtung | | 0,71 | 0,68 | 0,63 | 0,60 | 0,57 | |
| Gesamte Reduktion | | 0,30 | 0,24 | 0,18 | 0,12 | 0,07 | |
| Met.wahrsch.Beschattung | | 130 | 161 | 132 | 60 | 71 | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d54 - Söllingen, Pabstorfer Weg 15

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | |
|---------------------------|------------------------|------------------------|-----------------------------|-----------------------------|-----------------------------|-------|-------|
| 1 08:26 | 09:29 (WEA 13) 07:59 | 08:25 (WEA 07) 07:05 | 07:28 (WEA 06) 06:54 | 07:49 (WEA 11) 05:49 | 06:34 (WEA 10) 05:03 | | |
| 16:15 36 | 10:05 (WEA 13) 17:03 | 08:39 (WEA 07) 17:55 | 08:36 (WEA 12) 19:49 | 08:17 (WEA 11) 20:40 | 07:06 (WEA 10) 21:27 | | |
| 2 08:25 | 09:30 (WEA 13) 07:57 | 08:23 (WEA 07) 07:03 | 07:27 (WEA 06) 06:52 | 07:14 (WEA 11) 05:47 | 06:34 (WEA 10) 05:02 | | |
| 16:16 35 | 10:05 (WEA 13) 17:05 | 08:40 (WEA 07) 17:57 | 08:33 (WEA 12) 19:51 | 08:16 (WEA 11) 20:42 | 07:05 (WEA 10) 21:28 | | |
| 3 08:25 | 09:30 (WEA 13) 07:55 | 08:22 (WEA 07) 07:00 | 07:26 (WEA 06) 06:49 | 07:12 (WEA 11) 05:45 | 06:35 (WEA 10) 05:01 | | |
| 16:17 36 | 10:06 (WEA 13) 17:07 | 08:41 (WEA 07) 17:58 | 07:49 (WEA 06) 19:53 | 08:15 (WEA 11) 20:44 | 07:05 (WEA 10) 21:29 | | |
| 4 08:25 | 09:30 (WEA 13) 07:54 | 08:22 (WEA 07) 06:58 | 07:26 (WEA 06) 06:47 | 07:10 (WEA 11) 05:43 | 06:35 (WEA 10) 05:01 | | |
| 16:18 36 | 10:06 (WEA 13) 17:08 | 08:43 (WEA 07) 18:00 | 07:49 (WEA 06) 19:54 | 08:12 (WEA 11) 20:46 | 07:04 (WEA 10) 21:30 | | |
| 5 08:25 | 09:31 (WEA 13) 07:52 | 08:21 (WEA 07) 06:56 | 07:25 (WEA 06) 06:45 | 07:07 (WEA 11) 05:41 | 06:35 (WEA 10) 05:00 | | |
| 16:19 36 | 10:07 (WEA 13) 17:10 | 08:44 (WEA 07) 18:02 | 07:48 (WEA 06) 19:56 | 08:09 (WEA 11) 20:47 | 07:03 (WEA 10) 21:31 | | |
| 6 08:25 | 09:31 (WEA 13) 07:50 | 08:21 (WEA 07) 06:54 | 07:25 (WEA 06) 06:42 | 07:05 (WEA 11) 05:39 | 06:36 (WEA 10) 04:59 | | |
| 16:21 36 | 10:07 (WEA 13) 17:12 | 08:44 (WEA 07) 18:04 | 07:48 (WEA 06) 19:58 | 07:24 (WEA 11) 20:49 | 07:02 (WEA 10) 21:32 | | |
| 7 08:24 | 09:32 (WEA 13) 07:49 | 08:20 (WEA 07) 06:51 | 07:25 (WEA 06) 06:40 | 07:03 (WEA 11) 05:37 | 06:37 (WEA 10) 04:59 | | |
| 16:22 36 | 10:08 (WEA 13) 17:14 | 08:44 (WEA 07) 18:06 | 07:48 (WEA 06) 19:59 | 07:25 (WEA 11) 20:50 | 07:02 (WEA 10) 21:33 | | |
| 8 08:24 | 09:32 (WEA 13) 07:47 | 08:20 (WEA 07) 06:49 | 07:25 (WEA 06) 06:38 | 07:03 (WEA 11) 05:36 | 06:38 (WEA 10) 04:58 | | |
| 16:23 36 | 10:08 (WEA 13) 17:16 | 08:44 (WEA 07) 18:07 | 07:46 (WEA 06) 20:01 | 07:25 (WEA 11) 20:52 | 07:00 (WEA 10) 21:34 | | |
| 9 08:23 | 09:32 (WEA 13) 07:45 | 08:20 (WEA 07) 06:47 | 07:26 (WEA 06) 06:36 | 07:02 (WEA 11) 05:34 | 06:39 (WEA 10) 04:58 | | |
| 16:25 36 | 10:08 (WEA 13) 17:18 | 08:45 (WEA 07) 18:09 | 07:46 (WEA 06) 20:03 | 07:24 (WEA 11) 20:54 | 06:59 (WEA 10) 21:35 | | |
| 10 08:23 | 09:33 (WEA 13) 07:43 | 08:18 (WEA 12) 06:45 | 07:27 (WEA 06) 06:33 | 07:02 (WEA 11) 05:32 | 06:41 (WEA 10) 04:57 | | |
| 16:26 36 | 10:09 (WEA 13) 17:20 | 08:44 (WEA 07) 18:11 | 07:45 (WEA 06) 20:05 | 07:23 (WEA 11) 20:55 | 06:57 (WEA 10) 21:35 | | |
| 11 08:22 | 09:34 (WEA 13) 07:41 | 08:16 (WEA 12) 06:42 | 07:28 (WEA 06) 06:31 | 07:02 (WEA 11) 05:30 | 06:42 (WEA 10) 04:57 | | |
| 16:27 35 | 10:09 (WEA 13) 17:22 | 08:44 (WEA 07) 18:13 | 07:42 (WEA 06) 20:06 | 07:23 (WEA 11) 20:57 | 06:55 (WEA 10) 21:36 | | |
| 12 08:21 | 09:34 (WEA 13) 07:40 | 08:16 (WEA 12) 06:40 | 07:30 (WEA 06) 06:29 | 07:03 (WEA 11) 05:29 | 06:46 (WEA 10) 04:57 | | |
| 16:29 35 | 10:09 (WEA 13) 17:23 | 08:45 (WEA 07) 18:15 | 07:39 (WEA 06) 20:08 | 07:22 (WEA 11) 20:59 | 06:52 (WEA 10) 21:37 | | |
| 13 08:21 | 09:35 (WEA 13) 07:38 | 08:15 (WEA 12) 06:38 | | 07:03 (WEA 11) 05:27 | | 04:56 | |
| 16:30 34 | 10:09 (WEA 13) 17:25 | 08:44 (WEA 07) 18:16 | | 07:20 (WEA 11) 21:00 | | 21:37 | |
| 14 08:20 | 09:35 (WEA 13) 07:36 | 08:13 (WEA 12) 06:36 | | 07:04 (WEA 11) 05:26 | | 04:56 | |
| 16:32 34 | 10:09 (WEA 13) 17:27 | 08:42 (WEA 07) 18:18 | | 07:18 (WEA 11) 21:02 | | 21:38 | |
| 15 08:19 | 09:36 (WEA 13) 07:34 | 08:12 (WEA 12) 06:33 | | 07:06 (WEA 11) 05:24 | | 04:56 | |
| 16:33 33 | 10:09 (WEA 13) 17:29 | 08:43 (WEA 07) 18:20 | | 07:16 (WEA 11) 21:03 | | 21:39 | |
| 16 08:18 | 09:37 (WEA 13) 07:32 | 08:12 (WEA 12) 06:31 | 07:04 (WEA 11) 06:20 | | 05:22 | 04:56 | |
| 16:35 32 | 10:09 (WEA 13) 17:31 | 08:44 (WEA 07) 18:22 | 11 07:15 (WEA 11) 20:15 | | 21:05 | 21:39 | |
| 17 08:17 | 09:37 (WEA 13) 07:30 | 08:11 (WEA 12) 06:29 | 06:59 (WEA 11) 06:18 | 06:48 (WEA 10) 05:21 | | 04:56 | |
| 16:37 32 | 10:09 (WEA 13) 17:33 | 08:44 (WEA 07) 18:23 | 18 07:17 (WEA 11) 20:17 | 9 06:57 (WEA 10) 21:06 | | 21:40 | |
| 18 08:16 | 09:38 (WEA 13) 07:28 | 08:11 (WEA 12) 06:26 | 06:57 (WEA 11) 06:16 | 06:45 (WEA 10) 05:19 | | 04:56 | |
| 16:38 31 | 10:09 (WEA 13) 17:35 | 08:45 (WEA 07) 18:25 | 22 07:19 (WEA 11) 20:18 | 16 07:01 (WEA 10) 21:08 | | 21:40 | |
| 19 08:15 | 09:40 (WEA 13) 07:26 | 08:11 (WEA 12) 06:24 | 06:56 (WEA 11) 06:13 | 06:42 (WEA 10) 05:18 | | 04:56 | |
| 16:40 29 | 10:09 (WEA 13) 17:36 | 08:45 (WEA 07) 18:27 | 25 07:21 (WEA 11) 20:20 | 21 07:03 (WEA 10) 21:09 | | 21:40 | |
| 20 08:14 | 09:41 (WEA 13) 07:24 | 08:11 (WEA 12) 06:22 | 06:53 (WEA 11) 06:11 | 06:41 (WEA 10) 05:17 | | 04:56 | |
| 16:42 27 | 10:08 (WEA 13) 17:38 | 08:45 (WEA 07) 18:28 | 28 07:21 (WEA 11) 20:22 | 23 07:04 (WEA 10) 21:11 | | 21:41 | |
| 21 08:13 | 09:41 (WEA 13) 07:22 | 08:11 (WEA 12) 06:19 | 06:52 (WEA 11) 06:09 | 06:39 (WEA 10) 05:15 | | 04:56 | |
| 16:43 26 | 10:07 (WEA 13) 17:40 | 08:45 (WEA 07) 18:30 | 30 07:22 (WEA 11) 20:23 | 26 07:05 (WEA 10) 21:12 | | 21:41 | |
| 22 08:12 | 09:43 (WEA 13) 07:20 | 08:11 (WEA 12) 06:17 | 06:52 (WEA 11) 06:07 | 06:38 (WEA 10) 05:14 | | 04:56 | |
| 16:45 24 | 10:07 (WEA 13) 17:42 | 08:45 (WEA 07) 18:32 | 31 07:23 (WEA 11) 20:25 | 28 07:06 (WEA 10) 21:14 | | 21:41 | |
| 23 08:11 | 09:45 (WEA 13) 07:18 | 08:12 (WEA 12) 06:15 | 06:50 (WEA 11) 06:05 | 06:37 (WEA 10) 05:13 | | 04:56 | |
| 16:47 21 | 10:06 (WEA 13) 17:44 | 08:44 (WEA 07) 18:34 | 33 07:23 (WEA 11) 20:27 | 29 07:06 (WEA 10) 21:15 | | 21:41 | |
| 24 08:10 | 09:46 (WEA 13) 07:16 | 08:11 (WEA 12) 06:12 | 06:50 (WEA 11) 06:03 | 06:36 (WEA 10) 05:11 | | 04:57 | |
| 16:48 18 | 10:04 (WEA 13) 17:46 | 08:43 (WEA 07) 18:35 | 33 07:23 (WEA 11) 20:29 | 31 07:07 (WEA 10) 21:17 | | 21:41 | |
| 25 08:08 | 09:48 (WEA 13) 07:13 | 08:12 (WEA 12) 06:10 | 06:50 (WEA 11) 06:01 | 06:36 (WEA 10) 05:10 | | 04:57 | |
| 16:50 15 | 10:03 (WEA 13) 17:48 | 08:42 (WEA 07) 18:37 | 33 07:23 (WEA 11) 20:30 | 31 07:07 (WEA 10) 21:18 | | 21:41 | |
| 26 08:07 | 09:52 (WEA 13) 07:11 | 07:35 (WEA 06) 06:08 | 06:49 (WEA 11) 05:59 | 06:35 (WEA 10) 05:09 | | 04:57 | |
| 16:52 7 | 09:59 (WEA 13) 17:49 | 08:41 (WEA 07) 18:39 | 33 07:22 (WEA 11) 20:32 | 32 07:07 (WEA 10) 21:19 | | 21:41 | |
| 27 08:06 | | 07:33 (WEA 06) 06:05 | 06:49 (WEA 11) 05:57 | 06:35 (WEA 10) 05:08 | | 04:58 | |
| 16:54 | | 17:51 38 | 08:40 (WEA 12) 18:41 | 33 07:22 (WEA 11) 20:34 | 32 07:07 (WEA 10) 21:21 | | 21:41 |
| 28 08:04 | | 07:07 | 07:31 (WEA 06) 06:03 | 06:49 (WEA 11) 05:55 | 06:34 (WEA 10) 05:07 | | 04:58 |
| 16:56 | | 17:53 39 | 08:39 (WEA 12) 18:42 | 33 07:22 (WEA 11) 20:35 | 33 07:07 (WEA 10) 21:22 | | 21:41 |
| 29 08:03 | | | 07:01 | 07:48 (WEA 11) 05:53 | 06:34 (WEA 10) 05:06 | | 04:59 |
| 16:57 | | | 19:44 33 | 08:21 (WEA 11) 20:37 | 33 07:07 (WEA 10) 21:23 | | 21:41 |
| 30 08:02 | | | 06:58 | 07:49 (WEA 11) 05:51 | 06:34 (WEA 10) 05:05 | | 04:59 |
| 16:59 | | | 19:46 31 | 08:20 (WEA 11) 20:39 | 32 07:06 (WEA 10) 21:24 | | 21:41 |
| 31 08:00 | 08:27 (WEA 07) | | 06:56 | 07:49 (WEA 11) | 05:04 | | |
| 17:01 10 | 08:37 (WEA 07) | | 19:47 30 | 08:19 (WEA 11) | 21:25 | | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | |
| astr.max.mögl.Beschattung | 802 | 803 | 728 | 717 | 278 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | 0,45 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,57 | 0,62 | 0,66 | 0,71 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,25 | 0,30 | | |
| Met.wahrsch.Beschattung | 78 | 116 | 131 | 176 | 83 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d54 - Söllingen, Pabstorfer Weg 15

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 211 228 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | |
|---------------------------|-------|--------|-------------------|---------|-------------------|----------|-------------------|-------|-------------------|-------|-------------------|
| 1 | 05:00 | 05:37 | 06:55 (WEA 10) | 06:27 | 07:01 (WEA 01) | 07:16 | 08:11 (WEA 06) | 07:10 | 07:48 (WEA 12) | 08:02 | 09:16 (WEA 13) |
| | 21:41 | 21:09 | 9 07:04 (WEA 10) | 20:06 | 21 07:22 (WEA 01) | 18:56 | 5 08:16 (WEA 06) | 16:50 | 26 08:14 (WEA 07) | 16:09 | 35 09:51 (WEA 13) |
| 2 | 05:01 | 05:38 | 06:52 (WEA 10) | 06:28 | 07:01 (WEA 01) | 07:18 | 08:07 (WEA 06) | 07:12 | 07:50 (WEA 07) | 08:03 | 09:16 (WEA 13) |
| | 21:40 | 21:07 | 14 07:06 (WEA 10) | 20:04 | 21 07:22 (WEA 01) | 18:54 | 13 08:20 (WEA 06) | 16:48 | 24 08:14 (WEA 07) | 16:09 | 35 09:51 (WEA 13) |
| 3 | 05:01 | 05:40 | 06:50 (WEA 10) | 06:30 | 07:00 (WEA 01) | 07:19 | 08:06 (WEA 06) | 07:14 | 07:50 (WEA 07) | 08:04 | 09:16 (WEA 13) |
| | 21:40 | 21:05 | 19 07:09 (WEA 10) | 20:02 | 22 07:22 (WEA 01) | 18:52 | 16 08:22 (WEA 06) | 16:46 | 24 08:14 (WEA 07) | 16:08 | 36 09:52 (WEA 13) |
| 4 | 05:02 | 05:41 | 06:48 (WEA 10) | 06:32 | 07:00 (WEA 01) | 07:21 | 08:04 (WEA 06) | 07:16 | 07:50 (WEA 07) | 08:06 | 09:16 (WEA 13) |
| | 21:40 | 21:03 | 21 07:09 (WEA 10) | 19:59 | 22 07:22 (WEA 01) | 18:49 | 19 08:23 (WEA 06) | 16:44 | 24 08:14 (WEA 07) | 16:07 | 36 09:52 (WEA 13) |
| 5 | 05:03 | 05:43 | 06:47 (WEA 10) | 06:33 | 06:59 (WEA 01) | 07:23 | 08:02 (WEA 06) | 07:18 | 07:51 (WEA 07) | 08:07 | 09:17 (WEA 13) |
| | 21:39 | 21:02 | 23 07:10 (WEA 10) | 19:57 | 22 07:21 (WEA 01) | 18:47 | 21 08:23 (WEA 06) | 16:43 | 23 08:14 (WEA 07) | 16:07 | 36 09:53 (WEA 13) |
| 6 | 05:04 | 05:45 | 06:46 (WEA 10) | 06:35 | 07:01 (WEA 01) | 07:25 | 08:02 (WEA 06) | 07:19 | 07:51 (WEA 07) | 08:08 | 09:17 (WEA 13) |
| | 21:39 | 21:00 | 26 07:12 (WEA 10) | 19:55 | 19 07:20 (WEA 01) | 18:45 | 22 08:24 (WEA 06) | 16:41 | 22 08:13 (WEA 07) | 16:06 | 36 09:53 (WEA 13) |
| 7 | 05:05 | 05:46 | 06:45 (WEA 10) | 06:37 | 07:02 (WEA 01) | 07:26 | 08:01 (WEA 06) | 07:21 | 07:52 (WEA 07) | 08:10 | 09:18 (WEA 13) |
| | 21:38 | 20:58 | 27 07:12 (WEA 10) | 19:52 | 30 08:04 (WEA 11) | 18:43 | 23 08:24 (WEA 06) | 16:39 | 21 08:13 (WEA 07) | 16:06 | 36 09:54 (WEA 13) |
| 8 | 05:06 | 05:48 | 06:45 (WEA 10) | 06:38 | 07:04 (WEA 01) | 07:28 | 08:00 (WEA 06) | 07:23 | 07:53 (WEA 07) | 08:11 | 09:18 (WEA 13) |
| | 21:37 | 20:56 | 28 07:13 (WEA 10) | 19:50 | 32 08:06 (WEA 11) | 18:40 | 23 08:23 (WEA 06) | 16:37 | 19 08:12 (WEA 07) | 16:06 | 36 09:54 (WEA 13) |
| 9 | 05:07 | 05:49 | 06:43 (WEA 10) | 06:40 | 07:06 (WEA 01) | 07:30 | 08:00 (WEA 06) | 07:25 | 07:54 (WEA 07) | 08:12 | 09:18 (WEA 13) |
| | 21:37 | 20:54 | 30 07:13 (WEA 10) | 19:48 | 33 08:09 (WEA 11) | 18:38 | 23 08:23 (WEA 06) | 16:36 | 17 08:11 (WEA 07) | 16:05 | 36 09:54 (WEA 13) |
| 10 | 05:08 | 05:51 | 06:43 (WEA 10) | 06:42 | 07:07 (WEA 01) | 07:31 | 08:00 (WEA 06) | 07:27 | 07:56 (WEA 07) | 08:13 | 09:19 (WEA 13) |
| | 21:36 | 20:53 | 31 07:14 (WEA 10) | 19:46 | 31 08:09 (WEA 11) | 18:36 | 23 08:23 (WEA 06) | 16:34 | 14 08:10 (WEA 07) | 16:05 | 36 09:55 (WEA 13) |
| 11 | 05:09 | 05:53 | 06:42 (WEA 10) | 06:43 | 07:43 (WEA 11) | 07:33 | 08:00 (WEA 06) | 07:28 | 07:58 (WEA 07) | 08:14 | 09:19 (WEA 13) |
| | 21:35 | 20:51 | 32 07:14 (WEA 10) | 19:43 | 27 08:10 (WEA 11) | 18:34 | 31 09:05 (WEA 12) | 16:33 | 9 08:07 (WEA 07) | 16:05 | 36 09:55 (WEA 13) |
| 12 | 05:10 | 05:54 | 06:42 (WEA 10) | 06:45 | 07:41 (WEA 11) | 07:35 | 08:01 (WEA 06) | 07:30 | | 08:15 | 09:19 (WEA 13) |
| | 21:34 | 20:49 | 32 07:14 (WEA 10) | 19:41 | 29 08:10 (WEA 11) | 18:31 | 38 09:09 (WEA 12) | 16:31 | | 16:05 | 36 09:55 (WEA 13) |
| 13 | 05:11 | 05:56 | 06:42 (WEA 10) | 06:46 | 07:40 (WEA 11) | 07:37 | 08:02 (WEA 06) | 07:32 | | 08:16 | 09:20 (WEA 13) |
| | 21:33 | 20:47 | 33 07:15 (WEA 10) | 19:39 | 31 08:11 (WEA 11) | 18:29 | 39 09:10 (WEA 12) | 16:30 | | 16:05 | 36 09:56 (WEA 13) |
| 14 | 05:12 | 05:57 | 06:42 (WEA 10) | 06:48 | 07:40 (WEA 11) | 07:38 | 08:04 (WEA 06) | 07:34 | | 08:17 | 09:20 (WEA 13) |
| | 21:32 | 20:45 | 32 07:14 (WEA 10) | 19:36 | 32 08:12 (WEA 11) | 18:27 | 38 09:11 (WEA 12) | 16:28 | | 16:05 | 36 09:56 (WEA 13) |
| 15 | 05:13 | 05:59 | 06:42 (WEA 10) | 06:50 | 07:38 (WEA 11) | 07:40 | 08:06 (WEA 06) | 07:35 | | 08:18 | 09:21 (WEA 13) |
| | 21:31 | 20:43 | 32 07:14 (WEA 10) | 19:34 | 33 08:11 (WEA 11) | 18:25 | 37 09:13 (WEA 12) | 16:27 | | 16:05 | 36 09:57 (WEA 13) |
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| | 21:30 | 20:41 | 33 07:14 (WEA 10) | 19:32 | 34 08:12 (WEA 11) | 18:22 | 34 09:14 (WEA 12) | 16:25 | 8 09:32 (WEA 13) | 16:05 | 35 09:57 (WEA 13) |
| 17 | 05:16 | 06:02 | 06:42 (WEA 10) | 06:53 | 07:37 (WEA 11) | 07:43 | 08:44 (WEA 12) | 07:39 | 09:21 (WEA 13) | 08:20 | 09:22 (WEA 13) |
| | 21:29 | 20:39 | 32 07:14 (WEA 10) | 19:29 | 34 08:11 (WEA 11) | 18:20 | 31 09:15 (WEA 12) | 16:24 | 15 09:36 (WEA 13) | 16:05 | 36 09:58 (WEA 13) |
| 18 | 05:17 | 06:04 | 06:41 (WEA 10) | 06:55 | 07:37 (WEA 11) | 07:45 | 08:42 (WEA 12) | 07:41 | 09:20 (WEA 13) | 08:21 | 09:23 (WEA 13) |
| | 21:28 | 20:37 | 32 07:13 (WEA 10) | 19:27 | 34 08:11 (WEA 11) | 18:18 | 32 09:14 (WEA 12) | 16:22 | 18 09:38 (WEA 13) | 16:05 | 35 09:58 (WEA 13) |
| 19 | 05:18 | 06:06 | 06:42 (WEA 10) | 06:56 | 07:37 (WEA 11) | 07:47 | 08:42 (WEA 12) | 07:42 | 09:19 (WEA 13) | 08:21 | 09:23 (WEA 13) |
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| 20 | 05:19 | 06:07 | 06:42 (WEA 10) | 06:58 | 07:37 (WEA 11) | 07:49 | 08:42 (WEA 12) | 07:44 | 09:18 (WEA 13) | 08:22 | 09:24 (WEA 13) |
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| | 21:23 | 20:28 | 26 07:09 (WEA 10) | 19:17 | 30 08:07 (WEA 11) | 18:10 | 34 09:15 (WEA 12) | 16:18 | 27 09:44 (WEA 13) | 16:07 | 35 10:00 (WEA 13) |
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| | 21:21 | 20:24 | 20 07:06 (WEA 10) | 19:13 | 26 08:05 (WEA 11) | 18:06 | 34 09:15 (WEA 12) | 16:15 | 31 09:46 (WEA 13) | 16:08 | 35 10:01 (WEA 13) |
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| | 21:18 | 20:20 | 7 06:59 (WEA 10) | 19:08 | 20 08:01 (WEA 11) | 17:02 | 32 08:14 (WEA 12) | 16:13 | 32 09:48 (WEA 13) | 16:09 | 36 10:02 (WEA 13) |
| 27 | 05:29 | 06:19 | | 07:09 | 07:44 (WEA 11) | 07:01 | 07:43 (WEA 12) | 07:56 | 09:15 (WEA 13) | 08:25 | 09:26 (WEA 13) |
| | 21:16 | 20:17 | | 19:06 | 14 07:58 (WEA 11) | 17:00 | 31 08:14 (WEA 12) | 16:12 | 33 09:48 (WEA 13) | 16:10 | 36 10:02 (WEA 13) |
| 28 | 05:31 | 06:20 | 07:08 (WEA 01) | 07:11 | | 07:03 | 07:43 (WEA 12) | 07:57 | 09:15 (WEA 13) | 08:25 | 09:28 (WEA 13) |
| | 21:15 | 20:15 | 10 07:18 (WEA 01) | 19:03 | | 16:58 | 29 08:12 (WEA 07) | 16:12 | 34 09:49 (WEA 13) | 16:11 | 35 10:03 (WEA 13) |
| 29 | 05:32 | 06:22 | 07:05 (WEA 01) | 07:13 | | 07:05 | 07:43 (WEA 12) | 07:59 | 09:16 (WEA 13) | 08:25 | 09:28 (WEA 13) |
| | 21:13 | 20:13 | 14 07:19 (WEA 01) | 19:01 | | 16:56 | 30 08:13 (WEA 07) | 16:11 | 34 09:50 (WEA 13) | 16:12 | 36 10:04 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:04 (WEA 01) | 07:14 | | 07:07 | 07:45 (WEA 12) | 08:00 | 09:15 (WEA 13) | 08:26 | 09:28 (WEA 13) |
| | 21:12 | 20:11 | 17 07:21 (WEA 01) | 18:59 | | 16:54 | 28 08:13 (WEA 07) | 16:10 | 35 09:50 (WEA 13) | 16:13 | 35 10:03 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:02 (WEA 01) | | | 07:08 | 07:46 (WEA 12) | | | 08:26 | 09:28 (WEA 13) |
| | 21:10 | 20:08 | 19 07:21 (WEA 01) | | | 16:52 | 28 08:14 (WEA 07) | | | 16:14 | 36 10:04 (WEA 13) |
| Sonnenscheinstunden | 503 | 454 | | 381 | | 331 | | 266 | | 243 | |
| astr.max.mögl.Beschattung | | 723 | | 747 | | 881 | | 621 | | 1103 | |
| Red.Sonnenscheinwahrsch. | | 0,44 | | 0,37 | | 0,31 | | 0,21 | | 0,14 | |
| Reduktion Betriebsdauer | | 0,96 | | 0,96 | | 0,96 | | 0,96 | | 0,96 | |
| Reduktion Windrichtung | | 0,71 | | 0,69 | | 0,63 | | 0,59 | | 0,57 | |
| Gesamte Reduktion | | 0,30 | | 0,24 | | 0,18 | | 0,12 | | 0,07 | |
| Met.wahrsch.Beschattung | | 214 | | 178 | | 160 | | 72 | | 80 | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d56 - Söllingen, Poststraße 4

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:16 (WEA 12) | 07:59 | 08:32 (WEA 11) | 07:05 | 07:34 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 25 09:41 (WEA 12) | 17:03 | 25 08:57 (WEA 11) | 17:55 | 26 08:00 (WEA 10) | 19:49 | 20:40 | 21:27 | | | |
| 2 | 08:26 | 09:17 (WEA 12) | 07:57 | 08:31 (WEA 11) | 07:03 | 07:34 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 25 09:42 (WEA 12) | 17:05 | 26 08:57 (WEA 11) | 17:57 | 27 08:01 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:17 (WEA 12) | 07:55 | 08:31 (WEA 11) | 07:00 | 07:33 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 26 09:43 (WEA 12) | 17:07 | 26 08:57 (WEA 11) | 17:58 | 29 08:02 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:17 (WEA 12) | 07:54 | 08:31 (WEA 11) | 06:58 | 07:33 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 25 09:42 (WEA 12) | 17:08 | 27 08:58 (WEA 11) | 18:00 | 29 08:02 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:18 (WEA 12) | 07:52 | 08:31 (WEA 11) | 06:56 | 07:32 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 25 09:43 (WEA 12) | 17:10 | 28 08:59 (WEA 11) | 18:02 | 30 08:02 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:18 (WEA 12) | 07:50 | 08:31 (WEA 11) | 06:54 | 07:32 (WEA 10) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 25 09:43 (WEA 12) | 17:12 | 28 08:59 (WEA 11) | 18:04 | 30 08:02 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:20 (WEA 12) | 07:49 | 08:31 (WEA 11) | 06:52 | 07:32 (WEA 10) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 24 09:44 (WEA 12) | 17:14 | 28 08:59 (WEA 11) | 18:06 | 30 08:02 (WEA 10) | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:20 (WEA 12) | 07:47 | 08:31 (WEA 11) | 06:49 | 07:31 (WEA 10) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 24 09:44 (WEA 12) | 17:16 | 27 08:58 (WEA 11) | 18:07 | 29 08:00 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:21 (WEA 12) | 07:45 | 08:31 (WEA 11) | 06:47 | 07:32 (WEA 10) | 06:35 | 05:34 | 04:58 | | | |
| | 16:24 | 23 09:44 (WEA 12) | 17:18 | 27 08:58 (WEA 11) | 18:09 | 28 08:00 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:22 (WEA 12) | 07:43 | 08:31 (WEA 11) | 06:45 | 07:32 (WEA 10) | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 22 09:44 (WEA 12) | 17:20 | 27 08:58 (WEA 11) | 18:11 | 28 08:00 (WEA 10) | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | 09:22 (WEA 12) | 07:41 | 08:32 (WEA 11) | 06:42 | 07:32 (WEA 10) | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | 22 09:44 (WEA 12) | 17:22 | 25 08:57 (WEA 11) | 18:13 | 26 07:58 (WEA 10) | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 09:23 (WEA 12) | 07:40 | 08:34 (WEA 11) | 06:40 | 07:33 (WEA 10) | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 21 09:44 (WEA 12) | 17:23 | 23 08:57 (WEA 11) | 18:15 | 24 07:57 (WEA 10) | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 09:24 (WEA 12) | 07:38 | 08:35 (WEA 11) | 06:38 | 07:35 (WEA 10) | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 20 09:44 (WEA 12) | 17:25 | 21 08:56 (WEA 11) | 18:16 | 20 07:55 (WEA 10) | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 09:24 (WEA 12) | 07:36 | 08:36 (WEA 11) | 06:36 | 07:36 (WEA 10) | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 19 09:43 (WEA 12) | 17:27 | 19 08:55 (WEA 11) | 18:18 | 16 07:52 (WEA 10) | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 09:26 (WEA 12) | 07:34 | 08:37 (WEA 11) | 06:33 | 07:39 (WEA 10) | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 17 09:43 (WEA 12) | 17:29 | 15 08:52 (WEA 11) | 18:20 | 10 07:49 (WEA 10) | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 09:27 (WEA 12) | 07:32 | 08:40 (WEA 11) | 06:31 | 06:20 | 05:22 | 04:56 | | | | |
| | 16:35 | 15 09:42 (WEA 12) | 17:31 | 9 08:49 (WEA 11) | 18:22 | 20:15 | 21:05 | 21:39 | | | | |
| 17 | 08:17 | 09:29 (WEA 12) | 07:30 | 06:29 | 06:18 | 06:18 | 05:21 | 04:56 | | | | |
| | 16:37 | 12 09:41 (WEA 12) | 17:33 | 18:23 | 20:17 | 21:06 | 21:40 | | | | | |
| 18 | 08:16 | 09:31 (WEA 12) | 07:28 | 06:26 | 06:16 | 06:16 | 05:19 | 04:56 | | | | |
| | 16:38 | 9 09:40 (WEA 12) | 17:35 | 18:25 | 20:18 | 21:08 | 21:40 | | | | | |
| 19 | 08:15 | 07:26 | 06:24 | 06:13 | 05:18 | 04:56 | | | | | | |
| | 16:40 | 17:36 | 18:27 | 20:20 | 21:09 | 21:40 | | | | | | |
| 20 | 08:14 | 07:24 | 06:22 | 06:11 | 05:17 | 04:56 | | | | | | |
| | 16:41 | 17:38 | 18:28 | 20:22 | 21:11 | 21:41 | | | | | | |
| 21 | 08:13 | 07:22 | 06:19 | 06:09 | 05:15 | 04:56 | | | | | | |
| | 16:43 | 17:40 | 18:30 | 20:23 | 21:12 | 21:41 | | | | | | |
| 22 | 08:12 | 07:20 | 06:17 | 06:07 | 05:14 | 04:56 | | | | | | |
| | 16:45 | 17:42 | 18:32 | 20:25 | 21:14 | 21:41 | | | | | | |
| 23 | 08:11 | 07:18 | 06:15 | 06:05 | 05:13 | 04:56 | | | | | | |
| | 16:47 | 17:44 | 18:34 | 20:27 | 21:15 | 21:41 | | | | | | |
| 24 | 08:10 | 07:16 | 06:12 | 06:03 | 05:11 | 04:57 | | | | | | |
| | 16:48 | 17:46 | 18:35 | 20:29 | 21:17 | 21:41 | | | | | | |
| 25 | 08:09 | 07:13 | 06:10 | 06:01 | 05:10 | 04:57 | | | | | | |
| | 16:50 | 17:48 | 18:37 | 20:30 | 21:18 | 21:42 | | | | | | |
| 26 | 08:07 | 08:38 (WEA 11) | 07:11 | 07:40 (WEA 10) | 06:08 | 05:59 | 05:09 | 04:57 | | | | |
| | 16:52 | 9 08:47 (WEA 11) | 17:49 | 17 07:57 (WEA 10) | 18:39 | 20:32 | 21:19 | 21:42 | | | | |
| 27 | 08:06 | 08:36 (WEA 11) | 07:09 | 07:38 (WEA 10) | 06:05 | 05:57 | 05:08 | 04:58 | | | | |
| | 16:54 | 14 08:50 (WEA 11) | 17:51 | 21 07:59 (WEA 10) | 18:41 | 20:34 | 21:21 | 21:41 | | | | |
| 28 | 08:04 | 08:34 (WEA 11) | 07:07 | 07:36 (WEA 10) | 06:03 | 05:55 | 05:07 | 04:58 | | | | |
| | 16:56 | 17 08:51 (WEA 11) | 17:53 | 24 08:00 (WEA 10) | 18:42 | 20:35 | 21:22 | 21:41 | | | | |
| 29 | 08:03 | 08:34 (WEA 11) | 07:01 | 07:01 | 05:53 | 05:06 | 04:59 | | | | | |
| | 16:57 | 19 08:53 (WEA 11) | 19:44 | 20:37 | 21:23 | 21:41 | | | | | | |
| 30 | 08:02 | 08:33 (WEA 11) | 06:58 | 05:51 | 05:05 | 04:59 | | | | | | |
| | 16:59 | 21 08:54 (WEA 11) | 19:46 | 20:39 | 21:24 | 21:41 | | | | | | |
| 31 | 08:00 | 08:33 (WEA 11) | 06:56 | 05:56 | 05:04 | 04:59 | | | | | | |
| | 17:01 | 23 08:56 (WEA 11) | 19:47 | 21:25 | 21:41 | | | | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 482 | | 455 | | 382 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,57 | | 0,61 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,14 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 48 | | 66 | | 67 | | | | | | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d56 - Söllingen, Poststraße 4

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------------------------|---------------------------|---------------------------|----------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 08:13 (WEA 10) 07:10 | 08:01 (WEA 11) 08:02 | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 22 08:35 (WEA 10) 16:50 | 26 08:27 (WEA 11) 16:09 | |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 08:11 (WEA 10) 07:12 | 08:01 (WEA 11) 08:03 | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 25 08:36 (WEA 10) 16:48 | 27 08:28 (WEA 11) 16:08 | |
| 3 | 05:01 | 05:40 | 06:30 | 07:19 | 08:10 (WEA 10) 07:14 | 08:00 (WEA 11) 08:04 | |
| | 21:40 | 21:05 | 20:02 | 18:52 | 27 08:37 (WEA 10) 16:46 | 28 08:28 (WEA 11) 16:08 | |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 08:10 (WEA 10) 07:16 | 08:00 (WEA 11) 08:06 | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 28 08:38 (WEA 10) 16:44 | 28 08:28 (WEA 11) 16:07 | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 08:08 (WEA 10) 07:18 | 08:00 (WEA 11) 08:07 | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 29 08:37 (WEA 10) 16:43 | 28 08:28 (WEA 11) 16:07 | |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 08:08 (WEA 10) 07:19 | 08:01 (WEA 11) 08:08 | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 30 08:38 (WEA 10) 16:41 | 27 08:28 (WEA 11) 16:06 | |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 08:08 (WEA 10) 07:21 | 08:01 (WEA 11) 08:10 | |
| | 21:38 | 20:58 | 19:52 | 18:43 | 30 08:38 (WEA 10) 16:39 | 27 08:28 (WEA 11) 16:06 | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 08:07 (WEA 10) 07:23 | 08:01 (WEA 11) 08:11 | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 30 08:37 (WEA 10) 16:37 | 27 08:28 (WEA 11) 16:06 | |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 08:07 (WEA 10) 07:25 | 08:02 (WEA 11) 08:12 | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 29 08:36 (WEA 10) 16:36 | 26 08:28 (WEA 11) 16:05 | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 08:07 (WEA 10) 07:27 | 08:03 (WEA 11) 08:13 | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 29 08:36 (WEA 10) 16:34 | 24 08:27 (WEA 11) 16:05 | |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | 08:07 (WEA 10) 07:28 | 08:04 (WEA 11) 08:14 | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 29 08:36 (WEA 10) 16:33 | 23 08:27 (WEA 11) 16:05 | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 08:08 (WEA 10) 07:30 | 08:05 (WEA 11) 08:15 | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 27 08:35 (WEA 10) 16:31 | 21 08:26 (WEA 11) 16:05 | |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 08:08 (WEA 10) 07:32 | 08:06 (WEA 11) 08:16 | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 25 08:33 (WEA 10) 16:29 | 19 08:25 (WEA 11) 16:05 | |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 08:09 (WEA 10) 07:34 | 08:07 (WEA 11) 08:17 | |
| | 21:32 | 20:45 | 19:36 | 18:27 | 23 08:32 (WEA 10) 16:28 | 17 08:24 (WEA 11) 16:05 | |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 08:11 (WEA 10) 07:35 | 08:09 (WEA 11) 08:18 | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 19 08:30 (WEA 10) 16:27 | 14 08:23 (WEA 11) 16:05 | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 08:13 (WEA 10) 07:37 | 08:12 (WEA 11) 08:19 | |
| | 21:30 | 20:41 | 19:32 | 18:22 | 15 08:28 (WEA 10) 16:25 | 8 08:20 (WEA 11) 16:05 | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 08:16 (WEA 10) 07:39 | 08:20 | 09:09 (WEA 12) |
| | 21:29 | 20:39 | 19:29 | 18:20 | 9 08:25 (WEA 10) 16:24 | 16:05 | 09:35 (WEA 12) |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:21 | 09:10 (WEA 12) |
| | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | 16:05 | 09:35 (WEA 12) |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | 08:21 | 09:10 (WEA 12) |
| | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | 16:06 | 09:35 (WEA 12) |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | 08:22 | 09:10 (WEA 12) |
| | 21:26 | 20:32 | 19:22 | 18:14 | 16:20 | 16:06 | 09:36 (WEA 12) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | 08:23 | 09:11 (WEA 12) |
| | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 16:06 | 09:37 (WEA 12) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | 08:23 | 09:11 (WEA 12) |
| | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 16:07 | 09:37 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | 08:24 | 09:11 (WEA 12) |
| | 21:22 | 20:26 | 19:15 | 18:08 | 16:16 | 16:07 | 09:37 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | 09:08 (WEA 12) 08:24 | 09:12 (WEA 12) |
| | 21:21 | 20:24 | 19:13 | 18:06 | 16:15 | 9 09:17 (WEA 12) 16:08 | 09:38 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 06:58 | 07:52 | 09:07 (WEA 12) 08:25 | 09:13 (WEA 12) |
| | 21:19 | 20:22 | 19:10 | 17:04 | 16:14 | 12 09:19 (WEA 12) 16:09 | 09:38 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 06:59 | 08:10 (WEA 11) 07:54 | 09:06 (WEA 12) 08:25 | 09:13 (WEA 12) |
| | 21:18 | 20:20 | 19:08 | 17:02 | 10 08:20 (WEA 11) 16:13 | 15 09:21 (WEA 12) 16:09 | 09:39 (WEA 12) |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | 08:07 (WEA 11) 07:56 | 09:05 (WEA 12) 08:25 | 09:13 (WEA 12) |
| | 21:16 | 20:17 | 19:06 | 17:00 | 16 08:23 (WEA 11) 16:12 | 17 09:22 (WEA 12) 16:10 | 09:39 (WEA 12) |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | 08:04 (WEA 11) 07:57 | 09:05 (WEA 12) 08:25 | 09:15 (WEA 12) |
| | 21:15 | 20:15 | 19:03 | 6 08:22 (WEA 10) 16:58 | 20 08:24 (WEA 11) 16:12 | 18 09:23 (WEA 12) 16:11 | 09:40 (WEA 12) |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | 08:03 (WEA 11) 07:59 | 09:05 (WEA 12) 08:25 | 09:15 (WEA 12) |
| | 21:13 | 20:13 | 19:01 | 15 08:32 (WEA 10) 16:56 | 22 08:25 (WEA 11) 16:11 | 20 09:25 (WEA 12) 16:12 | 09:41 (WEA 12) |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | 08:02 (WEA 11) 08:00 | 09:04 (WEA 12) 08:26 | 09:16 (WEA 12) |
| | 21:12 | 20:11 | 18:59 | 19 08:15 (WEA 10) 16:54 | 24 08:26 (WEA 11) 16:10 | 21 09:25 (WEA 12) 16:13 | 09:41 (WEA 12) |
| 31 | 05:35 | 06:25 | | 07:08 | 08:01 (WEA 11) | 08:26 | 09:15 (WEA 12) |
| | 21:10 | 20:08 | | 16:52 | 26 08:27 (WEA 11) | 16:13 | 09:41 (WEA 12) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | |
| astr.max.mögl.Beschattung | | | 40 | 544 | | 482 | 781 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,64 | 0,63 | | 0,60 | 0,57 |
| Gesamte Reduktion | | | 0,22 | 0,19 | | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | 9 | 101 | | 58 | 57 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d57 - Söllingen, Ringstraße 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | | | |
|---------------------------|--------|------------------------|------------------------|------------------------|------------------------|------------------------|-------|------------------------|-------|
| 1 | 08:26 | 09:06 (WEA 13) 07:59 | 07:05 | 06:54 | 07:16 (WEA 10) 05:49 | 05:03 | | | |
| | 16:15 | 09:32 (WEA 13) 17:03 | 17:55 | 19:49 | 19 | 07:35 (WEA 10) 20:40 | 21:27 | | |
| 2 | 08:26 | 09:06 (WEA 13) 07:57 | 07:03 | 06:52 | 07:15 (WEA 10) 05:47 | 05:02 | | | |
| | 16:16 | 09:32 (WEA 13) 17:05 | 17:57 | 19:51 | 21 | 07:36 (WEA 10) 20:42 | 21:28 | | |
| 3 | 08:25 | 09:07 (WEA 13) 07:55 | 07:00 | 06:49 | 07:14 (WEA 10) 05:45 | 05:01 | | | |
| | 16:17 | 09:33 (WEA 13) 17:07 | 17:58 | 19:53 | 23 | 07:37 (WEA 10) 20:44 | 21:29 | | |
| 4 | 08:25 | 09:07 (WEA 13) 07:54 | 06:58 | 06:47 | 07:14 (WEA 10) 05:43 | 05:01 | | | |
| | 16:18 | 09:33 (WEA 13) 17:08 | 18:00 | 19:54 | 24 | 07:38 (WEA 10) 20:46 | 21:30 | | |
| 5 | 08:25 | 09:07 (WEA 13) 07:52 | 08:21 (WEA 12) 06:56 | 07:21 (WEA 11) 06:45 | 07:12 (WEA 10) 05:41 | 05:00 | | | |
| | 16:19 | 09:34 (WEA 13) 17:10 | 4 | 08:25 (WEA 12) 18:02 | 8 | 07:29 (WEA 11) 19:56 | 25 | 07:37 (WEA 10) 20:47 | 21:31 |
| 6 | 08:25 | 09:07 (WEA 13) 07:50 | 08:17 (WEA 12) 06:54 | 07:18 (WEA 11) 06:42 | 07:12 (WEA 10) 05:39 | 04:59 | | | |
| | 16:21 | 09:34 (WEA 13) 17:12 | 12 | 08:29 (WEA 12) 18:04 | 14 | 07:32 (WEA 11) 19:58 | 25 | 07:37 (WEA 10) 20:49 | 21:32 |
| 7 | 08:24 | 09:08 (WEA 13) 07:49 | 08:15 (WEA 12) 06:52 | 07:16 (WEA 11) 06:40 | 07:12 (WEA 10) 05:37 | 04:59 | | | |
| | 16:22 | 09:35 (WEA 13) 17:14 | 16 | 08:31 (WEA 12) 18:06 | 18 | 07:34 (WEA 11) 20:00 | 25 | 07:37 (WEA 10) 20:51 | 21:33 |
| 8 | 08:24 | 09:08 (WEA 13) 07:47 | 08:14 (WEA 12) 06:49 | 07:14 (WEA 11) 06:38 | 07:12 (WEA 10) 05:36 | 04:58 | | | |
| | 16:23 | 09:35 (WEA 13) 17:16 | 18 | 08:32 (WEA 12) 18:07 | 21 | 07:35 (WEA 11) 20:01 | 25 | 07:37 (WEA 10) 20:52 | 21:34 |
| 9 | 08:23 | 09:09 (WEA 13) 07:45 | 08:12 (WEA 12) 06:47 | 07:13 (WEA 11) 06:36 | 07:11 (WEA 10) 05:34 | 04:58 | | | |
| | 16:25 | 09:36 (WEA 13) 17:18 | 21 | 08:33 (WEA 12) 18:09 | 23 | 07:36 (WEA 11) 20:03 | 24 | 07:35 (WEA 10) 20:54 | 21:35 |
| 10 | 08:23 | 09:09 (WEA 13) 07:43 | 08:12 (WEA 12) 06:45 | 07:12 (WEA 11) 06:33 | 07:12 (WEA 10) 05:32 | 04:57 | | | |
| | 16:26 | 09:37 (WEA 13) 17:20 | 22 | 08:34 (WEA 12) 18:11 | 24 | 07:36 (WEA 11) 20:05 | 23 | 07:35 (WEA 10) 20:55 | 21:35 |
| 11 | 08:22 | 09:10 (WEA 13) 07:41 | 08:11 (WEA 12) 06:42 | 07:11 (WEA 11) 06:31 | 07:13 (WEA 10) 05:31 | 04:57 | | | |
| | 16:27 | 09:37 (WEA 13) 17:22 | 24 | 08:35 (WEA 12) 18:13 | 25 | 07:36 (WEA 11) 20:06 | 21 | 07:34 (WEA 10) 20:57 | 21:36 |
| 12 | 08:21 | 09:10 (WEA 13) 07:40 | 08:11 (WEA 12) 06:40 | 07:11 (WEA 11) 06:29 | 07:14 (WEA 10) 05:29 | 04:57 | | | |
| | 16:29 | 09:37 (WEA 13) 17:23 | 25 | 08:36 (WEA 12) 18:15 | 25 | 07:36 (WEA 11) 20:08 | 19 | 07:33 (WEA 10) 20:59 | 21:37 |
| 13 | 08:21 | 09:10 (WEA 13) 07:38 | 08:11 (WEA 12) 06:38 | 07:11 (WEA 11) 06:27 | 07:15 (WEA 10) 05:27 | 04:56 | | | |
| | 16:30 | 09:37 (WEA 13) 17:25 | 25 | 08:36 (WEA 12) 18:16 | 25 | 07:36 (WEA 11) 20:10 | 16 | 07:31 (WEA 10) 21:00 | 21:37 |
| 14 | 08:20 | 09:11 (WEA 13) 07:36 | 08:11 (WEA 12) 06:36 | 07:10 (WEA 11) 06:24 | 07:16 (WEA 10) 05:26 | 04:56 | | | |
| | 16:32 | 09:37 (WEA 13) 17:27 | 26 | 08:37 (WEA 12) 18:18 | 25 | 07:35 (WEA 11) 20:12 | 11 | 07:27 (WEA 10) 21:02 | 21:38 |
| 15 | 08:19 | 09:11 (WEA 13) 07:34 | 08:10 (WEA 12) 06:33 | 07:10 (WEA 11) 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 09:37 (WEA 13) 17:29 | 26 | 08:36 (WEA 12) 18:20 | 25 | 07:35 (WEA 11) 20:13 | | 21:03 | 21:39 |
| 16 | 08:18 | 09:12 (WEA 13) 07:32 | 08:10 (WEA 12) 06:31 | 07:11 (WEA 11) 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 09:37 (WEA 13) 17:31 | 25 | 08:35 (WEA 12) 18:22 | 23 | 07:34 (WEA 11) 20:15 | | 21:05 | 21:39 |
| 17 | 08:17 | 09:13 (WEA 13) 07:30 | 08:11 (WEA 12) 06:29 | 07:11 (WEA 11) 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 09:37 (WEA 13) 17:33 | 24 | 08:35 (WEA 12) 18:23 | 21 | 07:32 (WEA 11) 20:17 | | 21:06 | 21:40 |
| 18 | 08:16 | 09:14 (WEA 13) 07:28 | 08:11 (WEA 12) 06:26 | 07:12 (WEA 11) 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 09:37 (WEA 13) 17:35 | 24 | 08:35 (WEA 12) 18:25 | 19 | 07:31 (WEA 11) 20:18 | | 21:08 | 21:40 |
| 19 | 08:15 | 09:15 (WEA 13) 07:26 | 08:12 (WEA 12) 06:24 | 07:14 (WEA 11) 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 09:37 (WEA 13) 17:37 | 22 | 08:34 (WEA 12) 18:27 | 16 | 07:30 (WEA 11) 20:20 | | 21:09 | 21:40 |
| 20 | 08:14 | 09:16 (WEA 13) 07:24 | 08:13 (WEA 12) 06:22 | 07:15 (WEA 11) 06:11 | 05:17 | 04:56 | | | |
| | 16:42 | 09:37 (WEA 13) 17:38 | 20 | 08:33 (WEA 12) 18:29 | 11 | 07:26 (WEA 11) 20:22 | | 21:11 | 21:41 |
| 21 | 08:13 | 09:16 (WEA 13) 07:22 | 08:14 (WEA 12) 06:19 | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | 09:36 (WEA 13) 17:40 | 17 | 08:31 (WEA 12) 18:30 | 20:23 | 21:12 | | 21:41 | 21:41 |
| 22 | 08:12 | 09:18 (WEA 13) 07:20 | 08:16 (WEA 12) 06:17 | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | 09:36 (WEA 13) 17:42 | 14 | 08:30 (WEA 12) 18:32 | 20:25 | 21:14 | | 21:41 | 21:41 |
| 23 | 08:11 | 09:20 (WEA 13) 07:18 | 08:20 (WEA 12) 06:15 | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 09:35 (WEA 13) 17:44 | 6 | 08:26 (WEA 12) 18:34 | 20:27 | 21:15 | | 21:41 | 21:41 |
| 24 | 08:10 | 09:21 (WEA 13) 07:16 | 06:12 | 06:03 | 05:11 | 04:57 | | | |
| | 16:48 | 09:33 (WEA 13) 17:46 | 18:35 | 20:29 | 21:17 | 21:41 | | 21:41 | 21:41 |
| 25 | 08:09 | 09:25 (WEA 13) 07:13 | 06:10 | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | 09:30 (WEA 13) 17:48 | 18:37 | 20:30 | 21:18 | 21:42 | | 21:42 | 21:42 |
| 26 | 08:07 | 07:11 | 06:08 | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | 17:49 | 18:39 | 20:32 | 21:19 | 21:42 | | 21:42 | 21:42 |
| 27 | 08:06 | 07:09 | 06:05 | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | 17:51 | 18:41 | 20:34 | 21:21 | 21:41 | | 21:41 | 21:41 |
| 28 | 08:04 | 07:07 | 06:03 | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | 17:53 | 18:42 | 20:35 | 21:22 | 21:41 | | 21:41 | 21:41 |
| 29 | 08:03 | | 07:01 | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | | 19:44 | 20:37 | 21:23 | 21:41 | | 21:41 | 21:41 |
| 30 | 08:02 | | 06:58 | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | | 19:46 | 11 | 07:32 (WEA 10) 20:39 | 21:24 | | 21:42 | 21:42 |
| 31 | 08:00 | | 06:56 | 07:19 (WEA 10) | 05:04 | 04:59 | | | |
| | 17:01 | | 19:47 | 16 | 07:35 (WEA 10) | 21:25 | | 21:42 | 21:42 |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 585 | 371 | 350 | 301 | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | | | | |
| Reduktion Windrichtung | 0,56 | 0,62 | 0,66 | 0,71 | | | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | 0,25 | | | | | |
| Met.wahrsch.Beschattung | 56 | 54 | 62 | 74 | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d57 - Söllingen, Ringstraße 5

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | | | | | | |
|---------------------------|-------|--------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----|----------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:12 (WEA 10) | 07:16 | 07:50 (WEA 11) | 07:10 | 07:41 (WEA 12) | 08:02 | 08:52 (WEA 13) | | | | | | |
| | 21:41 | 21:09 | 20:06 | 21 | 07:33 (WEA 10) | 18:56 | 25 | 08:15 (WEA 11) | 16:50 | 23 | 08:04 (WEA 12) | 16:09 | 27 | 09:19 (WEA 13) | | |
| 2 | 05:01 | 05:38 | 06:28 | 07:11 (WEA 10) | 07:18 | 07:50 (WEA 11) | 07:12 | 07:42 (WEA 12) | 08:03 | 08:52 (WEA 13) | | | | | | |
| | 21:40 | 21:07 | 20:04 | 23 | 07:34 (WEA 10) | 18:54 | 25 | 08:15 (WEA 11) | 16:48 | 21 | 08:03 (WEA 12) | 16:09 | 28 | 09:20 (WEA 13) | | |
| 3 | 05:01 | 05:40 | 06:30 | 07:09 (WEA 10) | 07:20 | 07:50 (WEA 11) | 07:14 | 07:43 (WEA 12) | 08:04 | 08:52 (WEA 13) | | | | | | |
| | 21:40 | 21:05 | 20:02 | 24 | 07:33 (WEA 10) | 18:52 | 25 | 08:15 (WEA 11) | 16:46 | 19 | 08:02 (WEA 12) | 16:08 | 28 | 09:20 (WEA 13) | | |
| 4 | 05:02 | 05:41 | 06:32 | 07:09 (WEA 10) | 07:21 | 07:51 (WEA 11) | 07:16 | 07:45 (WEA 12) | 08:06 | 08:52 (WEA 13) | | | | | | |
| | 21:40 | 21:04 | 19:59 | 25 | 07:34 (WEA 10) | 18:49 | 23 | 08:14 (WEA 11) | 16:44 | 15 | 08:00 (WEA 12) | 16:07 | 27 | 09:19 (WEA 13) | | |
| 5 | 05:03 | 05:43 | 06:33 | 07:08 (WEA 10) | 07:23 | 07:50 (WEA 11) | 07:18 | 07:47 (WEA 12) | 08:07 | 08:53 (WEA 13) | | | | | | |
| | 21:39 | 21:02 | 19:57 | 25 | 07:33 (WEA 10) | 18:47 | 22 | 08:12 (WEA 11) | 16:43 | 11 | 07:58 (WEA 12) | 16:07 | 27 | 09:21 (WEA 13) | | |
| 6 | 05:04 | 05:45 | 06:35 | 07:08 (WEA 10) | 07:25 | 07:51 (WEA 11) | 07:19 | 08:08 | 08:53 (WEA 13) | | | | | | | |
| | 21:39 | 21:00 | 19:55 | 25 | 07:33 (WEA 10) | 18:45 | 20 | 08:11 (WEA 11) | 16:41 | 16:06 | 27 | 09:20 (WEA 13) | | | | |
| 7 | 05:05 | 05:46 | 06:37 | 07:07 (WEA 10) | 07:26 | 07:53 (WEA 11) | 07:21 | 08:10 | 08:55 (WEA 13) | | | | | | | |
| | 21:38 | 20:58 | 19:53 | 25 | 07:32 (WEA 10) | 18:43 | 16 | 08:09 (WEA 11) | 16:39 | 16:06 | 26 | 09:21 (WEA 13) | | | | |
| 8 | 05:06 | 05:48 | 06:38 | 07:08 (WEA 10) | 07:28 | 07:54 (WEA 11) | 07:23 | 08:11 | 08:55 (WEA 13) | | | | | | | |
| | 21:37 | 20:56 | 19:50 | 24 | 07:32 (WEA 10) | 18:40 | 12 | 08:06 (WEA 11) | 16:37 | 16:06 | 26 | 09:21 (WEA 13) | | | | |
| 9 | 05:07 | 05:49 | 06:40 | 07:08 (WEA 10) | 07:30 | 07:55 | 07:25 | 08:12 | 08:55 (WEA 13) | | | | | | | |
| | 21:37 | 20:54 | 19:48 | 23 | 07:31 (WEA 10) | 18:38 | 16:36 | 16:05 | 26 | 09:21 (WEA 13) | | | | | | |
| 10 | 05:08 | 05:51 | 06:42 | 07:08 (WEA 10) | 07:31 | 07:56 | 07:27 | 08:13 | 08:55 (WEA 13) | | | | | | | |
| | 21:36 | 20:53 | 19:46 | 22 | 07:30 (WEA 10) | 18:36 | 16:34 | 16:05 | 27 | 09:22 (WEA 13) | | | | | | |
| 11 | 05:09 | 05:53 | 06:43 | 07:09 (WEA 10) | 07:33 | 07:58 | 07:28 | 08:14 | 08:56 (WEA 13) | | | | | | | |
| | 21:35 | 20:51 | 19:43 | 20 | 07:29 (WEA 10) | 18:34 | 16:33 | 16:05 | 26 | 09:22 (WEA 13) | | | | | | |
| 12 | 05:10 | 05:54 | 06:45 | 07:10 (WEA 10) | 07:35 | 07:59 | 07:30 | 08:15 | 08:56 (WEA 13) | | | | | | | |
| | 21:34 | 20:49 | 19:41 | 16 | 07:26 (WEA 10) | 18:31 | 16:31 | 16:05 | 26 | 09:22 (WEA 13) | | | | | | |
| 13 | 05:11 | 05:56 | 06:46 | 07:12 (WEA 10) | 07:37 | 08:01 | 07:32 | 08:16 | 08:57 (WEA 13) | | | | | | | |
| | 21:33 | 20:47 | 19:39 | 12 | 07:24 (WEA 10) | 18:29 | 16:30 | 16:05 | 25 | 09:22 (WEA 13) | | | | | | |
| 14 | 05:12 | 05:57 | 06:48 | 07:13 (WEA 10) | 07:38 | 08:02 | 07:34 | 08:17 | 08:57 (WEA 13) | | | | | | | |
| | 21:32 | 20:45 | 19:36 | 18:27 | 16:28 | 16:05 | 26 | 09:23 (WEA 13) | | | | | | | | |
| 15 | 05:13 | 05:59 | 06:50 | 07:14 (WEA 10) | 07:40 | 08:04 | 07:35 | 08:18 | 08:58 (WEA 13) | | | | | | | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 16:05 | 25 | 09:23 (WEA 13) | | | | | | | | |
| 16 | 05:14 | 06:01 | 06:51 | 07:15 (WEA 10) | 07:42 | 08:06 | 07:37 | 08:19 | 08:59 (WEA 13) | | | | | | | |
| | 21:30 | 20:41 | 19:32 | 18:23 | 16:25 | 16:05 | 25 | 09:24 (WEA 13) | | | | | | | | |
| 17 | 05:16 | 06:02 | 06:53 | 07:16 (WEA 10) | 07:44 | 08:08 | 07:39 | 08:20 | 09:00 (WEA 13) | | | | | | | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | 6 | 09:04 (WEA 13) | 16:05 | 24 | 09:24 (WEA 13) | | | | | | |
| 18 | 05:17 | 06:04 | 06:55 | 07:17 (WEA 10) | 07:45 | 08:10 | 07:41 | 08:21 | 09:00 (WEA 13) | | | | | | | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | 12 | 09:07 (WEA 13) | 16:05 | 25 | 09:25 (WEA 13) | | | | | | |
| 19 | 05:18 | 06:06 | 06:56 | 07:18 (WEA 10) | 07:47 | 08:12 | 07:42 | 08:22 | 09:00 (WEA 13) | | | | | | | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 9 | 08:58 (WEA 12) | 16:21 | 15 | 09:09 (WEA 13) | 16:06 | 25 | 09:25 (WEA 13) | | | | |
| 20 | 05:19 | 06:07 | 06:58 | 07:19 (WEA 10) | 07:49 | 08:14 | 07:44 | 08:23 | 09:01 (WEA 13) | | | | | | | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 15 | 09:01 (WEA 12) | 16:20 | 18 | 09:11 (WEA 13) | 16:06 | 24 | 09:25 (WEA 13) | | | | |
| 21 | 05:21 | 06:09 | 07:00 | 07:20 (WEA 10) | 07:51 | 08:16 | 07:46 | 08:24 | 09:02 (WEA 13) | | | | | | | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 18 | 09:02 (WEA 12) | 16:19 | 20 | 09:12 (WEA 13) | 16:06 | 24 | 09:26 (WEA 13) | | | | |
| 22 | 05:22 | 06:10 | 07:01 | 07:21 (WEA 10) | 07:52 | 08:17 | 07:47 | 08:25 | 09:02 (WEA 13) | | | | | | | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 21 | 09:04 (WEA 12) | 16:18 | 21 | 09:13 (WEA 13) | 16:07 | 24 | 09:26 (WEA 13) | | | | |
| 23 | 05:23 | 06:12 | 07:03 | 07:22 (WEA 10) | 07:54 | 08:19 | 07:49 | 08:26 | 09:03 (WEA 13) | | | | | | | |
| | 21:22 | 20:26 | 19:15 | 8 | 08:09 (WEA 11) | 18:08 | 23 | 09:05 (WEA 12) | 16:16 | 22 | 09:14 (WEA 13) | 16:07 | 24 | 09:26 (WEA 13) | | |
| 24 | 05:25 | 06:14 | 07:04 | 07:23 (WEA 10) | 07:56 | 08:21 | 07:51 | 08:27 | 09:04 (WEA 13) | | | | | | | |
| | 21:21 | 20:24 | 19:13 | 15 | 08:13 (WEA 11) | 18:06 | 24 | 09:05 (WEA 12) | 16:15 | 23 | 09:14 (WEA 13) | 16:08 | 25 | 09:28 (WEA 13) | | |
| 25 | 05:26 | 06:15 | 07:06 | 07:24 (WEA 10) | 07:58 | 08:23 | 07:52 | 08:28 | 09:05 (WEA 13) | | | | | | | |
| | 21:19 | 20:22 | 19:10 | 18 | 08:13 (WEA 11) | 17:04 | 25 | 08:06 (WEA 12) | 16:14 | 24 | 09:15 (WEA 13) | 16:09 | 25 | 09:28 (WEA 13) | | |
| 26 | 05:28 | 06:17 | 07:08 | 07:25 (WEA 10) | 07:59 | 08:24 | 07:54 | 08:29 | 09:06 (WEA 13) | | | | | | | |
| | 21:18 | 20:20 | 19:08 | 21 | 08:15 (WEA 11) | 17:02 | 25 | 08:06 (WEA 12) | 16:13 | 25 | 09:16 (WEA 13) | 16:09 | 25 | 09:28 (WEA 13) | | |
| 27 | 05:29 | 06:19 | 07:09 | 07:26 (WEA 10) | 07:01 | 08:00 | 07:56 | 08:30 | 09:07 (WEA 13) | | | | | | | |
| | 21:16 | 20:17 | 19:06 | 23 | 08:16 (WEA 11) | 17:00 | 25 | 08:06 (WEA 12) | 16:12 | 26 | 09:16 (WEA 13) | 16:10 | 25 | 09:29 (WEA 13) | | |
| 28 | 05:31 | 06:20 | 07:11 | 07:27 (WEA 10) | 07:03 | 08:01 | 07:57 | 08:31 | 09:08 (WEA 13) | | | | | | | |
| | 21:15 | 20:15 | 19:03 | 24 | 08:15 (WEA 11) | 16:58 | 25 | 08:05 (WEA 12) | 16:12 | 26 | 09:17 (WEA 13) | 16:11 | 25 | 09:30 (WEA 13) | | |
| 29 | 05:32 | 06:22 | 07:13 | 07:28 (WEA 10) | 07:05 | 08:02 | 07:59 | 08:32 | 09:09 (WEA 13) | | | | | | | |
| | 21:13 | 20:13 | 12 | 07:29 (WEA 10) | 19:01 | 25 | 08:16 (WEA 11) | 16:56 | 25 | 08:05 (WEA 12) | 16:11 | 27 | 09:18 (WEA 13) | 16:12 | 25 | 09:30 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:15 (WEA 10) | 07:14 | 07:07 | 08:03 | 07:40 (WEA 12) | 08:00 | 08:33 | 09:10 (WEA 13) | | | | | | |
| | 21:12 | 20:11 | 16 | 07:31 (WEA 10) | 18:59 | 25 | 08:16 (WEA 11) | 16:54 | 25 | 08:05 (WEA 12) | 16:10 | 27 | 09:18 (WEA 13) | 16:13 | 25 | 09:31 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:12 (WEA 10) | 07:15 | 07:08 | 08:04 | 07:41 (WEA 12) | 08:00 | 08:34 | 09:11 (WEA 13) | | | | | | |
| | 21:10 | 20:08 | 20 | 07:32 (WEA 10) | 16:52 | 23 | 08:04 (WEA 12) | 16:14 | 26 | 09:31 (WEA 13) | | | | | | |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | | | | | | | | | | |
| astr.max.mögl.Beschattung | | 48 | 444 | 451 | 381 | 793 | | | | | | | | | | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 | | | | | | | | | | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | | | | | | | | | | |
| Reduktion Windrichtung | | 0,71 | 0,69 | 0,63 | 0,58 | 0,56 | | | | | | | | | | |
| Gesamte Reduktion | | 0,29 | 0,24 | 0,18 | 0,11 | 0,07 | | | | | | | | | | |
| Met.wahrsch.Beschattung | | 14 | 106 | 83 | 44 | 57 | | | | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d60 - Söllingen, Ringstraße 15

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|---------------------------|---------------------------|---------------------------|---------------------------|-------|
| 1 | 08:26 | 09:13 (WEA 13) 07:59 | 07:05 | 06:54 | 05:49 | 05:03 |
| | 16:15 | 29 09:42 (WEA 13) 17:03 | 17:55 | 19:49 | 20:40 | 21:27 |
| 2 | 08:26 | 09:14 (WEA 13) 07:57 | 07:03 | 06:52 | 07:16 (WEA 10) 05:47 | 05:02 |
| | 16:16 | 29 09:43 (WEA 13) 17:05 | 17:57 | 19:51 | 10 07:26 (WEA 10) 20:42 | 21:28 |
| 3 | 08:25 | 09:15 (WEA 13) 07:55 | 07:00 | 06:49 | 07:13 (WEA 10) 05:45 | 05:01 |
| | 16:17 | 29 09:44 (WEA 13) 17:07 | 17:58 | 19:53 | 16 07:29 (WEA 10) 20:44 | 21:29 |
| 4 | 08:25 | 09:14 (WEA 13) 07:54 | 06:58 | 06:47 | 07:11 (WEA 10) 05:43 | 05:01 |
| | 16:18 | 29 09:43 (WEA 13) 17:08 | 18:00 | 19:54 | 19 07:30 (WEA 10) 20:46 | 21:30 |
| 5 | 08:25 | 09:15 (WEA 13) 07:52 | 08:21 (WEA 12) 06:56 | 06:45 | 07:09 (WEA 10) 05:41 | 05:00 |
| | 16:19 | 29 09:44 (WEA 13) 17:10 | 10 08:31 (WEA 12) 18:02 | 19:56 | 22 07:31 (WEA 10) 20:47 | 21:31 |
| 6 | 08:25 | 09:15 (WEA 13) 07:50 | 08:19 (WEA 12) 06:54 | 07:23 (WEA 11) 06:42 | 07:08 (WEA 10) 05:39 | 04:59 |
| | 16:21 | 29 09:44 (WEA 13) 17:12 | 15 08:34 (WEA 12) 18:04 | 2 07:25 (WEA 11) 19:58 | 24 07:32 (WEA 10) 20:49 | 21:32 |
| 7 | 08:24 | 09:16 (WEA 13) 07:49 | 08:17 (WEA 12) 06:52 | 07:18 (WEA 11) 06:40 | 07:07 (WEA 10) 05:37 | 04:59 |
| | 16:22 | 29 09:45 (WEA 13) 17:14 | 19 08:36 (WEA 12) 18:06 | 13 07:31 (WEA 11) 20:00 | 25 07:32 (WEA 10) 20:50 | 21:33 |
| 8 | 08:24 | 09:16 (WEA 13) 07:47 | 08:16 (WEA 12) 06:49 | 07:15 (WEA 11) 06:38 | 07:07 (WEA 10) 05:36 | 04:58 |
| | 16:23 | 29 09:45 (WEA 13) 17:16 | 21 08:37 (WEA 12) 18:07 | 17 07:32 (WEA 11) 20:01 | 26 07:33 (WEA 10) 20:52 | 21:34 |
| 9 | 08:23 | 09:17 (WEA 13) 07:45 | 08:15 (WEA 12) 06:47 | 07:13 (WEA 11) 06:36 | 07:05 (WEA 10) 05:34 | 04:58 |
| | 16:25 | 29 09:46 (WEA 13) 17:18 | 23 08:38 (WEA 12) 18:09 | 21 07:34 (WEA 11) 20:03 | 27 07:32 (WEA 10) 20:54 | 21:35 |
| 10 | 08:23 | 09:17 (WEA 13) 07:43 | 08:14 (WEA 12) 06:45 | 07:12 (WEA 11) 06:33 | 07:05 (WEA 10) 05:32 | 04:57 |
| | 16:26 | 29 09:46 (WEA 13) 17:20 | 24 08:38 (WEA 12) 18:11 | 23 07:35 (WEA 11) 20:05 | 27 07:32 (WEA 10) 20:55 | 21:35 |
| 11 | 08:22 | 09:18 (WEA 13) 07:41 | 08:13 (WEA 12) 06:42 | 07:10 (WEA 11) 06:31 | 07:05 (WEA 10) 05:30 | 04:57 |
| | 16:27 | 28 09:46 (WEA 13) 17:22 | 26 08:39 (WEA 12) 18:13 | 25 07:35 (WEA 11) 20:06 | 27 07:32 (WEA 10) 20:57 | 21:36 |
| 12 | 08:21 | 09:18 (WEA 13) 07:40 | 08:14 (WEA 12) 06:40 | 07:10 (WEA 11) 06:29 | 07:05 (WEA 10) 05:29 | 04:57 |
| | 16:29 | 28 09:46 (WEA 13) 17:23 | 27 08:41 (WEA 12) 18:15 | 26 07:36 (WEA 11) 20:08 | 27 07:32 (WEA 10) 20:59 | 21:37 |
| 13 | 08:21 | 09:19 (WEA 13) 07:38 | 08:14 (WEA 12) 06:38 | 07:09 (WEA 11) 06:27 | 07:05 (WEA 10) 05:27 | 04:56 |
| | 16:30 | 27 09:46 (WEA 13) 17:25 | 27 08:41 (WEA 12) 18:16 | 27 07:36 (WEA 11) 20:10 | 26 07:31 (WEA 10) 21:00 | 21:37 |
| 14 | 08:20 | 09:19 (WEA 13) 07:36 | 08:14 (WEA 12) 06:36 | 07:08 (WEA 11) 06:24 | 07:05 (WEA 10) 05:26 | 04:56 |
| | 16:32 | 27 09:46 (WEA 13) 17:27 | 27 08:41 (WEA 12) 18:18 | 28 07:36 (WEA 11) 20:12 | 25 07:30 (WEA 10) 21:02 | 21:38 |
| 15 | 08:19 | 09:20 (WEA 13) 07:34 | 08:13 (WEA 12) 06:33 | 07:08 (WEA 11) 06:22 | 07:05 (WEA 10) 05:24 | 04:56 |
| | 16:33 | 26 09:46 (WEA 13) 17:29 | 27 08:40 (WEA 12) 18:20 | 28 07:36 (WEA 11) 20:13 | 24 07:29 (WEA 10) 21:03 | 21:39 |
| 16 | 08:18 | 09:21 (WEA 13) 07:32 | 08:13 (WEA 12) 06:31 | 07:08 (WEA 11) 06:20 | 07:06 (WEA 10) 05:22 | 04:56 |
| | 16:35 | 25 09:46 (WEA 13) 17:31 | 27 08:40 (WEA 12) 18:22 | 27 07:35 (WEA 11) 20:15 | 22 07:28 (WEA 10) 21:05 | 21:39 |
| 17 | 08:17 | 09:22 (WEA 13) 07:30 | 08:13 (WEA 12) 06:29 | 07:08 (WEA 11) 06:18 | 07:07 (WEA 10) 05:21 | 04:56 |
| | 16:37 | 24 09:46 (WEA 13) 17:33 | 27 08:40 (WEA 12) 18:23 | 26 07:34 (WEA 11) 20:17 | 19 07:26 (WEA 10) 21:06 | 21:40 |
| 18 | 08:16 | 09:23 (WEA 13) 07:28 | 08:14 (WEA 12) 06:26 | 07:08 (WEA 11) 06:16 | 07:09 (WEA 10) 05:19 | 04:56 |
| | 16:38 | 23 09:46 (WEA 13) 17:35 | 25 08:39 (WEA 12) 18:25 | 26 07:34 (WEA 11) 20:18 | 15 07:24 (WEA 10) 21:08 | 21:40 |
| 19 | 08:15 | 09:24 (WEA 13) 07:26 | 08:14 (WEA 12) 06:24 | 07:09 (WEA 11) 06:13 | 07:11 (WEA 10) 05:18 | 04:56 |
| | 16:40 | 22 09:46 (WEA 13) 17:36 | 25 08:39 (WEA 12) 18:27 | 24 07:33 (WEA 11) 20:20 | 11 07:22 (WEA 10) 21:09 | 21:40 |
| 20 | 08:14 | 09:25 (WEA 13) 07:24 | 08:15 (WEA 12) 06:22 | 07:09 (WEA 11) 06:11 | 05:17 | 04:56 |
| | 16:42 | 20 09:45 (WEA 13) 17:38 | 23 08:38 (WEA 12) 18:29 | 22 07:31 (WEA 11) 20:22 | 21:11 | 21:41 |
| 21 | 08:13 | 09:26 (WEA 13) 07:22 | 08:16 (WEA 12) 06:19 | 07:11 (WEA 11) 06:09 | 05:15 | 04:56 |
| | 16:43 | 18 09:44 (WEA 13) 17:40 | 20 08:36 (WEA 12) 18:30 | 18 07:29 (WEA 11) 20:23 | 21:12 | 21:41 |
| 22 | 08:12 | 09:28 (WEA 13) 07:20 | 08:18 (WEA 12) 06:17 | 07:13 (WEA 11) 06:07 | 05:14 | 04:56 |
| | 16:45 | 15 09:43 (WEA 13) 17:42 | 17 08:35 (WEA 12) 18:32 | 14 07:27 (WEA 11) 20:25 | 21:14 | 21:41 |
| 23 | 08:11 | 09:30 (WEA 13) 07:18 | 08:20 (WEA 12) 06:15 | 07:15 (WEA 11) 06:05 | 05:13 | 04:56 |
| | 16:47 | 12 09:42 (WEA 13) 17:44 | 13 08:33 (WEA 12) 18:34 | 8 07:23 (WEA 11) 20:27 | 21:15 | 21:41 |
| 24 | 08:10 | 09:34 (WEA 13) 07:16 | 06:12 | 06:03 | 05:11 | 04:57 |
| | 16:48 | 4 09:38 (WEA 13) 17:46 | 18:35 | 20:29 | 21:17 | 21:41 |
| 25 | 08:08 | 07:13 | 06:10 | 06:01 | 05:10 | 04:57 |
| | 16:50 | 17:48 | 18:37 | 20:30 | 21:18 | 21:42 |
| 26 | 08:07 | 07:11 | 06:08 | 05:59 | 05:09 | 04:57 |
| | 16:52 | 17:49 | 18:39 | 20:32 | 21:19 | 21:42 |
| 27 | 08:06 | 07:09 | 06:05 | 05:57 | 05:08 | 04:58 |
| | 16:54 | 17:51 | 18:41 | 20:34 | 21:21 | 21:41 |
| 28 | 08:04 | 07:07 | 06:03 | 05:55 | 05:07 | 04:58 |
| | 16:56 | 17:53 | 18:42 | 20:35 | 21:22 | 21:41 |
| 29 | 08:03 | | 07:01 | 05:53 | 05:06 | 04:59 |
| | 16:57 | | 19:44 | 20:37 | 21:23 | 21:41 |
| 30 | 08:02 | | 06:58 | 05:51 | 05:05 | 04:59 |
| | 16:59 | | 19:46 | 20:39 | 21:24 | 21:41 |
| 31 | 08:00 | | 06:56 | | 05:04 | |
| | 17:01 | | 19:47 | | 21:25 | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 589 | 423 | 375 | 392 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,57 | 0,62 | 0,66 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 57 | 61 | 67 | 97 | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d60 - Söllingen, Ringstraße 15

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | | |
|---------------------------|-------|--------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:04 (WEA 10) | 07:16 | 07:48 (WEA 11) | 07:10 | 07:44 (WEA 12) | 08:02 | 09:00 (WEA 13) | |
| | 21:41 | 21:09 | 20:06 | 27 07:31 (WEA 10) | 18:56 | 27 08:15 (WEA 11) | 16:50 | 24 08:08 (WEA 12) | 16:09 | 28 09:28 (WEA 13) | |
| 2 | 05:01 | 05:38 | 06:28 | 07:04 (WEA 10) | 07:18 | 07:49 (WEA 11) | 07:12 | 07:45 (WEA 12) | 08:03 | 09:01 (WEA 13) | |
| | 21:40 | 21:07 | 20:04 | 27 07:31 (WEA 10) | 18:54 | 25 08:14 (WEA 11) | 16:48 | 22 08:07 (WEA 12) | 16:09 | 28 09:29 (WEA 13) | |
| 3 | 05:01 | 05:40 | 06:30 | 07:03 (WEA 10) | 07:20 | 07:49 (WEA 11) | 07:14 | 07:46 (WEA 12) | 08:04 | 09:00 (WEA 13) | |
| | 21:40 | 21:05 | 20:02 | 27 07:30 (WEA 10) | 18:52 | 24 08:13 (WEA 11) | 16:46 | 20 08:06 (WEA 12) | 16:08 | 29 09:29 (WEA 13) | |
| 4 | 05:02 | 05:41 | 06:32 | 07:04 (WEA 10) | 07:21 | 07:50 (WEA 11) | 07:16 | 07:47 (WEA 12) | 08:06 | 09:00 (WEA 13) | |
| | 21:40 | 21:04 | 19:59 | 26 07:30 (WEA 10) | 18:49 | 22 08:12 (WEA 11) | 16:44 | 18 08:05 (WEA 12) | 16:07 | 29 09:29 (WEA 13) | |
| 5 | 05:03 | 05:43 | 06:33 | 07:03 (WEA 10) | 07:23 | 07:51 (WEA 11) | 07:18 | 07:49 (WEA 12) | 08:07 | 09:01 (WEA 13) | |
| | 21:39 | 21:02 | 19:57 | 25 07:28 (WEA 10) | 18:47 | 19 08:10 (WEA 11) | 16:43 | 14 08:03 (WEA 12) | 16:07 | 29 09:30 (WEA 13) | |
| 6 | 05:04 | 05:45 | 06:35 | 07:04 (WEA 10) | 07:25 | 07:53 (WEA 11) | 07:19 | 07:52 (WEA 12) | 08:08 | 09:01 (WEA 13) | |
| | 21:39 | 21:00 | 19:55 | 24 07:28 (WEA 10) | 18:45 | 15 08:08 (WEA 11) | 16:41 | 9 08:01 (WEA 12) | 16:06 | 29 09:30 (WEA 13) | |
| 7 | 05:05 | 05:46 | 06:37 | 07:04 (WEA 10) | 07:26 | 07:56 (WEA 11) | 07:21 | | 08:10 | 09:02 (WEA 13) | |
| | 21:38 | 20:58 | 19:53 | 22 07:26 (WEA 10) | 18:43 | 9 08:05 (WEA 11) | 16:39 | | 16:06 | 29 09:31 (WEA 13) | |
| 8 | 05:06 | 05:48 | 06:38 | 07:05 (WEA 10) | 07:28 | | 07:23 | | 08:11 | 09:02 (WEA 13) | |
| | 21:37 | 20:56 | 19:50 | 20 07:25 (WEA 10) | 18:40 | | 16:37 | | 16:06 | 29 09:31 (WEA 13) | |
| 9 | 05:07 | 05:49 | 06:40 | 07:07 (WEA 10) | 07:30 | | 07:25 | | 08:12 | 09:03 (WEA 13) | |
| | 21:37 | 20:54 | 19:48 | 16 07:23 (WEA 10) | 18:38 | | 16:36 | | 16:05 | 29 09:32 (WEA 13) | |
| 10 | 05:08 | 05:51 | 06:42 | 07:09 (WEA 10) | 07:31 | | 07:27 | | 08:13 | 09:03 (WEA 13) | |
| | 21:36 | 20:53 | 19:46 | 10 07:19 (WEA 10) | 18:36 | | 16:34 | | 16:05 | 29 09:32 (WEA 13) | |
| 11 | 05:09 | 05:53 | 06:43 | | 07:33 | | 07:28 | | 08:14 | 09:03 (WEA 13) | |
| | 21:35 | 20:51 | 19:43 | | 18:34 | | 16:33 | | 16:05 | 29 09:32 (WEA 13) | |
| 12 | 05:10 | 05:54 | 06:45 | | 07:35 | | 07:30 | | 08:15 | 09:04 (WEA 13) | |
| | 21:34 | 20:49 | 19:41 | | 18:31 | | 16:31 | | 16:05 | 28 09:32 (WEA 13) | |
| 13 | 05:11 | 05:56 | 06:46 | | 07:37 | | 07:32 | | 08:16 | 09:04 (WEA 13) | |
| | 21:33 | 20:47 | 19:39 | | 18:29 | | 16:30 | | 16:05 | 29 09:33 (WEA 13) | |
| 14 | 05:12 | 05:57 | 06:48 | | 07:38 | | 07:34 | | 08:17 | 09:05 (WEA 13) | |
| | 21:32 | 20:45 | 19:36 | | 18:27 | | 16:28 | | 16:05 | 28 09:33 (WEA 13) | |
| 15 | 05:13 | 05:59 | 06:50 | | 07:40 | | 07:35 | | 08:18 | 09:05 (WEA 13) | |
| | 21:32 | 20:43 | 19:34 | | 18:25 | | 16:27 | | 16:05 | 29 09:34 (WEA 13) | |
| 16 | 05:14 | 06:01 | 06:51 | | 07:42 | | 07:37 | | 08:19 | 09:06 (WEA 13) | |
| | 21:30 | 20:41 | 19:32 | | 18:23 | | 16:25 | | 16:05 | 28 09:34 (WEA 13) | |
| 17 | 05:16 | 06:02 | 06:53 | | 07:44 | | 07:39 | | 08:20 | 09:07 (WEA 13) | |
| | 21:29 | 20:39 | 19:29 | | 18:20 | | 16:24 | | 16:05 | 28 09:35 (WEA 13) | |
| 18 | 05:17 | 06:04 | 06:55 | | 07:45 | 08:54 (WEA 12) | 07:41 | 09:07 (WEA 13) | 08:21 | 09:07 (WEA 13) | |
| | 21:28 | 20:37 | 19:27 | | 18:18 | 7 09:01 (WEA 12) | 16:22 | 5 09:12 (WEA 13) | 16:05 | 29 09:36 (WEA 13) | |
| 19 | 05:18 | 06:06 | 06:56 | | 07:47 | 08:50 (WEA 12) | 07:42 | 09:04 (WEA 13) | 08:21 | 09:07 (WEA 13) | |
| | 21:27 | 20:35 | 19:24 | | 18:16 | 14 09:04 (WEA 12) | 16:21 | 12 09:16 (WEA 13) | 16:06 | 28 09:35 (WEA 13) | |
| 20 | 05:19 | 06:07 | 06:58 | 08:03 (WEA 11) | 07:49 | 08:48 (WEA 12) | 07:44 | 09:03 (WEA 13) | 08:22 | 09:08 (WEA 13) | |
| | 21:26 | 20:32 | 19:22 | 5 08:08 (WEA 11) | 18:14 | 18 09:06 (WEA 12) | 16:20 | 15 09:18 (WEA 13) | 16:06 | 28 09:36 (WEA 13) | |
| 21 | 05:21 | 06:09 | 07:00 | 07:59 (WEA 11) | 07:51 | 08:46 (WEA 12) | 07:46 | 09:02 (WEA 13) | 08:23 | 09:09 (WEA 13) | |
| | 21:25 | 20:30 | 19:20 | 13 08:12 (WEA 11) | 18:12 | 21 09:07 (WEA 12) | 16:19 | 18 09:20 (WEA 13) | 16:06 | 28 09:37 (WEA 13) | |
| 22 | 05:22 | 06:10 | 07:01 | 07:56 (WEA 11) | 07:52 | 08:45 (WEA 12) | 07:47 | 09:01 (WEA 13) | 08:23 | 09:09 (WEA 13) | |
| | 21:23 | 20:28 | 19:17 | 17 08:13 (WEA 11) | 18:10 | 23 09:08 (WEA 12) | 16:18 | 20 09:21 (WEA 13) | 16:07 | 28 09:37 (WEA 13) | |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 (WEA 11) | 07:54 | 08:44 (WEA 12) | 07:49 | 09:01 (WEA 13) | 08:24 | 09:09 (WEA 13) | |
| | 21:22 | 20:26 | 19:15 | 21 08:15 (WEA 11) | 18:08 | 25 09:09 (WEA 12) | 16:16 | 22 09:23 (WEA 13) | 16:07 | 28 09:37 (WEA 13) | |
| 24 | 05:25 | 06:14 | 07:04 | 07:53 (WEA 11) | 07:56 | 08:44 (WEA 12) | 07:51 | 09:00 (WEA 13) | 08:24 | 09:10 (WEA 13) | |
| | 21:21 | 20:24 | 12 07:14 (WEA 10) | 19:13 | 23 08:16 (WEA 11) | 18:06 | 26 09:10 (WEA 12) | 16:15 | 23 09:23 (WEA 13) | 16:08 | 28 09:38 (WEA 13) |
| 25 | 05:26 | 06:15 | 07:11 (WEA 10) | 07:06 | 07:51 (WEA 11) | 06:58 | 07:43 (WEA 12) | 07:52 | 09:00 (WEA 13) | 08:25 | 09:10 (WEA 13) |
| | 21:19 | 20:22 | 16 07:27 (WEA 10) | 19:10 | 25 08:16 (WEA 11) | 17:04 | 27 08:10 (WEA 12) | 16:14 | 24 09:24 (WEA 13) | 16:09 | 28 09:38 (WEA 13) |
| 26 | 05:28 | 06:17 | 07:10 (WEA 10) | 07:08 | 07:50 (WEA 11) | 06:59 | 07:43 (WEA 12) | 07:54 | 09:00 (WEA 13) | 08:25 | 09:11 (WEA 13) |
| | 21:18 | 20:20 | 19 07:29 (WEA 10) | 19:08 | 27 08:17 (WEA 11) | 17:02 | 27 08:10 (WEA 12) | 16:13 | 25 09:25 (WEA 13) | 16:09 | 28 09:39 (WEA 13) |
| 27 | 05:29 | 06:19 | 07:08 (WEA 10) | 07:09 | 07:50 (WEA 11) | 07:01 | 07:43 (WEA 12) | 07:56 | 08:59 (WEA 13) | 08:25 | 09:11 (WEA 13) |
| | 21:16 | 20:17 | 22 07:30 (WEA 10) | 19:06 | 27 08:17 (WEA 11) | 17:00 | 28 08:11 (WEA 12) | 16:12 | 26 09:25 (WEA 13) | 16:10 | 28 09:39 (WEA 13) |
| 28 | 05:31 | 06:20 | 07:07 (WEA 10) | 07:11 | 07:49 (WEA 11) | 07:03 | 07:42 (WEA 12) | 07:57 | 08:59 (WEA 13) | 08:25 | 09:12 (WEA 13) |
| | 21:15 | 20:15 | 24 07:31 (WEA 10) | 19:03 | 27 08:16 (WEA 11) | 16:58 | 27 08:09 (WEA 12) | 16:12 | 27 09:26 (WEA 13) | 16:11 | 29 09:41 (WEA 13) |
| 29 | 05:32 | 06:22 | 07:05 (WEA 10) | 07:13 | 07:49 (WEA 11) | 07:05 | 07:42 (WEA 12) | 07:59 | 09:00 (WEA 13) | 08:25 | 09:12 (WEA 13) |
| | 21:13 | 20:13 | 26 07:31 (WEA 10) | 19:01 | 27 08:16 (WEA 11) | 16:56 | 27 08:09 (WEA 12) | 16:11 | 27 09:27 (WEA 13) | 16:12 | 29 09:41 (WEA 13) |
| 30 | 05:34 | 06:24 | 07:05 (WEA 10) | 07:14 | 07:49 (WEA 11) | 07:07 | 07:43 (WEA 12) | 08:00 | 08:59 (WEA 13) | 08:26 | 09:13 (WEA 13) |
| | 21:12 | 20:11 | 26 07:31 (WEA 10) | 18:59 | 27 08:16 (WEA 11) | 16:54 | 26 08:09 (WEA 12) | 16:10 | 28 09:27 (WEA 13) | 16:13 | 29 09:42 (WEA 13) |
| 31 | 05:35 | 06:25 | 07:04 (WEA 10) | | 07:08 | | 07:43 (WEA 12) | | 08:26 | | 09:12 (WEA 13) |
| | 21:10 | 20:08 | 27 07:31 (WEA 10) | | 16:52 | 26 08:09 (WEA 12) | | | 16:14 | 29 09:41 (WEA 13) | |
| Sonnenscheinstunden | 503 | 454 | 381 | | 331 | | 266 | | 243 | | |
| astr.max.mögl.Beschattung | | 172 | 463 | | 463 | | 379 | | 884 | | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | | 0,31 | | 0,21 | | 0,14 | | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | | 0,96 | | 0,96 | | 0,96 | | |
| Reduktion Windrichtung | | 0,71 | 0,68 | | 0,63 | | 0,58 | | 0,57 | | |
| Gesamte Reduktion | | 0,29 | 0,24 | | 0,18 | | 0,12 | | 0,07 | | |
| Met.wahrsch.Beschattung | | 51 | 110 | | 85 | | 44 | | 64 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d61 - Söllingen, Ringstraße 16

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|--------------------------|---------------------------|---------------------------|---------------------------|-------|
| 1 | 08:26 | 09:09 (WEA 13) 07:59 | 07:05 | 06:54 | 05:49 | 05:03 |
| | 16:15 | 09:39 (WEA 14) 17:03 | 17:55 | 19:49 | 20:40 | 21:27 |
| 2 | 08:26 | 09:10 (WEA 13) 07:57 | 07:03 | 06:52 | 05:47 | 05:02 |
| | 16:16 | 09:39 (WEA 14) 17:05 | 17:57 | 19:51 | 20:42 | 21:28 |
| 3 | 08:25 | 09:10 (WEA 13) 07:55 | 07:00 | 06:49 | 05:45 | 05:01 |
| | 16:17 | 09:40 (WEA 14) 17:07 | 17:58 | 19:53 | 20:44 | 21:29 |
| 4 | 08:25 | 09:10 (WEA 13) 07:54 | 06:58 | 06:47 | 05:43 | 05:01 |
| | 16:18 | 09:40 (WEA 14) 17:08 | 18:00 | 19:54 | 20:46 | 21:30 |
| 5 | 08:25 | 09:11 (WEA 13) 07:52 | 06:56 | 06:45 | 05:41 | 05:00 |
| | 16:19 | 09:40 (WEA 14) 17:10 | 18:02 | 19:56 | 20:47 | 21:31 |
| 6 | 08:25 | 09:10 (WEA 13) 07:50 | 06:54 | 06:42 | 05:39 | 04:59 |
| | 16:21 | 09:40 (WEA 14) 17:12 | 18:04 | 19:58 | 20:49 | 21:32 |
| 7 | 08:24 | 09:11 (WEA 13) 07:49 | 06:52 | 06:40 | 05:37 | 04:59 |
| | 16:22 | 09:41 (WEA 14) 17:14 | 18:06 | 20:00 | 20:50 | 21:33 |
| 8 | 08:24 | 09:11 (WEA 13) 07:47 | 06:49 | 06:38 | 05:36 | 04:58 |
| | 16:23 | 09:41 (WEA 14) 17:16 | 18:07 | 20:01 | 20:52 | 21:34 |
| 9 | 08:23 | 09:11 (WEA 13) 07:45 | 06:47 | 06:36 | 05:34 | 04:58 |
| | 16:25 | 09:42 (WEA 14) 17:18 | 5 08:16 (WEA 12) 18:09 | 20:03 | 16 07:16 (WEA 10) 20:54 | 21:35 |
| 10 | 08:23 | 09:12 (WEA 13) 07:43 | 08:12 (WEA 12) 06:45 | 06:33 | 20 06:58 (WEA 10) 05:32 | 04:57 |
| | 16:26 | 09:43 (WEA 14) 17:20 | 13 08:25 (WEA 12) 18:11 | 20:05 | 20 07:18 (WEA 10) 20:55 | 21:35 |
| 11 | 08:22 | 09:12 (WEA 13) 07:41 | 08:10 (WEA 12) 06:42 | 06:31 | 20 06:57 (WEA 10) 05:30 | 04:57 |
| | 16:27 | 09:43 (WEA 14) 17:22 | 17 08:27 (WEA 12) 18:13 | 20:06 | 22 07:19 (WEA 10) 20:57 | 21:36 |
| 12 | 08:21 | 09:13 (WEA 13) 07:40 | 08:10 (WEA 12) 06:40 | 07:07 (WEA 11) 06:29 | 24 06:56 (WEA 10) 05:29 | 04:57 |
| | 16:29 | 09:43 (WEA 14) 17:23 | 20 08:30 (WEA 12) 18:15 | 12 07:19 (WEA 11) 20:08 | 24 07:20 (WEA 10) 20:59 | 21:37 |
| 13 | 08:21 | 09:13 (WEA 13) 07:38 | 08:08 (WEA 12) 06:38 | 07:04 (WEA 11) 06:27 | 25 06:55 (WEA 10) 05:27 | 04:56 |
| | 16:30 | 09:43 (WEA 14) 17:25 | 23 08:31 (WEA 12) 18:16 | 18 07:22 (WEA 11) 20:10 | 25 07:20 (WEA 10) 21:00 | 21:37 |
| 14 | 08:20 | 09:13 (WEA 13) 07:36 | 08:08 (WEA 12) 06:36 | 07:02 (WEA 11) 06:24 | 26 06:53 (WEA 10) 05:26 | 04:56 |
| | 16:32 | 09:44 (WEA 14) 17:27 | 24 08:32 (WEA 12) 18:18 | 21 07:23 (WEA 11) 20:12 | 27 07:20 (WEA 10) 21:02 | 21:38 |
| 15 | 08:19 | 09:14 (WEA 13) 07:34 | 08:06 (WEA 12) 06:33 | 07:01 (WEA 11) 06:22 | 27 06:53 (WEA 10) 05:24 | 04:56 |
| | 16:33 | 09:44 (WEA 14) 17:29 | 26 08:32 (WEA 12) 18:20 | 23 07:24 (WEA 11) 20:13 | 27 07:20 (WEA 10) 21:03 | 21:39 |
| 16 | 08:18 | 09:14 (WEA 13) 07:32 | 08:05 (WEA 12) 06:31 | 07:00 (WEA 11) 06:20 | 28 06:52 (WEA 10) 05:22 | 04:56 |
| | 16:35 | 09:44 (WEA 14) 17:31 | 28 08:33 (WEA 12) 18:22 | 25 07:25 (WEA 11) 20:15 | 28 07:20 (WEA 10) 21:05 | 21:39 |
| 17 | 08:17 | 09:15 (WEA 13) 07:30 | 08:05 (WEA 12) 06:29 | 06:58 (WEA 11) 06:18 | 28 06:52 (WEA 10) 05:21 | 04:56 |
| | 16:37 | 09:44 (WEA 14) 17:33 | 28 08:33 (WEA 12) 18:23 | 27 07:25 (WEA 11) 20:17 | 28 07:20 (WEA 10) 21:06 | 21:40 |
| 18 | 08:16 | 09:15 (WEA 13) 07:28 | 08:05 (WEA 12) 06:26 | 06:58 (WEA 11) 06:16 | 28 06:52 (WEA 10) 05:19 | 04:56 |
| | 16:38 | 09:45 (WEA 14) 17:35 | 28 08:33 (WEA 12) 18:25 | 27 07:25 (WEA 11) 20:18 | 28 07:20 (WEA 10) 21:08 | 21:40 |
| 19 | 08:15 | 09:16 (WEA 13) 07:26 | 08:05 (WEA 12) 06:24 | 06:57 (WEA 11) 06:13 | 27 06:52 (WEA 10) 05:18 | 04:56 |
| | 16:40 | 09:45 (WEA 14) 17:36 | 28 08:33 (WEA 12) 18:27 | 29 07:26 (WEA 11) 20:20 | 27 07:19 (WEA 10) 21:09 | 21:40 |
| 20 | 08:14 | 09:17 (WEA 13) 07:24 | 08:05 (WEA 12) 06:22 | 06:56 (WEA 11) 06:11 | 26 06:53 (WEA 10) 05:17 | 04:56 |
| | 16:42 | 09:45 (WEA 14) 17:38 | 28 08:33 (WEA 12) 18:29 | 29 07:25 (WEA 11) 20:22 | 26 07:19 (WEA 10) 21:11 | 21:41 |
| 21 | 08:13 | 09:17 (WEA 13) 07:22 | 08:05 (WEA 12) 06:19 | 06:56 (WEA 11) 06:09 | 25 06:53 (WEA 10) 05:15 | 04:56 |
| | 16:43 | 09:44 (WEA 14) 17:40 | 28 08:33 (WEA 12) 18:30 | 29 07:25 (WEA 11) 20:23 | 25 07:18 (WEA 10) 21:12 | 21:41 |
| 22 | 08:12 | 09:18 (WEA 13) 07:20 | 08:06 (WEA 12) 06:17 | 06:57 (WEA 11) 06:07 | 23 06:54 (WEA 10) 05:14 | 04:56 |
| | 16:45 | 09:44 (WEA 14) 17:42 | 27 08:33 (WEA 12) 18:32 | 27 07:24 (WEA 11) 20:25 | 23 07:17 (WEA 10) 21:14 | 21:41 |
| 23 | 08:11 | 09:20 (WEA 13) 07:18 | 08:06 (WEA 12) 06:15 | 06:56 (WEA 11) 06:05 | 23 06:54 (WEA 10) 05:13 | 04:56 |
| | 16:47 | 09:44 (WEA 14) 17:44 | 26 08:32 (WEA 12) 18:34 | 27 07:23 (WEA 11) 20:27 | 22 07:16 (WEA 10) 21:15 | 21:41 |
| 24 | 08:10 | 09:20 (WEA 13) 07:16 | 08:06 (WEA 12) 06:12 | 06:57 (WEA 11) 06:03 | 22 06:56 (WEA 10) 05:11 | 04:57 |
| | 16:48 | 09:43 (WEA 14) 17:46 | 24 08:30 (WEA 12) 18:35 | 25 07:22 (WEA 11) 20:29 | 18 07:14 (WEA 10) 21:17 | 21:41 |
| 25 | 08:08 | 09:22 (WEA 13) 07:13 | 08:07 (WEA 12) 06:10 | 06:58 (WEA 11) 06:01 | 15 06:57 (WEA 10) 05:10 | 04:57 |
| | 16:50 | 09:42 (WEA 14) 17:48 | 23 08:30 (WEA 12) 18:37 | 23 07:21 (WEA 11) 20:30 | 15 07:12 (WEA 10) 21:18 | 21:41 |
| 26 | 08:07 | 09:23 (WEA 13) 07:11 | 08:08 (WEA 12) 06:08 | 06:58 (WEA 11) 05:59 | 9 07:00 (WEA 10) 05:09 | 04:57 |
| | 16:52 | 09:41 (WEA 14) 17:49 | 20 08:28 (WEA 12) 18:39 | 21 07:19 (WEA 11) 20:32 | 9 07:09 (WEA 10) 21:19 | 21:41 |
| 27 | 08:06 | 09:25 (WEA 13) 07:09 | 08:10 (WEA 12) 06:05 | 07:00 (WEA 11) 05:57 | 05:08 | 04:58 |
| | 16:54 | 09:40 (WEA 14) 17:51 | 16 08:26 (WEA 12) 18:41 | 17 07:17 (WEA 11) 20:34 | 21:21 | 21:41 |
| 28 | 08:04 | 09:28 (WEA 13) 07:07 | 08:13 (WEA 12) 06:03 | 07:02 (WEA 11) 05:55 | 05:07 | 04:58 |
| | 16:56 | 9 09:37 (WEA 14) 17:53 | 10 08:23 (WEA 12) 18:42 | 13 07:15 (WEA 11) 20:35 | 21:22 | 21:41 |
| 29 | 08:03 | | 07:01 | 08:06 (WEA 11) 05:53 | 05:06 | 04:59 |
| | 16:57 | | 19:44 | 3 08:09 (WEA 11) 20:37 | 21:23 | 21:41 |
| 30 | 08:02 | | 06:58 | 05:51 | 05:05 | 04:59 |
| | 16:59 | | 19:46 | 20:39 | 21:24 | 21:41 |
| 31 | 08:00 | | 06:56 | | 05:04 | |
| | 17:01 | | 19:47 | | 21:25 | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 760 | 442 | 396 | 422 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,56 | 0,63 | 0,67 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 73 | 64 | 72 | 104 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d61 - Söllingen, Ringstraße 16

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | |
|---------------------------|-------|--------|-----------|-------------------|----------|-------------------|----------------|-------------------|-------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 06:56 (WEA 10) | 07:16 | 07:45 (WEA 11) | 07:10 | 07:43 (WEA 12) | 08:02 | 08:54 (WEA 13) |
| | 21:41 | 21:09 | 20:06 | 22 07:18 (WEA 10) | 18:56 | 14 07:59 (WEA 11) | 16:50 | 11 07:54 (WEA 12) | 16:09 | 31 09:25 (WEA 13) |
| 2 | 05:01 | 05:38 | 06:28 | 06:57 (WEA 10) | 07:18 | 07:48 (WEA 11) | 07:12 | | 08:03 | 08:55 (WEA 13) |
| | 21:40 | 21:07 | 20:04 | 20 07:17 (WEA 10) | 18:54 | 8 07:56 (WEA 11) | 16:48 | | 16:09 | 31 09:26 (WEA 13) |
| 3 | 05:01 | 05:40 | 06:30 | 06:58 (WEA 10) | 07:20 | | 07:14 | | 08:04 | 08:55 (WEA 13) |
| | 21:40 | 21:05 | 20:02 | 16 07:14 (WEA 10) | 18:52 | | 16:46 | | 16:08 | 31 09:26 (WEA 13) |
| 4 | 05:02 | 05:41 | 06:32 | 07:00 (WEA 10) | 07:21 | | 07:16 | | 08:06 | 08:55 (WEA 13) |
| | 21:40 | 21:04 | 19:59 | 12 07:12 (WEA 10) | 18:49 | | 16:44 | | 16:07 | 30 09:25 (WEA 13) |
| 5 | 05:03 | 05:43 | 06:33 | | 07:23 | | 07:18 | | 08:07 | 08:56 (WEA 13) |
| | 21:39 | 21:02 | 19:57 | | 18:47 | | 16:43 | | 16:07 | 30 09:26 (WEA 13) |
| 6 | 05:04 | 05:45 | 06:35 | | 07:25 | | 07:19 | | 08:08 | 08:56 (WEA 13) |
| | 21:39 | 21:00 | 19:55 | | 18:45 | | 16:41 | | 16:06 | 30 09:26 (WEA 13) |
| 7 | 05:05 | 05:46 | 06:37 | | 07:26 | | 07:21 | | 08:10 | 08:58 (WEA 13) |
| | 21:38 | 20:58 | 19:52 | | 18:43 | | 16:39 | | 16:06 | 29 09:27 (WEA 13) |
| 8 | 05:06 | 05:48 | 06:38 | | 07:28 | | 07:23 | | 08:11 | 08:58 (WEA 13) |
| | 21:37 | 20:56 | 19:50 | | 18:40 | | 16:37 | | 16:06 | 30 09:28 (WEA 14) |
| 9 | 05:07 | 05:49 | 06:40 | | 07:30 | | 07:25 | | 08:12 | 08:58 (WEA 13) |
| | 21:37 | 20:54 | 19:48 | | 18:38 | | 16:36 | | 16:05 | 30 09:28 (WEA 14) |
| 10 | 05:08 | 05:51 | 06:42 | | 07:31 | | 07:27 | | 08:13 | 08:59 (WEA 13) |
| | 21:36 | 20:53 | 19:46 | | 18:36 | | 16:34 | | 16:05 | 29 09:28 (WEA 14) |
| 11 | 05:09 | 05:53 | 06:43 | | 07:33 | | 07:28 | | 08:14 | 08:59 (WEA 13) |
| | 21:35 | 20:51 | 19:43 | | 18:34 | | 16:33 | | 16:05 | 30 09:29 (WEA 14) |
| 12 | 05:10 | 05:54 | 06:45 | | 07:35 | | 07:30 | | 08:15 | 09:00 (WEA 13) |
| | 21:34 | 20:49 | 19:41 | | 18:31 | | 16:31 | | 16:05 | 30 09:30 (WEA 14) |
| 13 | 05:11 | 05:56 | 06:46 | | 07:37 | | 08:50 (WEA 12) | | 08:16 | 09:00 (WEA 13) |
| | 21:33 | 20:47 | 19:39 | | 18:29 | 1 08:51 (WEA 12) | 16:30 | | 16:05 | 30 09:30 (WEA 14) |
| 14 | 05:12 | 05:57 | 06:48 | | 07:38 | | 08:44 (WEA 12) | | 08:17 | 09:01 (WEA 13) |
| | 21:32 | 20:45 | 19:36 | | 18:27 | 13 08:57 (WEA 12) | 16:28 | 10 09:00 (WEA 13) | 16:05 | 30 09:31 (WEA 14) |
| 15 | 05:13 | 05:59 | 06:50 | | 07:40 | | 08:42 (WEA 12) | | 08:18 | 09:02 (WEA 13) |
| | 21:32 | 20:43 | 19:34 | 12 08:04 (WEA 11) | 18:25 | 17 08:59 (WEA 12) | 16:27 | 15 09:13 (WEA 13) | 16:05 | 29 09:31 (WEA 14) |
| 16 | 05:14 | 06:01 | 06:51 | | 07:42 | | 08:40 (WEA 12) | | 08:19 | 09:02 (WEA 13) |
| | 21:30 | 20:41 | 19:32 | 17 08:06 (WEA 11) | 18:23 | 21 09:01 (WEA 12) | 16:25 | 18 09:15 (WEA 13) | 16:05 | 30 09:32 (WEA 14) |
| 17 | 05:16 | 06:02 | 06:53 | | 07:44 | | 08:39 (WEA 12) | | 08:20 | 09:03 (WEA 13) |
| | 21:29 | 20:39 | 19:29 | 20 08:07 (WEA 11) | 18:20 | 23 09:02 (WEA 12) | 16:24 | 20 09:15 (WEA 13) | 16:05 | 30 09:33 (WEA 14) |
| 18 | 05:17 | 06:04 | 06:55 | | 07:45 | | 08:38 (WEA 12) | | 08:21 | 09:04 (WEA 13) |
| | 21:28 | 20:37 | 19:27 | 24 08:09 (WEA 11) | 18:18 | 25 09:03 (WEA 12) | 16:22 | 23 09:17 (WEA 13) | 16:05 | 29 09:33 (WEA 14) |
| 19 | 05:18 | 06:06 | 06:56 | | 07:47 | | 08:36 (WEA 12) | | 08:21 | 09:04 (WEA 13) |
| | 21:27 | 20:35 | 19:24 | 25 08:10 (WEA 11) | 18:16 | 27 09:03 (WEA 12) | 16:21 | 24 09:18 (WEA 13) | 16:06 | 29 09:33 (WEA 14) |
| 20 | 05:19 | 06:07 | 06:58 | | 07:49 | | 08:36 (WEA 12) | | 08:22 | 09:05 (WEA 13) |
| | 21:26 | 20:32 | 19:22 | 26 08:09 (WEA 11) | 18:14 | 27 09:03 (WEA 12) | 16:20 | 26 09:19 (WEA 13) | 16:06 | 29 09:34 (WEA 14) |
| 21 | 05:21 | 06:09 | 07:00 | | 07:51 | | 08:35 (WEA 12) | | 08:23 | 09:06 (WEA 13) |
| | 21:25 | 20:30 | 19:20 | 28 08:10 (WEA 11) | 18:12 | 29 09:04 (WEA 12) | 16:19 | 27 09:20 (WEA 13) | 16:06 | 29 09:35 (WEA 14) |
| 22 | 05:22 | 06:10 | 07:01 | | 07:52 | | 08:35 (WEA 12) | | 08:23 | 09:06 (WEA 13) |
| | 21:23 | 20:28 | 19:17 | 28 08:09 (WEA 11) | 18:10 | 29 09:04 (WEA 12) | 16:18 | 28 09:21 (WEA 13) | 16:07 | 29 09:35 (WEA 14) |
| 23 | 05:23 | 06:12 | 07:03 | | 07:54 | | 08:35 (WEA 12) | | 08:24 | 09:06 (WEA 13) |
| | 21:22 | 20:26 | 19:15 | 28 08:09 (WEA 11) | 18:08 | 29 09:04 (WEA 12) | 16:16 | 29 09:22 (WEA 13) | 16:07 | 29 09:35 (WEA 14) |
| 24 | 05:25 | 06:14 | 07:04 | | 07:56 | | 08:35 (WEA 12) | | 08:24 | 09:07 (WEA 13) |
| | 21:21 | 20:24 | 19:13 | 28 08:09 (WEA 11) | 18:06 | 29 09:04 (WEA 12) | 16:15 | 30 09:22 (WEA 13) | 16:08 | 29 09:36 (WEA 14) |
| 25 | 05:26 | 06:15 | 07:06 | | 07:58 | | 07:36 (WEA 12) | | 08:25 | 09:07 (WEA 13) |
| | 21:19 | 20:22 | 19:10 | 28 08:08 (WEA 11) | 17:04 | 27 08:03 (WEA 12) | 16:14 | 29 09:22 (WEA 13) | 16:09 | 29 09:36 (WEA 14) |
| 26 | 05:28 | 06:17 | 07:08 | | 07:59 | | 07:36 (WEA 12) | | 08:25 | 09:07 (WEA 13) |
| | 21:18 | 20:20 | 19:08 | 27 08:08 (WEA 11) | 17:02 | 27 08:03 (WEA 12) | 16:13 | 30 09:23 (WEA 13) | 16:09 | 30 09:37 (WEA 14) |
| 27 | 05:29 | 06:19 | 07:09 | | 08:00 | | 07:37 (WEA 12) | | 08:25 | 09:07 (WEA 13) |
| | 21:16 | 20:17 | 19:06 | 26 08:07 (WEA 11) | 17:00 | 25 08:02 (WEA 12) | 16:12 | 30 09:23 (WEA 13) | 16:10 | 30 09:37 (WEA 14) |
| 28 | 05:31 | 06:20 | 07:11 | | 08:01 | | 07:36 (WEA 12) | | 08:25 | 09:08 (WEA 13) |
| | 21:15 | 20:15 | 19:03 | 24 08:05 (WEA 11) | 16:58 | 25 08:01 (WEA 12) | 16:12 | 31 09:24 (WEA 13) | 16:11 | 30 09:38 (WEA 14) |
| 29 | 05:32 | 06:22 | 07:13 | | 08:02 | | 07:37 (WEA 12) | | 08:25 | 09:09 (WEA 13) |
| | 21:13 | 20:13 | 19:01 | 22 08:04 (WEA 11) | 16:56 | 23 08:00 (WEA 12) | 16:11 | 31 09:25 (WEA 13) | 16:12 | 30 09:39 (WEA 14) |
| 30 | 05:34 | 06:24 | 07:14 | | 08:03 | | 07:39 (WEA 12) | | 08:26 | 09:09 (WEA 13) |
| | 21:12 | 20:11 | 18:59 | 19 08:03 (WEA 11) | 16:54 | 19 07:58 (WEA 12) | 16:10 | 30 09:24 (WEA 13) | 16:13 | 30 09:39 (WEA 14) |
| 31 | 05:35 | 06:25 | 07:15 | | 08:04 | | 07:40 (WEA 12) | | 08:26 | 09:09 (WEA 13) |
| | 21:10 | 20:08 | 18:57 | | 08:05 | 17 07:57 (WEA 12) | | | 16:14 | 29 09:38 (WEA 14) |
| Sonnenscheinstunden | 503 | 454 | 381 | | 331 | | 266 | | 243 | |
| astr.max.mögl.Beschattung | | 356 | 452 | | 455 | | 442 | | 921 | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | | 0,31 | | 0,21 | | 0,14 | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | | 0,96 | | 0,96 | | 0,96 | |
| Reduktion Windrichtung | | 0,71 | 0,68 | | 0,63 | | 0,56 | | 0,56 | |
| Gesamte Reduktion | | 0,29 | 0,23 | | 0,18 | | 0,11 | | 0,07 | |
| Met.wahrsch.Beschattung | | 105 | 106 | | 83 | | 49 | | 66 | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d63 - Söllingen, Ringstraße 21

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|---------------------------|---------------------------|---------------------------|---------------------------|-------|
| 1 | 08:26 | 08:59 (WEA 13) 07:59 | 07:05 | 06:54 | 05:49 | 05:03 |
| | 16:15 | 19 09:18 (WEA 13) 17:03 | 17:55 | 19:49 | 20:40 | 21:27 |
| 2 | 08:26 | 08:59 (WEA 13) 07:57 | 07:03 | 06:52 | 05:47 | 05:02 |
| | 16:16 | 20 09:19 (WEA 13) 17:05 | 17:57 | 19:51 | 20:42 | 21:28 |
| 3 | 08:25 | 09:00 (WEA 13) 07:55 | 07:00 | 06:49 | 05:45 | 05:01 |
| | 16:17 | 20 09:20 (WEA 13) 17:07 | 17:58 | 19:53 | 3 07:17 (WEA 10) 20:44 | 21:29 |
| 4 | 08:25 | 08:59 (WEA 13) 07:54 | 06:58 | 06:47 | 07:10 (WEA 10) 05:43 | 05:01 |
| | 16:18 | 21 09:20 (WEA 13) 17:08 | 18:00 | 19:54 | 12 07:22 (WEA 10) 20:46 | 21:30 |
| 5 | 08:25 | 09:00 (WEA 13) 07:52 | 06:56 | 06:45 | 07:07 (WEA 10) 05:41 | 05:00 |
| | 16:19 | 21 09:21 (WEA 13) 17:10 | 18:02 | 19:56 | 16 07:23 (WEA 10) 20:47 | 21:31 |
| 6 | 08:25 | 08:59 (WEA 13) 07:50 | 06:54 | 06:42 | 07:05 (WEA 10) 05:39 | 04:59 |
| | 16:21 | 23 09:22 (WEA 13) 17:12 | 18:04 | 19:58 | 20 07:25 (WEA 10) 20:49 | 21:32 |
| 7 | 08:24 | 09:00 (WEA 13) 07:49 | 06:52 | 06:40 | 07:04 (WEA 10) 05:37 | 04:59 |
| | 16:22 | 23 09:23 (WEA 13) 17:14 | 18:06 | 20:00 | 22 07:26 (WEA 10) 20:51 | 21:33 |
| 8 | 08:24 | 08:59 (WEA 13) 07:47 | 06:49 | 06:38 | 07:03 (WEA 10) 05:36 | 04:58 |
| | 16:23 | 24 09:23 (WEA 13) 17:16 | 18:07 | 20:01 | 23 07:26 (WEA 10) 20:52 | 21:34 |
| 9 | 08:23 | 09:00 (WEA 13) 07:45 | 06:47 | 06:36 | 07:02 (WEA 10) 05:34 | 04:58 |
| | 16:25 | 25 09:25 (WEA 13) 17:18 | 18:09 | 20:03 | 24 07:26 (WEA 10) 20:54 | 21:35 |
| 10 | 08:23 | 09:00 (WEA 13) 07:43 | 06:45 | 06:33 | 07:01 (WEA 10) 05:32 | 04:57 |
| | 16:26 | 25 09:25 (WEA 13) 17:20 | 18:11 | 8 07:18 (WEA 11) 20:05 | 25 07:26 (WEA 10) 20:55 | 21:35 |
| 11 | 08:22 | 09:00 (WEA 13) 07:41 | 06:42 | 07:06 (WEA 11) 06:31 | 07:01 (WEA 10) 05:31 | 04:57 |
| | 16:27 | 26 09:26 (WEA 13) 17:22 | 8 08:16 (WEA 12) 18:13 | 14 07:20 (WEA 11) 20:06 | 25 07:26 (WEA 10) 20:57 | 21:36 |
| 12 | 08:21 | 09:00 (WEA 13) 07:40 | 06:40 | 07:04 (WEA 11) 06:29 | 07:01 (WEA 10) 05:29 | 04:57 |
| | 16:29 | 26 09:26 (WEA 13) 17:23 | 14 08:20 (WEA 12) 18:15 | 18 07:22 (WEA 11) 20:08 | 25 07:26 (WEA 10) 20:59 | 21:37 |
| 13 | 08:21 | 09:00 (WEA 13) 07:38 | 06:38 | 07:03 (WEA 11) 06:27 | 07:01 (WEA 10) 05:27 | 04:56 |
| | 16:30 | 27 09:27 (WEA 13) 17:25 | 17 08:22 (WEA 12) 18:16 | 21 07:24 (WEA 11) 20:10 | 24 07:25 (WEA 10) 21:00 | 21:37 |
| 14 | 08:20 | 09:00 (WEA 13) 07:36 | 06:36 | 07:01 (WEA 11) 06:24 | 07:00 (WEA 10) 05:26 | 04:56 |
| | 16:32 | 27 09:27 (WEA 13) 17:27 | 20 08:23 (WEA 12) 18:18 | 23 07:24 (WEA 11) 20:12 | 24 07:24 (WEA 10) 21:02 | 21:38 |
| 15 | 08:19 | 09:00 (WEA 13) 07:34 | 06:33 | 07:00 (WEA 11) 06:22 | 07:01 (WEA 10) 05:24 | 04:56 |
| | 16:33 | 28 09:28 (WEA 13) 17:29 | 22 08:23 (WEA 12) 18:20 | 24 07:24 (WEA 11) 20:13 | 22 07:23 (WEA 10) 21:03 | 21:39 |
| 16 | 08:18 | 09:01 (WEA 13) 07:32 | 06:31 | 07:00 (WEA 11) 06:20 | 07:02 (WEA 10) 05:22 | 04:56 |
| | 16:35 | 27 09:28 (WEA 13) 17:31 | 23 08:24 (WEA 12) 18:22 | 25 07:25 (WEA 11) 20:15 | 20 07:22 (WEA 10) 21:05 | 21:39 |
| 17 | 08:17 | 09:01 (WEA 13) 07:30 | 06:29 | 06:59 (WEA 11) 06:18 | 07:03 (WEA 10) 05:21 | 04:56 |
| | 16:37 | 28 09:29 (WEA 13) 17:33 | 25 08:25 (WEA 12) 18:23 | 25 07:24 (WEA 11) 20:17 | 18 07:21 (WEA 10) 21:06 | 21:40 |
| 18 | 08:16 | 09:01 (WEA 13) 07:28 | 06:26 | 06:59 (WEA 11) 06:16 | 07:04 (WEA 10) 05:20 | 04:56 |
| | 16:38 | 28 09:29 (WEA 13) 17:35 | 25 08:25 (WEA 12) 18:25 | 25 07:24 (WEA 11) 20:18 | 15 07:19 (WEA 10) 21:08 | 21:40 |
| 19 | 08:15 | 09:02 (WEA 13) 07:26 | 06:24 | 06:59 (WEA 11) 06:13 | 07:06 (WEA 10) 05:18 | 04:56 |
| | 16:40 | 27 09:29 (WEA 13) 17:37 | 25 08:25 (WEA 12) 18:27 | 25 07:24 (WEA 11) 20:20 | 11 07:17 (WEA 10) 21:09 | 21:40 |
| 20 | 08:14 | 09:03 (WEA 13) 07:24 | 06:22 | 06:58 (WEA 11) 06:11 | 05:17 | 04:56 |
| | 16:42 | 27 09:30 (WEA 13) 17:38 | 25 08:25 (WEA 12) 18:29 | 25 07:23 (WEA 11) 20:22 | 21:11 | 21:41 |
| 21 | 08:13 | 09:02 (WEA 13) 07:22 | 06:19 | 06:59 (WEA 11) 06:09 | 05:15 | 04:56 |
| | 16:43 | 27 09:29 (WEA 13) 17:40 | 25 08:25 (WEA 12) 18:30 | 23 07:22 (WEA 11) 20:23 | 21:12 | 21:41 |
| 22 | 08:12 | 09:03 (WEA 13) 07:20 | 06:17 | 07:00 (WEA 11) 06:07 | 05:14 | 04:56 |
| | 16:45 | 27 09:30 (WEA 13) 17:42 | 25 08:25 (WEA 12) 18:32 | 21 07:21 (WEA 11) 20:25 | 21:14 | 21:41 |
| 23 | 08:11 | 09:04 (WEA 13) 07:18 | 06:15 | 07:00 (WEA 11) 06:05 | 05:13 | 04:56 |
| | 16:47 | 26 09:30 (WEA 13) 17:44 | 23 08:24 (WEA 12) 18:34 | 19 07:19 (WEA 11) 20:27 | 21:15 | 21:41 |
| 24 | 08:10 | 09:04 (WEA 13) 07:16 | 06:12 | 07:02 (WEA 11) 06:03 | 05:11 | 04:57 |
| | 16:48 | 25 09:29 (WEA 13) 17:46 | 22 08:23 (WEA 12) 18:35 | 15 07:17 (WEA 11) 20:29 | 21:17 | 21:41 |
| 25 | 08:09 | 09:05 (WEA 13) 07:13 | 06:10 | 07:04 (WEA 11) 06:01 | 05:10 | 04:57 |
| | 16:50 | 24 09:29 (WEA 13) 17:48 | 20 08:22 (WEA 12) 18:37 | 10 07:14 (WEA 11) 20:30 | 21:18 | 21:42 |
| 26 | 08:07 | 09:06 (WEA 13) 07:11 | 06:08 | 05:59 | 05:09 | 04:57 |
| | 16:52 | 22 09:28 (WEA 13) 17:49 | 17 08:20 (WEA 12) 18:39 | 20:32 | 21:19 | 21:42 |
| 27 | 08:06 | 09:07 (WEA 13) 07:09 | 06:05 | 05:57 | 05:08 | 04:58 |
| | 16:54 | 21 09:28 (WEA 13) 17:51 | 13 08:18 (WEA 12) 18:41 | 20:34 | 21:21 | 21:41 |
| 28 | 08:04 | 09:08 (WEA 13) 07:07 | 06:03 | 05:55 | 05:07 | 04:58 |
| | 16:56 | 19 09:27 (WEA 13) 17:53 | 4 08:14 (WEA 12) 18:42 | 20:35 | 21:22 | 21:41 |
| 29 | 08:03 | 09:11 (WEA 13) | 07:01 | 05:53 | 05:06 | 04:59 |
| | 16:57 | 15 09:26 (WEA 13) | 19:44 | 20:37 | 21:23 | 21:41 |
| 30 | 08:02 | 09:12 (WEA 13) | 06:58 | 05:51 | 05:05 | 04:59 |
| | 16:59 | 12 09:24 (WEA 13) | 19:46 | 20:39 | 21:24 | 21:41 |
| 31 | 08:00 | 09:18 (WEA 13) | 06:56 | | 05:04 | |
| | 17:01 | 2 09:20 (WEA 13) | 19:47 | | 21:25 | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 712 | 353 | 321 | 329 | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | 0,56 | 0,63 | 0,67 | 0,71 | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | 0,25 | | |
| Met.wahrsch.Beschattung | 68 | 52 | 58 | 81 | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d63 - Söllingen, Ringstraße 21

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | |
|---------------------------|-------|--------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:00 (WEA 10) 07:16 | 07:42 (WEA 11) 07:10 | 08:02 08:42 (WEA 13) | | |
| | 21:41 | 21:09 | 20:06 | 25 07:25 (WEA 10) 18:56 | 20 08:02 (WEA 11) 16:50 | 16:09 26 09:08 (WEA 13) | | |
| 2 | 05:01 | 05:38 | 06:28 | 07:00 (WEA 10) 07:18 | 07:44 (WEA 11) 07:12 | 08:03 08:43 (WEA 13) | | |
| | 21:40 | 21:07 | 20:04 | 25 07:25 (WEA 10) 18:54 | 16 08:00 (WEA 11) 16:48 | 16:09 25 09:08 (WEA 13) | | |
| 3 | 05:01 | 05:40 | 06:30 | 07:00 (WEA 10) 07:20 | 07:46 (WEA 11) 07:14 | 08:04 08:43 (WEA 13) | | |
| | 21:40 | 21:05 | 20:02 | 24 07:24 (WEA 10) 18:52 | 12 07:58 (WEA 11) 16:46 | 16:08 25 09:08 (WEA 13) | | |
| 4 | 05:02 | 05:41 | 06:32 | 07:00 (WEA 10) 07:21 | 07:16 | 08:06 08:43 (WEA 13) | | |
| | 21:40 | 21:04 | 19:59 | 23 07:23 (WEA 10) 18:49 | 16:44 | 16:07 25 09:08 (WEA 13) | | |
| 5 | 05:03 | 05:43 | 06:33 | 07:00 (WEA 10) 07:23 | 07:18 | 08:07 08:45 (WEA 13) | | |
| | 21:39 | 21:02 | 19:57 | 22 07:22 (WEA 10) 18:47 | 16:43 | 16:07 23 09:08 (WEA 13) | | |
| 6 | 05:04 | 05:45 | 06:35 | 07:01 (WEA 10) 07:25 | 07:19 | 08:08 08:45 (WEA 13) | | |
| | 21:39 | 21:00 | 19:55 | 20 07:21 (WEA 10) 18:45 | 16:41 | 16:06 23 09:08 (WEA 13) | | |
| 7 | 05:05 | 05:46 | 06:37 | 07:02 (WEA 10) 07:26 | 07:21 | 08:10 08:47 (WEA 13) | | |
| | 21:38 | 20:58 | 19:53 | 16 07:18 (WEA 10) 18:43 | 16:39 | 16:06 22 09:09 (WEA 13) | | |
| 8 | 05:06 | 05:48 | 06:38 | 07:04 (WEA 10) 07:28 | 07:23 | 08:11 08:47 (WEA 13) | | |
| | 21:37 | 20:56 | 19:50 | 12 07:16 (WEA 10) 18:40 | 16:37 | 16:06 21 09:08 (WEA 13) | | |
| 9 | 05:07 | 05:49 | 06:40 | 07:08 (WEA 10) 07:30 | 07:25 | 08:12 08:48 (WEA 13) | | |
| | 21:37 | 20:54 | 19:48 | 4 07:12 (WEA 10) 18:38 | 16:36 | 16:05 20 09:08 (WEA 13) | | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | 08:13 08:48 (WEA 13) | | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | 16:05 20 09:08 (WEA 13) | | |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | 07:28 | 08:14 08:49 (WEA 13) | | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | 4 08:52 (WEA 13) 16:05 | 19 09:08 (WEA 13) | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | 08:44 (WEA 13) 08:15 | 18 08:50 (WEA 13) | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | 12 08:56 (WEA 13) 16:05 | 18 09:08 (WEA 13) | |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | 08:42 (WEA 13) 08:16 | 17 08:51 (WEA 13) | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 16:30 | 16 08:58 (WEA 13) 16:05 | 17 09:08 (WEA 13) | |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | 08:41 (WEA 13) 08:17 | 17 08:51 (WEA 13) | |
| | 21:32 | 20:45 | 19:36 | 18:27 | 9 08:49 (WEA 12) 16:28 | 19 09:00 (WEA 13) 16:05 | 17 09:08 (WEA 13) | |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | 08:40 (WEA 13) 08:18 | 16 08:52 (WEA 13) | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 14 08:51 (WEA 12) 16:27 | 21 09:01 (WEA 13) 16:05 | 16 09:08 (WEA 13) | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | 08:40 (WEA 13) 08:19 | 16 08:53 (WEA 13) | |
| | 21:30 | 20:41 | 19:32 | 18:23 | 18 08:53 (WEA 12) 16:25 | 22 09:02 (WEA 13) 16:05 | 15 09:08 (WEA 13) | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | 08:38 (WEA 13) 08:20 | 15 08:54 (WEA 13) | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 20 08:54 (WEA 12) 16:24 | 24 09:02 (WEA 13) 16:05 | 15 09:09 (WEA 13) | |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:38 (WEA 13) 08:21 | 15 08:55 (WEA 13) | |
| | 21:28 | 20:37 | 19:27 | 8 08:01 (WEA 11) 18:18 | 22 08:55 (WEA 12) 16:22 | 25 09:03 (WEA 13) 16:05 | 14 09:09 (WEA 13) | |
| 19 | 05:18 | 06:06 | 06:56 | 07:47 | 07:42 | 08:38 (WEA 13) 08:21 | 14 08:55 (WEA 13) | |
| | 21:27 | 20:35 | 19:24 | 14 08:04 (WEA 11) 18:16 | 24 08:55 (WEA 12) 16:21 | 26 09:04 (WEA 13) 16:06 | 14 09:09 (WEA 13) | |
| 20 | 05:19 | 06:07 | 06:58 | 07:47 | 07:44 | 08:38 (WEA 13) 08:22 | 14 08:56 (WEA 13) | |
| | 21:26 | 20:32 | 19:22 | 18 08:05 (WEA 11) 18:14 | 25 08:55 (WEA 12) 16:20 | 27 09:05 (WEA 13) 16:06 | 14 09:10 (WEA 13) | |
| 21 | 05:21 | 06:09 | 07:00 | 07:46 | 07:51 | 08:38 (WEA 13) 08:23 | 14 08:57 (WEA 13) | |
| | 21:25 | 20:30 | 19:20 | 20 08:06 (WEA 11) 18:12 | 26 08:56 (WEA 12) 16:19 | 27 09:05 (WEA 13) 16:06 | 13 09:10 (WEA 13) | |
| 22 | 05:22 | 06:10 | 07:01 | 07:44 | 07:52 | 08:30 (WEA 12) 07:47 | 13 08:57 (WEA 13) | |
| | 21:23 | 20:28 | 19:17 | 22 08:06 (WEA 11) 18:10 | 26 08:56 (WEA 12) 16:18 | 27 09:06 (WEA 13) 16:07 | 13 09:10 (WEA 13) | |
| 23 | 05:23 | 06:12 | 07:03 | 07:43 | 07:54 | 08:30 (WEA 12) 07:49 | 13 08:57 (WEA 13) | |
| | 21:22 | 20:26 | 19:15 | 24 08:07 (WEA 11) 18:08 | 26 08:56 (WEA 12) 16:16 | 28 09:07 (WEA 13) 16:07 | 14 09:11 (WEA 13) | |
| 24 | 05:25 | 06:14 | 07:04 | 07:43 | 07:56 | 08:30 (WEA 12) 07:51 | 14 08:58 (WEA 13) | |
| | 21:21 | 20:24 | 11 07:21 (WEA 10) 19:13 | 24 08:07 (WEA 11) 18:06 | 25 08:55 (WEA 12) 16:15 | 28 09:06 (WEA 13) 16:08 | 14 09:12 (WEA 13) | |
| 25 | 05:26 | 06:15 | 07:07 | 07:41 | 06:58 | 07:31 (WEA 12) 07:52 | 14 08:58 (WEA 13) | |
| | 21:19 | 20:22 | 15 07:22 (WEA 10) 19:10 | 26 08:07 (WEA 11) 17:04 | 24 07:55 (WEA 12) 16:14 | 28 09:07 (WEA 13) 16:09 | 14 09:12 (WEA 13) | |
| 26 | 05:28 | 06:17 | 07:05 | 07:41 | 06:59 | 07:31 (WEA 12) 07:54 | 14 08:58 (WEA 13) | |
| | 21:18 | 20:20 | 19 07:24 (WEA 10) 19:08 | 26 08:07 (WEA 11) 17:02 | 23 07:54 (WEA 12) 16:13 | 27 09:07 (WEA 13) 16:09 | 15 09:13 (WEA 13) | |
| 27 | 05:29 | 06:19 | 07:03 | 07:41 | 07:01 | 07:32 (WEA 12) 07:56 | 15 08:58 (WEA 13) | |
| | 21:16 | 20:17 | 21 07:24 (WEA 10) 19:06 | 26 08:07 (WEA 11) 17:00 | 22 07:54 (WEA 12) 16:12 | 28 09:07 (WEA 13) 16:10 | 15 09:13 (WEA 13) | |
| 28 | 05:31 | 06:20 | 07:03 | 07:41 | 07:03 | 07:32 (WEA 12) 07:57 | 15 08:59 (WEA 13) | |
| | 21:15 | 20:15 | 22 07:25 (WEA 10) 19:03 | 24 08:05 (WEA 11) 16:58 | 20 07:52 (WEA 12) 16:12 | 27 09:07 (WEA 13) 16:11 | 16 09:15 (WEA 13) | |
| 29 | 05:32 | 06:22 | 07:01 | 07:41 | 07:05 | 07:33 (WEA 12) 07:59 | 16 08:59 (WEA 13) | |
| | 21:13 | 20:13 | 24 07:25 (WEA 10) 19:01 | 24 08:05 (WEA 11) 16:56 | 17 07:50 (WEA 12) 16:11 | 27 09:08 (WEA 13) 16:12 | 17 09:16 (WEA 13) | |
| 30 | 05:34 | 06:24 | 07:01 | 07:42 | 07:07 | 07:35 (WEA 12) 08:00 | 16 08:41 (WEA 13) 08:26 | 16 09:00 (WEA 13) |
| | 21:12 | 20:11 | 24 07:25 (WEA 10) 18:59 | 22 08:04 (WEA 11) 16:54 | 13 07:48 (WEA 12) 16:10 | 26 09:07 (WEA 13) 16:13 | 16 09:16 (WEA 13) | |
| 31 | 05:35 | 06:25 | 07:00 | 07:42 | 07:08 | 07:39 (WEA 12) 08:00 | 16 08:26 | 16 08:59 (WEA 13) |
| | 21:10 | 20:08 | 25 07:25 (WEA 10) 18:57 | 22 08:04 (WEA 11) 16:52 | 6 07:45 (WEA 12) 16:14 | 17 09:16 (WEA 13) | 16 09:16 (WEA 13) | |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | | |
| astr.max.mögl.Beschattung | | 161 | 449 | 408 | 469 | 553 | | |
| Red.Sonnenscheinwahrsch. | | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 | | |
| Reduktion Betriebsdauer | | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | | |
| Reduktion Windrichtung | | 0,71 | 0,69 | 0,63 | 0,56 | 0,56 | | |
| Gesamte Reduktion | | 0,29 | 0,24 | 0,18 | 0,11 | 0,07 | | |
| Met.wahrsch.Beschattung | | 47 | 107 | 75 | 52 | 40 | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d67 - Söllingen, Schulstraße 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:05 (WEA 12) | 07:59 | 08:27 (WEA 11) | 07:05 | 07:31 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 24 09:29 (WEA 12) | 17:03 | 14 08:41 (WEA 11) | 17:55 | 19 07:50 (WEA 10) | 19:49 | 20:40 | 21:27 | | | |
| 2 | 08:26 | 09:06 (WEA 12) | 07:57 | 08:25 (WEA 11) | 07:03 | 07:30 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 24 09:30 (WEA 12) | 17:05 | 18 08:43 (WEA 11) | 17:57 | 21 07:51 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:06 (WEA 12) | 07:55 | 08:24 (WEA 11) | 07:00 | 07:29 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 24 09:30 (WEA 12) | 17:07 | 20 08:44 (WEA 11) | 17:58 | 24 07:53 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:06 (WEA 12) | 07:54 | 08:24 (WEA 11) | 06:58 | 07:28 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 24 09:30 (WEA 12) | 17:08 | 22 08:46 (WEA 11) | 18:00 | 25 07:53 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:07 (WEA 12) | 07:52 | 08:23 (WEA 11) | 06:56 | 07:26 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 24 09:31 (WEA 12) | 17:10 | 24 08:47 (WEA 11) | 18:02 | 27 07:53 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:07 (WEA 12) | 07:50 | 08:23 (WEA 11) | 06:54 | 07:26 (WEA 10) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 24 09:31 (WEA 12) | 17:12 | 24 08:47 (WEA 11) | 18:04 | 28 07:54 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:08 (WEA 12) | 07:49 | 08:22 (WEA 11) | 06:52 | 07:26 (WEA 10) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 24 09:32 (WEA 12) | 17:14 | 25 08:47 (WEA 11) | 18:06 | 28 07:54 (WEA 10) | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:08 (WEA 12) | 07:47 | 08:22 (WEA 11) | 06:49 | 07:25 (WEA 10) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 24 09:32 (WEA 12) | 17:16 | 26 08:48 (WEA 11) | 18:07 | 28 07:53 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:09 (WEA 12) | 07:45 | 08:22 (WEA 11) | 06:47 | 07:25 (WEA 10) | 06:36 | 05:34 | 04:58 | | | |
| | 16:24 | 24 09:33 (WEA 12) | 17:18 | 26 08:48 (WEA 11) | 18:09 | 28 07:53 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:09 (WEA 12) | 07:43 | 08:21 (WEA 11) | 06:45 | 07:25 (WEA 10) | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 24 09:33 (WEA 12) | 17:20 | 27 08:48 (WEA 11) | 18:11 | 28 07:53 (WEA 10) | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | 09:09 (WEA 12) | 07:41 | 08:22 (WEA 11) | 06:42 | 07:25 (WEA 10) | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | 25 09:34 (WEA 12) | 17:22 | 26 08:48 (WEA 11) | 18:13 | 26 07:51 (WEA 10) | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 09:10 (WEA 12) | 07:40 | 08:23 (WEA 11) | 06:40 | 07:26 (WEA 10) | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 24 09:34 (WEA 12) | 17:23 | 25 08:48 (WEA 11) | 18:15 | 24 07:50 (WEA 10) | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 09:10 (WEA 12) | 07:38 | 08:23 (WEA 11) | 06:38 | 07:27 (WEA 10) | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 24 09:34 (WEA 12) | 17:25 | 25 08:48 (WEA 11) | 18:16 | 23 07:50 (WEA 10) | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 09:10 (WEA 12) | 07:36 | 08:24 (WEA 11) | 06:36 | 07:27 (WEA 10) | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 24 09:34 (WEA 12) | 17:27 | 23 08:47 (WEA 11) | 18:18 | 20 07:47 (WEA 10) | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 09:11 (WEA 12) | 07:34 | 08:24 (WEA 11) | 06:33 | 07:29 (WEA 10) | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 23 09:34 (WEA 12) | 17:29 | 22 08:46 (WEA 11) | 18:20 | 16 07:45 (WEA 10) | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 09:12 (WEA 12) | 07:32 | 08:25 (WEA 11) | 06:31 | 07:32 (WEA 10) | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 22 09:34 (WEA 12) | 17:31 | 20 08:45 (WEA 11) | 18:22 | 11 07:43 (WEA 10) | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | 09:13 (WEA 12) | 07:30 | 08:26 (WEA 11) | 06:29 | | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | 21 09:34 (WEA 12) | 17:33 | 17 08:43 (WEA 11) | 18:23 | | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | 09:14 (WEA 12) | 07:28 | 08:28 (WEA 11) | 06:26 | | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | 20 09:34 (WEA 12) | 17:35 | 13 08:41 (WEA 11) | 18:25 | | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | 09:15 (WEA 12) | 07:26 | 08:32 (WEA 11) | 06:24 | | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | 19 09:34 (WEA 12) | 17:36 | 5 08:37 (WEA 11) | 18:27 | | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | 09:16 (WEA 12) | 07:24 | | 06:22 | | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | 17 09:33 (WEA 12) | 17:38 | | 18:29 | | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | 09:17 (WEA 12) | 07:22 | | 06:19 | | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | 15 09:32 (WEA 12) | 17:40 | | 18:30 | | 20:23 | 21:12 | 21:41 | | | |
| 22 | 08:12 | 09:19 (WEA 12) | 07:20 | | 06:17 | | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | 12 09:31 (WEA 12) | 17:42 | | 18:32 | | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | 09:22 (WEA 12) | 07:18 | | 06:15 | | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 7 09:29 (WEA 12) | 17:44 | | 18:34 | | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | | 07:16 | | 06:12 | | 06:03 | 05:11 | 04:57 | | | |
| | 16:48 | | 17:46 | | 18:35 | | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | | 07:13 | | 06:10 | | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | | 17:48 | | 18:37 | | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | | 07:11 | | 06:08 | | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | | 17:49 | | 18:39 | | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | | 07:09 | 07:38 (WEA 10) | 06:05 | | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | | 17:51 | 7 07:45 (WEA 10) | 18:41 | | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | | 07:07 | 07:34 (WEA 10) | 06:03 | | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | | 17:53 | 15 07:49 (WEA 10) | 18:42 | | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | | | | 07:01 | | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | | | | 19:44 | | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | | | | 06:58 | | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | | | | 19:46 | | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | 08:30 (WEA 11) | | | 06:56 | | | 05:04 | | | | |
| | 17:01 | 9 08:39 (WEA 11) | | | 19:47 | | | 21:25 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 502 | | 424 | | 376 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,56 | | 0,61 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 49 | | 62 | | 66 | | | | | | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d67 - Söllingen, Schulstraße 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------------------------|---------------------------|---------------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 08:05 (WEA 10) 07:10 | 07:51 (WEA 11) 08:02 | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 24 08:29 (WEA 10) 16:50 | 27 08:18 (WEA 11) 16:09 | |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 08:04 (WEA 10) 07:12 | 07:51 (WEA 11) 08:03 | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 26 08:30 (WEA 10) 16:48 | 26 08:17 (WEA 11) 16:09 | |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 08:04 (WEA 10) 07:14 | 07:51 (WEA 11) 08:04 | |
| | 21:40 | 21:05 | 20:02 | 18:52 | 26 08:30 (WEA 10) 16:46 | 26 08:17 (WEA 11) 16:08 | |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 08:03 (WEA 10) 07:16 | 07:52 (WEA 11) 08:06 | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 28 08:31 (WEA 10) 16:44 | 25 08:17 (WEA 11) 16:07 | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 08:02 (WEA 10) 07:18 | 07:52 (WEA 11) 08:07 | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 28 08:30 (WEA 10) 16:43 | 25 08:17 (WEA 11) 16:07 | |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 08:02 (WEA 10) 07:19 | 07:53 (WEA 11) 08:08 | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 28 08:30 (WEA 10) 16:41 | 23 08:16 (WEA 11) 16:06 | |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 08:02 (WEA 10) 07:21 | 07:54 (WEA 11) 08:10 | |
| | 21:38 | 20:58 | 19:53 | 18:43 | 28 08:30 (WEA 10) 16:39 | 22 08:16 (WEA 11) 16:06 | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 08:01 (WEA 10) 07:23 | 07:55 (WEA 11) 08:11 | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 27 08:28 (WEA 10) 16:37 | 20 08:15 (WEA 11) 16:06 | |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 08:02 (WEA 10) 07:25 | 07:56 (WEA 11) 08:12 | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 26 08:28 (WEA 10) 16:36 | 18 08:14 (WEA 11) 16:05 | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 08:02 (WEA 10) 07:27 | 07:58 (WEA 11) 08:13 | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 25 08:27 (WEA 10) 16:34 | 14 08:12 (WEA 11) 16:05 | |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | 08:03 (WEA 10) 07:28 | 08:01 (WEA 11) 08:14 | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 23 08:26 (WEA 10) 16:33 | 9 08:10 (WEA 11) 16:05 | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 08:05 (WEA 10) 07:30 | 08:15 (WEA 11) 08:15 | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 20 08:25 (WEA 10) 16:31 | 16:05 | 23 09:19 (WEA 12) |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 08:05 (WEA 10) 07:32 | 08:16 (WEA 11) 08:16 | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 17 08:22 (WEA 10) 16:30 | 16:05 | 23 09:20 (WEA 12) |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 08:08 (WEA 10) 07:34 | 08:17 (WEA 11) 08:17 | |
| | 21:33 | 20:45 | 19:36 | 18:27 | 12 08:20 (WEA 10) 16:28 | 16:05 | 23 09:20 (WEA 12) |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 (WEA 10) 16:27 | 08:18 (WEA 11) 08:18 | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 16:05 | 23 09:20 (WEA 12) |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 (WEA 10) 16:25 | 08:19 (WEA 11) 08:19 | |
| | 21:31 | 20:41 | 19:32 | 18:22 | 16:25 | 16:05 | 23 09:21 (WEA 12) |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 (WEA 10) 16:24 | 08:20 (WEA 11) 08:20 | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | 16:05 | 22 09:21 (WEA 12) |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 (WEA 10) 16:22 | 08:21 (WEA 11) 08:21 | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | 16:05 | 22 09:22 (WEA 12) |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 (WEA 10) 16:21 | 08:56 (WEA 12) 08:21 | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | 7 09:03 (WEA 12) 16:06 | 23 09:22 (WEA 12) |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 (WEA 10) 16:20 | 08:54 (WEA 12) 08:22 | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 16:20 | 12 09:06 (WEA 12) 16:06 | 23 09:23 (WEA 12) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 (WEA 10) 16:19 | 08:53 (WEA 12) 08:23 | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 15 09:08 (WEA 12) 16:06 | 23 09:24 (WEA 12) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 (WEA 10) 16:18 | 08:52 (WEA 12) 08:23 | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 17 09:09 (WEA 12) 16:07 | 22 09:23 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 09:01 (WEA 11) 07:49 | 08:52 (WEA 12) 08:24 | |
| | 21:22 | 20:26 | 19:15 | 18:08 | 8 09:09 (WEA 11) 16:16 | 19 09:11 (WEA 12) 16:07 | 23 09:24 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 08:58 (WEA 11) 07:51 | 08:51 (WEA 12) 08:24 | |
| | 21:21 | 20:24 | 19:13 | 18:06 | 14 09:12 (WEA 11) 16:15 | 20 09:11 (WEA 12) 16:08 | 23 09:25 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 06:58 | 07:56 (WEA 11) 07:52 | 08:51 (WEA 12) 08:25 | |
| | 21:19 | 20:22 | 19:10 | 17:04 | 18 08:14 (WEA 11) 16:14 | 21 09:12 (WEA 12) 16:09 | 22 09:25 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 06:59 | 07:55 (WEA 11) 07:54 | 08:51 (WEA 12) 08:25 | |
| | 21:18 | 20:20 | 19:08 | 17:02 | 20 08:15 (WEA 11) 16:13 | 22 09:13 (WEA 12) 16:09 | 22 09:25 (WEA 12) |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | 07:54 (WEA 11) 07:56 | 08:51 (WEA 12) 08:25 | |
| | 21:16 | 20:17 | 19:06 | 8 08:23 (WEA 10) 17:00 | 22 08:16 (WEA 11) 16:12 | 23 09:14 (WEA 12) 16:10 | 23 09:26 (WEA 12) |
| 28 | 05:31 | 06:20 | 07:11 | 08:11 (WEA 10) 07:03 | 07:52 (WEA 11) 07:57 | 08:51 (WEA 12) 08:25 | |
| | 21:15 | 20:15 | 19:03 | 14 08:25 (WEA 10) 16:58 | 24 08:16 (WEA 11) 16:12 | 23 09:14 (WEA 12) 16:11 | 23 09:27 (WEA 12) |
| 29 | 05:32 | 06:22 | 07:13 | 08:09 (WEA 10) 07:05 | 07:52 (WEA 11) 07:59 | 08:51 (WEA 12) 08:25 | |
| | 21:13 | 20:13 | 19:01 | 18 08:27 (WEA 10) 16:56 | 25 08:17 (WEA 11) 16:11 | 24 09:15 (WEA 12) 16:12 | 23 09:28 (WEA 12) |
| 30 | 05:34 | 06:24 | 07:14 | 08:07 (WEA 10) 07:07 | 07:51 (WEA 11) 08:00 | 08:51 (WEA 12) 08:26 | |
| | 21:12 | 20:11 | 18:59 | 22 08:29 (WEA 10) 16:54 | 26 08:17 (WEA 11) 16:10 | 24 09:15 (WEA 12) 16:13 | 23 09:05 (WEA 12) |
| 31 | 05:35 | 06:25 | | 07:08 | 07:51 (WEA 11) 16:52 | 08:26 (WEA 12) 16:13 | 24 09:04 (WEA 12) |
| | 21:10 | 20:08 | | 16:52 | 26 08:17 (WEA 11) 16:52 | 16:13 | 24 09:28 (WEA 12) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | 723 |
| astr.max.mögl.Beschattung | | | 62 | 521 | | 462 | 723 |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | | 0,96 | 0,96 |
| Reduktion Windrichtung | | | 0,64 | 0,63 | | 0,59 | 0,56 |
| Gesamte Reduktion | | | 0,22 | 0,18 | | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | 14 | 96 | | 55 | 53 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d69 - Söllingen, Schulstraße 3

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|--------|-------------------|-------|-------------------|-------|-------------------|
| 1 | 08:26 | 08:58 (WEA 12) | 07:59 | | 06:54 | 05:03 |
| | 16:15 | 18 09:16 (WEA 12) | 17:03 | | 19:49 | 20:40 |
| 2 | 08:26 | 08:59 (WEA 12) | 07:57 | | 06:52 | 05:47 |
| | 16:16 | 18 09:17 (WEA 12) | 17:05 | | 19:51 | 20:42 |
| 3 | 08:25 | 08:59 (WEA 12) | 07:55 | | 06:49 | 05:45 |
| | 16:17 | 19 09:18 (WEA 12) | 17:07 | | 19:53 | 20:44 |
| 4 | 08:25 | 08:58 (WEA 12) | 07:54 | | 06:58 | 05:43 |
| | 16:18 | 21 09:19 (WEA 12) | 17:08 | | 18:00 | 19:54 |
| 5 | 08:25 | 08:59 (WEA 12) | 07:52 | 08:22 (WEA 11) | 06:56 | 07:22 (WEA 10) |
| | 16:19 | 21 09:20 (WEA 12) | 17:10 | 5 08:27 (WEA 11) | 18:02 | 14 07:33 (WEA 10) |
| 6 | 08:25 | 08:59 (WEA 12) | 07:50 | 08:18 (WEA 11) | 06:54 | 07:19 (WEA 10) |
| | 16:21 | 21 09:20 (WEA 12) | 17:12 | 12 08:30 (WEA 11) | 18:04 | 19 07:38 (WEA 10) |
| 7 | 08:24 | 08:59 (WEA 12) | 07:49 | 08:16 (WEA 11) | 06:52 | 07:18 (WEA 10) |
| | 16:22 | 22 09:21 (WEA 12) | 17:14 | 16 08:32 (WEA 11) | 18:06 | 21 07:39 (WEA 10) |
| 8 | 08:24 | 08:59 (WEA 12) | 07:47 | 08:14 (WEA 11) | 06:49 | 07:16 (WEA 10) |
| | 16:23 | 23 09:22 (WEA 12) | 17:16 | 20 08:34 (WEA 11) | 18:07 | 24 07:40 (WEA 10) |
| 9 | 08:23 | 09:00 (WEA 12) | 07:45 | 08:13 (WEA 11) | 06:47 | 07:15 (WEA 10) |
| | 16:24 | 23 09:23 (WEA 12) | 17:18 | 22 08:35 (WEA 11) | 18:09 | 26 07:41 (WEA 10) |
| 10 | 08:23 | 09:00 (WEA 12) | 07:43 | 08:12 (WEA 11) | 06:45 | 07:15 (WEA 10) |
| | 16:26 | 23 09:23 (WEA 12) | 17:20 | 23 08:35 (WEA 11) | 18:11 | 26 07:41 (WEA 10) |
| 11 | 08:22 | 09:00 (WEA 12) | 07:41 | 08:12 (WEA 11) | 06:42 | 07:13 (WEA 10) |
| | 16:27 | 24 09:24 (WEA 12) | 17:22 | 24 08:36 (WEA 11) | 18:13 | 28 07:41 (WEA 10) |
| 12 | 08:21 | 09:00 (WEA 12) | 07:40 | 08:12 (WEA 11) | 06:40 | 07:13 (WEA 10) |
| | 16:29 | 24 09:24 (WEA 12) | 17:23 | 26 08:38 (WEA 11) | 18:15 | 28 07:41 (WEA 10) |
| 13 | 08:21 | 09:00 (WEA 12) | 07:38 | 08:12 (WEA 11) | 06:38 | 07:13 (WEA 10) |
| | 16:30 | 24 09:24 (WEA 12) | 17:25 | 26 08:38 (WEA 11) | 18:16 | 28 07:41 (WEA 10) |
| 14 | 08:20 | 09:00 (WEA 12) | 07:36 | 08:12 (WEA 11) | 06:36 | 07:12 (WEA 10) |
| | 16:32 | 25 09:25 (WEA 12) | 17:27 | 26 08:38 (WEA 11) | 18:18 | 28 07:40 (WEA 10) |
| 15 | 08:19 | 09:00 (WEA 12) | 07:34 | 08:11 (WEA 11) | 06:33 | 07:13 (WEA 10) |
| | 16:33 | 25 09:25 (WEA 12) | 17:29 | 26 08:37 (WEA 11) | 18:20 | 26 07:39 (WEA 10) |
| 16 | 08:18 | 09:01 (WEA 12) | 07:32 | 08:11 (WEA 11) | 06:31 | 07:13 (WEA 10) |
| | 16:35 | 25 09:26 (WEA 12) | 17:31 | 26 08:37 (WEA 11) | 18:22 | 26 07:39 (WEA 10) |
| 17 | 08:17 | 09:01 (WEA 12) | 07:30 | 08:11 (WEA 11) | 06:29 | 07:13 (WEA 10) |
| | 16:37 | 25 09:26 (WEA 12) | 17:33 | 26 08:37 (WEA 11) | 18:23 | 24 07:37 (WEA 10) |
| 18 | 08:16 | 09:02 (WEA 12) | 07:28 | 08:12 (WEA 11) | 06:26 | 07:14 (WEA 10) |
| | 16:38 | 24 09:26 (WEA 12) | 17:35 | 24 08:36 (WEA 11) | 18:25 | 22 07:36 (WEA 10) |
| 19 | 08:15 | 09:02 (WEA 12) | 07:26 | 08:12 (WEA 11) | 06:24 | 07:16 (WEA 10) |
| | 16:40 | 25 09:27 (WEA 12) | 17:36 | 24 08:36 (WEA 11) | 18:27 | 19 07:35 (WEA 10) |
| 20 | 08:14 | 09:03 (WEA 12) | 07:24 | 08:13 (WEA 11) | 06:22 | 07:17 (WEA 10) |
| | 16:41 | 24 09:27 (WEA 12) | 17:38 | 22 08:35 (WEA 11) | 18:29 | 15 07:32 (WEA 10) |
| 21 | 08:13 | 09:03 (WEA 12) | 07:22 | 08:15 (WEA 11) | 06:19 | 07:20 (WEA 10) |
| | 16:43 | 23 09:26 (WEA 12) | 17:40 | 19 08:34 (WEA 11) | 18:30 | 8 07:28 (WEA 10) |
| 22 | 08:12 | 09:04 (WEA 12) | 07:20 | 08:16 (WEA 11) | 06:17 | 06:07 |
| | 16:45 | 22 09:26 (WEA 12) | 17:42 | 16 08:32 (WEA 11) | 18:32 | 20:25 |
| 23 | 08:11 | 09:05 (WEA 12) | 07:18 | 08:19 (WEA 11) | 06:15 | 06:05 |
| | 16:47 | 21 09:26 (WEA 12) | 17:44 | 10 08:29 (WEA 11) | 18:34 | 20:27 |
| 24 | 08:10 | 09:06 (WEA 12) | 07:16 | | 06:12 | 06:03 |
| | 16:48 | 19 09:25 (WEA 12) | 17:46 | | 18:35 | 20:29 |
| 25 | 08:09 | 09:07 (WEA 12) | 07:13 | | 06:10 | 06:01 |
| | 16:50 | 18 09:25 (WEA 12) | 17:48 | | 18:37 | 20:30 |
| 26 | 08:07 | 09:08 (WEA 12) | 07:11 | | 06:08 | 05:59 |
| | 16:52 | 16 09:24 (WEA 12) | 17:49 | | 18:39 | 20:32 |
| 27 | 08:06 | 09:11 (WEA 12) | 07:09 | | 06:05 | 05:57 |
| | 16:54 | 12 09:23 (WEA 12) | 17:51 | | 18:41 | 20:34 |
| 28 | 08:04 | 09:13 (WEA 12) | 07:07 | | 06:03 | 05:55 |
| | 16:56 | 7 09:20 (WEA 12) | 17:53 | | 18:42 | 20:35 |
| 29 | 08:03 | | | | 07:01 | 05:53 |
| | 16:57 | | | | 19:44 | 20:37 |
| 30 | 08:02 | | | | 06:58 | 05:51 |
| | 16:59 | | | | 19:46 | 20:39 |
| 31 | 08:00 | | | | 06:56 | 05:04 |
| | 17:01 | | | | 19:47 | 21:25 |
| Sonnenscheinstunden | 258 | 277 | 367 | | 416 | 486 |
| astr.max.mögl.Beschattung | 592 | 393 | 389 | | | 500 |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | | | |
| Reduktion Windrichtung | 0,56 | 0,62 | 0,65 | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | | | |
| Met.wahrsch.Beschattung | 58 | 58 | 69 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d69 - Söllingen, Schulstraße 3

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | | |
|---------------------------|-------|--------|-----------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:52 (WEA 10) | 07:10 | 07:42 (WEA 11) | 08:02 | 08:42 (WEA 12) | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 28 08:20 (WEA 10) | 16:50 | 23 08:05 (WEA 11) | 16:09 | 24 09:06 (WEA 12) | |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:52 (WEA 10) | 07:12 | 07:43 (WEA 11) | 08:03 | 08:43 (WEA 12) | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 28 08:20 (WEA 10) | 16:48 | 21 08:04 (WEA 11) | 16:09 | 23 09:06 (WEA 12) | |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 07:52 (WEA 10) | 07:14 | 07:44 (WEA 11) | 08:04 | 08:43 (WEA 12) | |
| | 21:40 | 21:05 | 20:02 | 18:52 | 27 08:19 (WEA 10) | 16:46 | 19 08:03 (WEA 11) | 16:08 | 23 09:06 (WEA 12) | |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:53 (WEA 10) | 07:16 | 07:46 (WEA 11) | 08:06 | 08:43 (WEA 12) | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 26 08:19 (WEA 10) | 16:44 | 16 08:02 (WEA 11) | 16:07 | 23 09:06 (WEA 12) | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 07:52 (WEA 10) | 07:18 | 07:48 (WEA 11) | 08:07 | 08:44 (WEA 12) | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 25 08:17 (WEA 10) | 16:43 | 12 08:00 (WEA 11) | 16:07 | 22 09:06 (WEA 12) | |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 07:53 (WEA 10) | 07:19 | 07:52 (WEA 11) | 08:08 | 08:45 (WEA 12) | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 23 08:16 (WEA 10) | 16:41 | 3 07:55 (WEA 11) | 16:06 | 21 09:06 (WEA 12) | |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 07:55 (WEA 10) | 07:21 | | 08:10 | 08:46 (WEA 12) | |
| | 21:38 | 20:58 | 19:53 | 18:43 | 20 08:15 (WEA 10) | 16:39 | | 16:06 | 21 09:07 (WEA 12) | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:55 (WEA 10) | 07:23 | | 08:11 | 08:46 (WEA 12) | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 17 08:12 (WEA 10) | 16:37 | | 16:06 | 21 09:07 (WEA 12) | |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:58 (WEA 10) | 07:25 | | 08:12 | 08:47 (WEA 12) | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 11 08:09 (WEA 10) | 16:36 | | 16:05 | 20 09:07 (WEA 12) | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | | 07:27 | | 08:13 | 08:48 (WEA 12) | |
| | 21:36 | 20:53 | 19:46 | 18:36 | | 16:34 | | 16:05 | 18 09:06 (WEA 12) | |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | | 07:28 | | 08:14 | 08:48 (WEA 12) | |
| | 21:35 | 20:51 | 19:43 | 18:34 | | 16:33 | | 16:05 | 18 09:06 (WEA 12) | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | | 07:30 | | 08:15 | 08:49 (WEA 12) | |
| | 21:34 | 20:49 | 19:41 | 18:31 | | 16:31 | | 16:05 | 17 09:06 (WEA 12) | |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | | 07:32 | | 08:16 | 08:51 (WEA 12) | |
| | 21:33 | 20:47 | 19:39 | 18:29 | | 16:30 | | 16:05 | 17 09:08 (WEA 12) | |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | | 07:34 | 08:46 (WEA 12) | 08:17 | 08:50 (WEA 12) | |
| | 21:33 | 20:45 | 19:36 | 18:27 | | 16:28 | 7 08:53 (WEA 12) | 16:05 | 17 09:07 (WEA 12) | |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | | 07:35 | 08:44 (WEA 12) | 08:18 | 08:51 (WEA 12) | |
| | 21:32 | 20:43 | 19:34 | 18:25 | | 16:27 | 12 08:56 (WEA 12) | 16:05 | 16 09:07 (WEA 12) | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | | 07:37 | 08:42 (WEA 12) | 08:19 | 08:52 (WEA 12) | |
| | 21:31 | 20:41 | 19:32 | 18:22 | | 16:25 | 16 08:58 (WEA 12) | 16:05 | 15 09:07 (WEA 12) | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | | 07:39 | 08:40 (WEA 12) | 08:20 | 08:53 (WEA 12) | |
| | 21:29 | 20:39 | 19:29 | 18:20 | | 16:24 | 18 08:58 (WEA 12) | 16:05 | 15 09:08 (WEA 12) | |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 08:54 (WEA 11) | 07:41 | 08:40 (WEA 12) | 08:21 | 08:54 (WEA 12) | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 3 08:57 (WEA 11) | 16:22 | 19 08:59 (WEA 12) | 16:05 | 14 09:08 (WEA 12) | |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 08:48 (WEA 11) | 07:42 | 08:39 (WEA 12) | 08:21 | 08:54 (WEA 12) | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 13 09:01 (WEA 11) | 16:21 | 21 09:00 (WEA 12) | 16:06 | 14 09:08 (WEA 12) | |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 08:46 (WEA 11) | 07:44 | 08:39 (WEA 12) | 08:22 | 08:55 (WEA 12) | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 17 09:03 (WEA 11) | 16:20 | 22 09:01 (WEA 12) | 16:06 | 14 09:09 (WEA 12) | |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 08:45 (WEA 11) | 07:46 | 08:39 (WEA 12) | 08:23 | 08:56 (WEA 12) | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 19 09:04 (WEA 11) | 16:19 | 23 09:02 (WEA 12) | 16:06 | 13 09:09 (WEA 12) | |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 08:43 (WEA 11) | 07:47 | 08:39 (WEA 12) | 08:23 | 08:56 (WEA 12) | |
| | 21:23 | 20:28 | 19:17 | 4 08:11 (WEA 10) | 18:10 | 23 09:06 (WEA 11) | 16:18 | 24 09:03 (WEA 12) | 16:07 | 13 09:09 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 08:02 (WEA 10) | 07:54 | 08:43 (WEA 11) | 07:49 | 08:40 (WEA 12) | 08:24 | 08:56 (WEA 12) |
| | 21:22 | 20:26 | 19:15 | 14 08:16 (WEA 10) | 18:08 | 23 09:06 (WEA 11) | 16:16 | 24 09:04 (WEA 12) | 16:07 | 14 09:10 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 08:00 (WEA 10) | 07:56 | 08:42 (WEA 11) | 07:51 | 08:39 (WEA 12) | 08:24 | 08:57 (WEA 12) |
| | 21:21 | 20:24 | 19:13 | 18 08:18 (WEA 10) | 18:06 | 25 09:07 (WEA 11) | 16:15 | 24 09:03 (WEA 12) | 16:08 | 14 09:11 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 07:57 (WEA 10) | 06:58 | 07:42 (WEA 11) | 07:52 | 08:39 (WEA 12) | 08:25 | 08:57 (WEA 12) |
| | 21:19 | 20:22 | 19:10 | 21 08:18 (WEA 10) | 17:04 | 25 08:07 (WEA 11) | 16:14 | 25 09:04 (WEA 12) | 16:09 | 14 09:11 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 07:56 (WEA 10) | 06:59 | 07:41 (WEA 11) | 07:54 | 08:40 (WEA 12) | 08:25 | 08:57 (WEA 12) |
| | 21:18 | 20:20 | 19:08 | 24 08:20 (WEA 10) | 17:02 | 27 08:08 (WEA 11) | 16:13 | 25 09:05 (WEA 12) | 16:09 | 14 09:11 (WEA 12) |
| 27 | 05:29 | 06:19 | 07:09 | 07:55 (WEA 10) | 07:01 | 07:41 (WEA 11) | 07:56 | 08:39 (WEA 12) | 08:25 | 08:57 (WEA 12) |
| | 21:16 | 20:17 | 19:06 | 25 08:20 (WEA 10) | 17:00 | 27 08:08 (WEA 11) | 16:12 | 25 09:04 (WEA 12) | 16:10 | 15 09:12 (WEA 12) |
| 28 | 05:31 | 06:20 | 07:11 | 07:54 (WEA 10) | 07:03 | 07:40 (WEA 11) | 07:57 | 08:40 (WEA 12) | 08:25 | 08:58 (WEA 12) |
| | 21:15 | 20:15 | 19:03 | 26 08:20 (WEA 10) | 16:58 | 27 08:07 (WEA 11) | 16:12 | 25 09:05 (WEA 12) | 16:11 | 16 09:14 (WEA 12) |
| 29 | 05:32 | 06:22 | 07:13 | 07:53 (WEA 10) | 07:05 | 07:41 (WEA 11) | 07:59 | 08:41 (WEA 12) | 08:25 | 08:58 (WEA 12) |
| | 21:13 | 20:13 | 19:01 | 27 08:20 (WEA 10) | 16:56 | 25 08:06 (WEA 11) | 16:11 | 25 09:06 (WEA 12) | 16:12 | 16 09:14 (WEA 12) |
| 30 | 05:34 | 06:24 | 07:14 | 07:53 (WEA 10) | 07:07 | 07:41 (WEA 11) | 08:00 | 08:41 (WEA 12) | 08:26 | 08:59 (WEA 12) |
| | 21:12 | 20:11 | 18:59 | 28 08:21 (WEA 10) | 16:54 | 25 08:06 (WEA 11) | 16:10 | 24 09:05 (WEA 12) | 16:13 | 16 09:15 (WEA 12) |
| 31 | 05:35 | 06:25 | | 07:08 | | 07:41 (WEA 11) | | | 08:26 | 08:58 (WEA 12) |
| | 21:10 | 20:08 | | 16:52 | 25 08:06 (WEA 11) | | | | 16:13 | 17 09:15 (WEA 12) |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | | 266 | | 243 | | |
| astr.max.mögl.Beschattung | | | 187 | 509 | | 453 | | 535 | | |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | | 0,21 | | 0,14 | | |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | | 0,96 | | 0,96 | | |
| Reduktion Windrichtung | | | 0,65 | 0,63 | | 0,57 | | 0,56 | | |
| Gesamte Reduktion | | | 0,23 | 0,19 | | 0,12 | | 0,07 | | |
| Met.wahrsch.Beschattung | | | 43 | 95 | | 52 | | 39 | | |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d71 - Söllingen, Schulstraße 6

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|---------------------------|----------------|----------------------------------|----------------------------------|----------------|----------------------------------|----------------|
| 1 | 08:26 16:15 | 07:59 17:03 | 08:55 (WEA 12) 09:16 (WEA 12) | 07:05 17:55 | 07:56 (WEA 11) 08:17 (WEA 11) | 06:54 19:49 |
| 2 | 08:26 16:16 | 07:57 17:05 | 08:56 (WEA 12) 09:15 (WEA 12) | 07:03 17:57 | 07:57 (WEA 11) 08:16 (WEA 11) | 06:52 19:51 |
| 3 | 08:25 16:17 | 07:55 17:07 | 08:58 (WEA 12) 09:13 (WEA 12) | 07:00 17:58 | 07:59 (WEA 11) 08:14 (WEA 11) | 06:49 19:53 |
| 4 | 08:25 16:18 | 07:54 17:08 | 09:01 (WEA 12) 09:12 (WEA 12) | 06:58 18:00 | 08:03 (WEA 11) 08:10 (WEA 11) | 06:47 19:54 |
| 5 | 08:25 16:19 | 07:52 17:10 | | 06:56 18:02 | 06:45 19:56 | 05:41 20:47 |
| 6 | 08:25 16:21 | 07:50 17:12 | | 06:54 18:04 | 06:42 19:58 | 05:39 20:49 |
| 7 | 08:24 16:22 | 07:49 17:14 | | 06:52 18:06 | 06:40 20:00 | 05:37 20:51 |
| 8 | 08:24 16:23 | 07:47 17:16 | | 06:49 18:07 | 06:38 20:01 | 05:36 20:52 |
| 9 | 08:23 16:25 | 08:56 (WEA 12) 09:02 (WEA 12) | 07:45 17:18 | 06:47 18:09 | 06:36 20:03 | 05:34 20:54 |
| 10 | 08:23 16:26 | 08:54 (WEA 12) 09:04 (WEA 12) | 07:43 17:20 | 06:45 18:11 | 06:33 20:05 | 05:32 20:55 |
| 11 | 08:22 16:27 | 08:53 (WEA 12) 09:06 (WEA 12) | 07:41 17:22 | 06:42 18:13 | 06:31 20:06 | 05:30 20:57 |
| 12 | 08:21 16:29 | 08:52 (WEA 12) 09:07 (WEA 12) | 07:40 17:23 | 06:40 18:15 | 06:29 20:08 | 05:29 20:59 |
| 13 | 08:21 16:30 | 08:52 (WEA 12) 09:08 (WEA 12) | 07:38 17:25 | 06:38 18:16 | 06:27 20:10 | 05:27 21:00 |
| 14 | 08:20 16:32 | 08:51 (WEA 12) 09:10 (WEA 12) | 07:36 17:27 | 06:36 18:18 | 07:01 (WEA 10) 07:12 (WEA 10) | 06:24 20:12 |
| 15 | 08:19 16:33 | 08:51 (WEA 12) 09:11 (WEA 12) | 07:34 17:29 | 06:33 18:20 | 06:58 (WEA 10) 07:15 (WEA 10) | 06:22 20:13 |
| 16 | 08:18 16:35 | 08:50 (WEA 12) 09:12 (WEA 12) | 07:32 17:31 | 06:31 18:22 | 06:57 (WEA 10) 07:17 (WEA 10) | 06:20 20:15 |
| 17 | 08:17 16:37 | 08:50 (WEA 12) 09:13 (WEA 12) | 07:30 17:33 | 06:29 18:23 | 06:54 (WEA 10) 07:17 (WEA 10) | 06:18 20:17 |
| 18 | 08:16 16:38 | 08:50 (WEA 12) 09:14 (WEA 12) | 07:28 17:35 | 06:26 18:25 | 06:53 (WEA 10) 07:18 (WEA 10) | 06:16 20:18 |
| 19 | 08:15 16:40 | 08:50 (WEA 12) 09:15 (WEA 12) | 07:26 17:36 | 06:24 18:27 | 06:53 (WEA 10) 07:19 (WEA 10) | 06:13 20:20 |
| 20 | 08:14 16:41 | 08:50 (WEA 12) 09:16 (WEA 12) | 07:24 17:38 | 06:22 18:29 | 06:51 (WEA 10) 07:19 (WEA 10) | 06:11 20:22 |
| 21 | 08:13 16:43 | 08:50 (WEA 12) 09:15 (WEA 12) | 07:22 17:40 | 06:19 18:30 | 06:51 (WEA 10) 07:19 (WEA 10) | 06:09 20:23 |
| 22 | 08:12 16:45 | 08:50 (WEA 12) 09:16 (WEA 12) | 07:20 17:42 | 06:17 18:32 | 06:51 (WEA 10) 07:19 (WEA 10) | 06:07 20:25 |
| 23 | 08:11 16:47 | 08:51 (WEA 12) 09:17 (WEA 12) | 07:18 17:44 | 06:15 18:34 | 06:50 (WEA 10) 07:18 (WEA 10) | 06:05 20:27 |
| 24 | 08:10 16:48 | 08:50 (WEA 12) 09:17 (WEA 12) | 07:16 17:46 | 06:12 18:35 | 06:50 (WEA 10) 07:18 (WEA 10) | 06:03 20:29 |
| 25 | 08:09 16:50 | 08:51 (WEA 12) 09:17 (WEA 12) | 07:13 17:48 | 06:10 18:37 | 06:50 (WEA 10) 07:18 (WEA 10) | 06:01 20:30 |
| 26 | 08:07 16:52 | 08:51 (WEA 12) 09:17 (WEA 12) | 07:11 17:49 | 06:08 18:39 | 06:50 (WEA 10) 07:16 (WEA 10) | 05:59 20:32 |
| 27 | 08:06 16:54 | 08:52 (WEA 12) 09:18 (WEA 12) | 07:09 17:51 | 06:05 18:41 | 06:50 (WEA 10) 07:15 (WEA 10) | 05:57 20:34 |
| 28 | 08:04 16:56 | 08:52 (WEA 12) 09:17 (WEA 12) | 07:07 17:53 | 06:03 18:42 | 06:51 (WEA 10) 07:14 (WEA 10) | 05:55 20:35 |
| 29 | 08:03 16:57 | 08:53 (WEA 12) 09:18 (WEA 12) | | 07:01 19:44 | 07:52 (WEA 10) 08:12 (WEA 10) | 05:53 20:37 |
| 30 | 08:02 16:59 | 08:53 (WEA 12) 09:17 (WEA 12) | | 06:58 19:46 | 07:54 (WEA 10) 08:10 (WEA 10) | 05:51 20:39 |
| 31 | 08:00 17:01 | 08:55 (WEA 12) 09:17 (WEA 12) | | 06:56 19:47 | 07:57 (WEA 10) 08:07 (WEA 10) | 05:54 21:25 |
| Sonneneinstunden | 258 | 277 | 367 | 416 | 486 | 500 |
| astr.max.mögl.Beschattung | 497 | 416 | 472 | | | |
| Red.Sonneneinstunden | 0,18 | 0,25 | 0,29 | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | | | |
| Reduktion Windrichtung | 0,58 | 0,62 | 0,67 | | | |
| Gesamte Reduktion | 0,10 | 0,15 | 0,18 | | | |
| Met.wahrsch.Beschattung | 50 | 61 | 87 | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO**Schattenrezeptor:** IO d71 - Söllingen, Schulstraße 6

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------|----------|----------|---------------------------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:10 | 08:02 | 08:35 (WEA 12) |
| | 21:41 | 21:09 | 20:06 | 18:56 | 16:50 | 16:09 | 13 08:48 (WEA 12) |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:12 | 08:03 | 08:37 (WEA 12) |
| | 21:40 | 21:07 | 20:04 | 18:54 | 16:48 | 16:09 | 11 08:48 (WEA 12) |
| 3 | 05:01 | 05:40 | 06:30 | 07:20 | 07:14 | 08:04 | 08:39 (WEA 12) |
| | 21:40 | 21:05 | 20:02 | 18:52 | 16:46 | 16:08 | 7 08:46 (WEA 12) |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:16 | 08:06 | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 16:44 | 16:07 | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 07:18 | 08:07 | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 16:43 | 16:07 | |
| 6 | 05:04 | 05:45 | 06:35 | 07:25 | 07:19 | 08:08 | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 16:41 | 16:06 | 4 08:38 (WEA 12) |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 07:21 | 08:10 | |
| | 21:38 | 20:58 | 19:52 | 18:43 | 16:39 | 16:06 | 12 08:42 (WEA 12) |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:23 | 08:11 | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 16:37 | 16:06 | 16 08:44 (WEA 12) |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:25 | 08:12 | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 16:36 | 16:05 | 19 08:46 (WEA 12) |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | 08:13 | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | 16:05 | 11 08:46 (WEA 11) 21 08:47 (WEA 12) |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | 07:28 | 08:14 | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | 16:05 | 17 08:49 (WEA 11) 23 08:48 (WEA 12) |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | 08:15 | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | 16:05 | 21 08:51 (WEA 11) 24 08:49 (WEA 12) |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | 08:16 | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 16:30 | 16:05 | 23 08:28 (WEA 11) 24 08:49 (WEA 12) |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | 08:17 | |
| | 21:32 | 20:45 | 19:36 | 18:27 | 16:28 | 16:05 | 20 08:03 (WEA 10) 25 08:50 (WEA 12) |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | 08:18 | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 16:05 | 22 08:03 (WEA 10) 26 08:51 (WEA 12) |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | 08:19 | |
| | 21:30 | 20:41 | 19:32 | 18:22 | 16:25 | 16:05 | 25 08:26 (WEA 11) 26 08:51 (WEA 12) |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | 08:20 | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | 16:05 | 25 08:26 (WEA 11) 26 08:50 (WEA 12) |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:21 | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | 16:05 | 26 08:25 (WEA 11) 27 08:51 (WEA 12) |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | 08:22 | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | 16:06 | 27 08:53 (WEA 11) 26 08:51 (WEA 12) |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | 08:23 | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 16:20 | 16:06 | 28 08:25 (WEA 11) 26 08:51 (WEA 12) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | 08:24 | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 16:06 | 27 08:52 (WEA 11) 25 08:51 (WEA 12) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | 08:25 | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 16:07 | 26 08:25 (WEA 11) 26 08:52 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | 08:26 | |
| | 21:22 | 20:26 | 19:15 | 18:08 | 16:16 | 16:07 | 26 08:26 (WEA 11) 25 08:52 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | 08:27 | |
| | 21:21 | 20:24 | 19:13 | 18:06 | 16:15 | 16:08 | 24 08:27 (WEA 11) 24 08:51 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 07:58 | 07:52 | 08:28 | |
| | 21:19 | 20:22 | 19:10 | 17:04 | 16:14 | 16:09 | 23 08:28 (WEA 11) 23 08:51 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 07:59 | 07:54 | 08:29 | |
| | 21:18 | 20:20 | 19:08 | 17:02 | 16:13 | 16:09 | 20 07:29 (WEA 11) 22 08:29 (WEA 12) |
| 27 | 05:29 | 06:19 | 07:09 | 07:59 | 07:56 | 08:30 | |
| | 21:16 | 20:17 | 19:06 | 17:00 | 16:12 | 16:10 | 18 07:47 (WEA 11) 20 08:50 (WEA 12) |
| 28 | 05:31 | 06:20 | 07:11 | 07:59 | 07:57 | 08:31 | |
| | 21:15 | 20:15 | 19:03 | 16:58 | 16:11 | 16:11 | 13 07:45 (WEA 11) 19 08:50 (WEA 12) |
| 29 | 05:32 | 06:22 | 07:13 | 07:59 | 07:59 | 08:32 | |
| | 21:13 | 20:13 | 19:01 | 16:56 | 16:11 | 16:12 | 6 07:40 (WEA 11) 17 08:50 (WEA 12) |
| 30 | 05:34 | 06:24 | 07:14 | 07:59 | 07:57 | 08:33 | |
| | 21:12 | 20:11 | 18:59 | 16:54 | 16:10 | 16:13 | 22 08:29 (WEA 11) 15 08:48 (WEA 12) |
| 31 | 05:35 | 06:25 | | 07:00 | | 08:26 | |
| | 21:10 | 20:08 | | 16:52 | | 16:13 | |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | |
| astr.max.mögl.Beschattung | | | 418 | 417 | 541 | 31 | |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | 0,14 | |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | 0,96 | |
| Reduktion Windrichtung | | | 0,68 | 0,63 | 0,58 | 0,58 | |
| Gesamte Reduktion | | | 0,24 | 0,19 | 0,12 | 0,07 | |
| Met.wahrsch.Beschattung | | | 100 | 77 | 63 | 2 | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d75 - Söllingen, Schulstraße 14

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni |
|----|---------------------------|------------------------|------------------------|------------------------|------------------------|-------|
| 1 | 08:26 | 09:52 (WEA 13) 07:59 | 08:42 (WEA 12) 07:05 | 07:39 (WEA 11) 06:54 | 07:31 (WEA 10) 05:49 | 05:03 |
| 2 | 16:15 | 10:04 (WEA 13) 17:03 | 09:10 (WEA 12) 17:55 | 08:08 (WEA 11) 19:49 | 08:00 (WEA 10) 20:40 | 21:27 |
| 3 | 08:26 | 09:53 (WEA 13) 07:57 | 08:42 (WEA 12) 07:03 | 07:39 (WEA 11) 06:52 | 07:31 (WEA 10) 05:47 | 05:02 |
| 4 | 16:16 | 10:04 (WEA 13) 17:05 | 09:09 (WEA 12) 17:57 | 08:08 (WEA 11) 19:51 | 08:00 (WEA 10) 20:42 | 21:28 |
| 5 | 08:25 | 09:55 (WEA 13) 07:55 | 08:42 (WEA 12) 07:00 | 07:39 (WEA 11) 06:49 | 07:32 (WEA 10) 05:45 | 05:01 |
| 6 | 16:17 | 10:04 (WEA 13) 17:07 | 09:09 (WEA 12) 17:58 | 08:08 (WEA 11) 19:53 | 07:59 (WEA 10) 20:44 | 21:29 |
| 7 | 08:25 | 09:57 (WEA 13) 07:54 | 08:43 (WEA 12) 06:58 | 07:39 (WEA 11) 06:47 | 07:33 (WEA 10) 05:43 | 05:01 |
| 8 | 16:18 | 10:02 (WEA 13) 17:08 | 09:09 (WEA 12) 18:00 | 08:08 (WEA 11) 19:54 | 07:59 (WEA 10) 20:46 | 21:30 |
| 9 | 08:25 | 07:52 | 08:43 (WEA 12) 06:56 | 07:39 (WEA 11) 06:45 | 07:32 (WEA 10) 05:41 | 05:00 |
| 10 | 16:19 | 17:10 | 09:09 (WEA 12) 18:02 | 08:06 (WEA 11) 19:56 | 07:57 (WEA 10) 20:47 | 21:31 |
| 11 | 08:25 | 07:50 | 08:44 (WEA 12) 06:54 | 07:39 (WEA 11) 06:42 | 07:34 (WEA 10) 05:39 | 04:59 |
| 12 | 16:21 | 17:12 | 09:08 (WEA 12) 18:04 | 08:06 (WEA 11) 19:58 | 07:55 (WEA 10) 20:49 | 21:32 |
| 13 | 08:24 | 07:49 | 08:45 (WEA 12) 06:52 | 07:40 (WEA 11) 06:40 | 07:35 (WEA 10) 05:37 | 04:59 |
| 14 | 16:22 | 17:14 | 09:07 (WEA 12) 18:06 | 08:05 (WEA 11) 20:00 | 07:54 (WEA 10) 20:50 | 21:33 |
| 15 | 08:24 | 07:47 | 08:46 (WEA 12) 06:49 | 07:40 (WEA 11) 06:38 | 07:37 (WEA 10) 05:36 | 04:58 |
| 16 | 16:23 | 17:16 | 09:06 (WEA 12) 18:07 | 08:03 (WEA 11) 20:01 | 07:51 (WEA 10) 20:52 | 21:34 |
| 17 | 08:23 | 07:45 | 08:47 (WEA 12) 06:47 | 07:42 (WEA 11) 06:36 | 07:41 (WEA 10) 05:34 | 04:58 |
| 18 | 16:25 | 17:18 | 09:05 (WEA 12) 18:09 | 08:02 (WEA 11) 20:03 | 07:46 (WEA 10) 20:54 | 21:35 |
| 19 | 08:23 | 07:43 | 08:49 (WEA 12) 06:45 | 07:44 (WEA 11) 06:33 | 07:44 (WEA 10) 05:32 | 04:57 |
| 20 | 16:26 | 17:20 | 09:02 (WEA 12) 18:11 | 08:00 (WEA 11) 20:05 | 07:55 (WEA 10) 20:55 | 21:35 |
| 21 | 08:22 | 07:41 | 08:53 (WEA 12) 06:42 | 07:46 (WEA 11) 06:31 | 07:46 (WEA 10) 05:30 | 04:57 |
| 22 | 16:27 | 17:22 | 08:59 (WEA 12) 18:13 | 07:56 (WEA 11) 20:06 | 07:57 (WEA 10) 20:57 | 21:36 |
| 23 | 08:21 | 07:40 | 06:40 | 06:29 | 05:29 | 04:57 |
| 24 | 16:29 | 17:23 | 18:15 | 20:08 | 20:59 | 21:37 |
| 25 | 08:21 | 07:38 | 06:38 | 06:27 | 05:27 | 04:56 |
| 26 | 16:30 | 17:25 | 18:16 | 20:10 | 21:00 | 21:37 |
| 27 | 08:20 | 07:36 | 06:36 | 06:24 | 05:26 | 04:56 |
| 28 | 16:32 | 17:27 | 18:18 | 20:12 | 21:02 | 21:38 |
| 29 | 08:19 | 07:34 | 06:33 | 06:22 | 05:24 | 04:56 |
| 30 | 16:33 | 17:29 | 18:20 | 20:13 | 21:03 | 21:39 |
| 31 | 08:18 | 07:32 | 06:31 | 06:20 | 05:22 | 04:56 |
| 32 | 16:35 | 17:31 | 18:22 | 20:15 | 21:05 | 21:39 |
| 33 | 08:17 | 07:30 | 06:29 | 06:18 | 05:21 | 04:56 |
| 34 | 16:37 | 17:33 | 18:23 | 20:17 | 21:06 | 21:40 |
| 35 | 08:16 | 07:28 | 06:26 | 06:16 | 05:19 | 04:56 |
| 36 | 16:38 | 17:35 | 18:25 | 20:18 | 21:08 | 21:40 |
| 37 | 08:15 | 07:26 | 06:24 | 06:13 | 05:18 | 04:56 |
| 38 | 16:40 | 17:36 | 18:27 | 20:20 | 21:09 | 21:40 |
| 39 | 08:14 | 07:24 | 06:22 | 06:11 | 05:17 | 04:56 |
| 40 | 16:41 | 17:38 | 18:29 | 20:22 | 21:11 | 21:41 |
| 41 | 08:13 | 07:22 | 06:19 | 06:09 | 05:15 | 04:56 |
| 42 | 16:43 | 17:40 | 18:30 | 20:23 | 21:12 | 21:41 |
| 43 | 08:12 | 07:20 | 06:17 | 06:07 | 05:14 | 04:56 |
| 44 | 16:45 | 17:42 | 18:32 | 20:25 | 21:14 | 21:41 |
| 45 | 08:11 | 07:18 | 06:15 | 06:05 | 05:13 | 04:56 |
| 46 | 16:47 | 17:44 | 18:34 | 20:27 | 21:15 | 21:41 |
| 47 | 08:10 | 07:16 | 06:12 | 06:03 | 05:11 | 04:57 |
| 48 | 16:48 | 17:46 | 18:35 | 20:29 | 21:17 | 21:41 |
| 49 | 08:08 | 07:13 | 06:10 | 06:01 | 05:10 | 04:57 |
| 50 | 16:50 | 17:48 | 18:37 | 20:30 | 21:18 | 21:42 |
| 51 | 08:07 | 07:11 | 06:08 | 05:59 | 05:09 | 04:57 |
| 52 | 16:52 | 17:49 | 18:39 | 20:32 | 21:19 | 21:42 |
| 53 | 08:06 | 07:09 | 06:05 | 05:57 | 05:08 | 04:58 |
| 54 | 16:54 | 17:51 | 18:41 | 20:34 | 21:21 | 21:41 |
| 55 | 08:04 | 07:07 | 06:03 | 05:55 | 05:07 | 04:58 |
| 56 | 16:56 | 17:53 | 18:42 | 20:35 | 21:22 | 21:41 |
| 57 | 08:03 | 07:07 | 06:03 | 05:53 | 05:06 | 04:59 |
| 58 | 16:57 | 17:53 | 18:43 | 20:37 | 21:23 | 21:41 |
| 59 | 08:02 | 07:07 | 06:03 | 05:51 | 05:05 | 04:59 |
| 60 | 16:59 | 17:53 | 18:44 | 20:39 | 21:24 | 21:41 |
| 61 | 08:00 | 07:07 | 06:03 | 05:51 | 05:04 | 04:59 |
| 62 | 17:01 | 09:10 (WEA 12) | 19:47 | 08:01 (WEA 10) | 21:25 | 05:04 |
| 63 | Sonnenscheinstunden | 258 | 367 | 416 | 486 | 500 |
| 64 | astr.max.mögl.Beschattung | 333 | 402 | 506 | 195 | |
| 65 | Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | |
| 66 | Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | |
| 67 | Reduktion Windrichtung | 0,59 | 0,61 | 0,66 | 0,70 | |
| 68 | Gesamte Reduktion | 0,10 | 0,14 | 0,18 | 0,24 | |
| 69 | Met.wahrsch.Beschattung | 34 | 58 | 92 | 48 | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

DE-38384 Gevensleben

+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO **Schattenrezeptor:** IO d75 - Söllingen, Schulstraße 14

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | | | |
|---------------------------|-------|--------|-----------|-------------------|------------------|-------------------|-------------------|-------------------|-------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:10 | 08:18 (WEA 12) | 08:02 | | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 16:50 | 15 08:33 (WEA 12) | 16:09 | | |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 08:27 (WEA 11) | 07:12 | 08:17 (WEA 12) | 08:03 | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 5 08:32 (WEA 11) | 16:48 | 17 08:34 (WEA 12) | 16:09 | |
| 3 | 05:01 | 05:40 | 06:30 | 07:39 (WEA 10) | 07:19 | 08:23 (WEA 11) | 07:14 | 08:15 (WEA 12) | 08:04 |
| | 21:40 | 21:05 | 20:02 | 5 07:44 (WEA 10) | 18:52 | 13 08:36 (WEA 11) | 16:46 | 21 08:36 (WEA 12) | 16:08 |
| 4 | 05:02 | 05:41 | 06:32 | 07:34 (WEA 10) | 07:21 | 08:20 (WEA 11) | 07:16 | 08:14 (WEA 12) | 08:06 |
| | 21:40 | 21:04 | 19:59 | 14 07:48 (WEA 10) | 18:49 | 19 08:39 (WEA 11) | 16:44 | 23 08:37 (WEA 12) | 16:07 |
| 5 | 05:03 | 05:43 | 06:33 | 07:31 (WEA 10) | 07:23 | 08:18 (WEA 11) | 07:18 | 08:14 (WEA 12) | 08:07 |
| | 21:39 | 21:02 | 19:57 | 19 07:50 (WEA 10) | 18:47 | 21 08:39 (WEA 11) | 16:43 | 24 08:38 (WEA 12) | 16:07 |
| 6 | 05:04 | 05:45 | 06:35 | 07:30 (WEA 10) | 07:25 | 08:17 (WEA 11) | 07:19 | 08:13 (WEA 12) | 08:08 |
| | 21:39 | 21:00 | 19:55 | 21 07:51 (WEA 10) | 18:45 | 24 08:41 (WEA 11) | 16:41 | 26 08:39 (WEA 12) | 16:06 |
| 7 | 05:05 | 05:46 | 06:37 | 07:28 (WEA 10) | 07:26 | 08:16 (WEA 11) | 07:21 | 08:13 (WEA 12) | 08:10 |
| | 21:38 | 20:58 | 19:52 | 24 07:52 (WEA 10) | 18:43 | 25 08:41 (WEA 11) | 16:39 | 26 08:39 (WEA 12) | 16:06 |
| 8 | 05:06 | 05:48 | 06:38 | 07:27 (WEA 10) | 07:28 | 08:14 (WEA 11) | 07:23 | 08:13 (WEA 12) | 08:11 |
| | 21:37 | 20:56 | 19:50 | 26 07:53 (WEA 10) | 18:40 | 27 08:41 (WEA 11) | 16:37 | 27 08:40 (WEA 12) | 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:26 (WEA 10) | 07:30 | 08:14 (WEA 11) | 07:25 | 08:12 (WEA 12) | 08:12 |
| | 21:37 | 20:54 | 19:48 | 27 07:53 (WEA 10) | 18:38 | 28 08:42 (WEA 11) | 16:36 | 28 08:40 (WEA 12) | 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:25 (WEA 10) | 07:31 | 08:13 (WEA 11) | 07:27 | 08:13 (WEA 12) | 08:13 |
| | 21:36 | 20:53 | 19:46 | 28 07:53 (WEA 10) | 18:36 | 29 08:42 (WEA 11) | 16:34 | 27 08:40 (WEA 12) | 16:05 |
| 11 | 05:09 | 05:53 | 06:43 | 07:24 (WEA 10) | 07:33 | 08:13 (WEA 11) | 07:28 | 08:13 (WEA 12) | 08:14 |
| | 21:35 | 20:51 | 19:43 | 29 07:53 (WEA 10) | 18:34 | 29 08:42 (WEA 11) | 16:33 | 28 08:41 (WEA 12) | 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:23 (WEA 10) | 07:35 | 08:13 (WEA 11) | 07:30 | 08:13 (WEA 12) | 08:15 |
| | 21:34 | 20:49 | 19:41 | 30 07:53 (WEA 10) | 18:31 | 29 08:42 (WEA 11) | 16:31 | 28 08:41 (WEA 12) | 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:23 (WEA 10) | 07:37 | 08:12 (WEA 11) | 07:32 | 08:13 (WEA 12) | 08:16 |
| | 21:33 | 20:47 | 19:39 | 30 07:53 (WEA 10) | 18:29 | 29 08:41 (WEA 11) | 16:30 | 28 08:41 (WEA 12) | 16:05 |
| 14 | 05:12 | 05:57 | 06:48 | 07:24 (WEA 10) | 07:38 | 08:13 (WEA 11) | 07:34 | 08:14 (WEA 12) | 08:17 |
| | 21:32 | 20:45 | 19:36 | 29 07:53 (WEA 10) | 18:27 | 27 08:40 (WEA 11) | 16:28 | 27 08:41 (WEA 12) | 16:05 |
| 15 | 05:13 | 05:59 | 06:50 | 07:23 (WEA 10) | 07:40 | 08:13 (WEA 11) | 07:35 | 08:14 (WEA 12) | 08:18 |
| | 21:32 | 20:43 | 19:34 | 28 07:51 (WEA 10) | 18:25 | 27 08:40 (WEA 11) | 16:27 | 26 08:40 (WEA 12) | 16:05 |
| 16 | 05:14 | 06:01 | 06:51 | 07:23 (WEA 10) | 07:42 | 08:14 (WEA 11) | 07:37 | 08:15 (WEA 12) | 08:19 |
| | 21:30 | 20:41 | 19:32 | 28 07:51 (WEA 10) | 18:22 | 25 08:39 (WEA 11) | 16:25 | 25 08:40 (WEA 12) | 16:05 |
| 17 | 05:16 | 06:02 | 06:53 | 07:23 (WEA 10) | 07:44 | 08:15 (WEA 11) | 07:39 | 08:15 (WEA 12) | 08:20 |
| | 21:29 | 20:39 | 19:29 | 26 07:49 (WEA 10) | 18:20 | 23 08:38 (WEA 11) | 16:24 | 24 08:39 (WEA 12) | 16:05 |
| 18 | 05:17 | 06:04 | 06:55 | 07:24 (WEA 10) | 07:45 | 08:16 (WEA 11) | 07:41 | 08:16 (WEA 12) | 08:21 |
| | 21:28 | 20:37 | 19:27 | 24 07:48 (WEA 10) | 18:18 | 21 08:37 (WEA 11) | 16:22 | 23 08:39 (WEA 12) | 16:05 |
| 19 | 05:18 | 06:05 | 06:56 | 07:25 (WEA 10) | 07:47 | 08:17 (WEA 11) | 07:42 | 08:17 (WEA 12) | 08:21 |
| | 21:27 | 20:35 | 19:24 | 22 07:47 (WEA 10) | 18:16 | 17 08:34 (WEA 11) | 16:21 | 21 08:38 (WEA 12) | 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:26 (WEA 10) | 07:49 | 08:19 (WEA 11) | 07:44 | 08:19 (WEA 12) | 08:22 |
| | 21:26 | 20:32 | 19:22 | 18 07:44 (WEA 10) | 18:14 | 12 08:31 (WEA 11) | 16:20 | 19 08:38 (WEA 12) | 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:28 (WEA 10) | 07:51 | | 07:46 | 08:20 (WEA 12) | 08:23 |
| | 21:25 | 20:30 | 19:20 | 14 07:42 (WEA 10) | 18:12 | | 16:19 | 17 08:37 (WEA 12) | 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:32 (WEA 10) | 07:52 | | 07:47 | 08:22 (WEA 12) | 08:23 |
| | 21:23 | 20:28 | 19:17 | 4 07:36 (WEA 10) | 18:10 | | 16:18 | 14 08:36 (WEA 12) | 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | | 07:54 | | 07:49 | 08:24 (WEA 12) | 08:24 |
| | 21:22 | 20:26 | 19:15 | | 18:08 | | 16:16 | 11 08:35 (WEA 12) | 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | | 07:56 | | 07:51 | 08:27 (WEA 12) | 08:24 |
| | 21:21 | 20:24 | 19:13 | | 18:06 | | 16:15 | 4 08:31 (WEA 12) | 16:08 |
| 25 | 05:26 | 06:15 | 07:06 | | 06:58 | | 07:52 | | 08:25 |
| | 21:19 | 20:22 | 19:10 | | 17:04 | | 16:14 | | 16:09 |
| 26 | 05:28 | 06:17 | 07:08 | | 06:59 | | 07:54 | | 08:25 |
| | 21:18 | 20:20 | 19:08 | | 17:02 | | 16:13 | | 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | | 07:01 | | 07:56 | | 08:25 |
| | 21:16 | 20:17 | 19:06 | | 17:00 | | 16:12 | | 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | | 07:03 | | 07:57 | | 08:25 |
| | 21:15 | 20:15 | 19:03 | | 16:58 | | 16:12 | | 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | | 07:05 | | 07:59 | | 08:25 |
| | 21:13 | 20:13 | 19:01 | | 16:56 | | 16:11 | | 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | | 07:07 | | 08:00 | | 08:26 |
| | 21:12 | 20:11 | 18:59 | | 16:54 | | 16:10 | | 16:13 |
| 31 | 05:35 | 06:25 | | | 07:08 | | 08:21 (WEA 12) | | 08:26 |
| | 21:10 | 20:08 | | | 16:52 | 8 | 08:29 (WEA 12) | | 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | | 243 | | |
| astr.max.mögl.Beschattung | | | 446 | 438 | 529 | | 378 | | |
| Red.Sonnenscheinwahrsch. | | | 0,37 | 0,31 | 0,21 | | 0,14 | | |
| Reduktion Betriebsdauer | | | 0,96 | 0,96 | 0,96 | | 0,96 | | |
| Reduktion Windrichtung | | | 0,70 | 0,64 | 0,59 | | 0,57 | | |
| Gesamte Reduktion | | | 0,24 | 0,19 | 0,12 | | 0,07 | | |
| Met.wahrsch.Beschattung | | | 109 | 81 | 63 | | 28 | | |

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

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

Projekt:

Söllingen Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235
Andreas Schulze / gutachten@sowiwas.de
Berechnet:
17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d77 - Söllingen, Sonnenhof 1

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | Februar | März | April | Mai | Juni | | | | |
|---------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|-----------------------------|--|--|--|--|
| 1 08:26 | 09:05 (WEA 14) 07:59 | 08:59 (WEA 13) 07:05 | 07:39 (WEA 12) 06:54 | 05:49 | 05:03 | 06:07 (WEA 10) | | | | |
| 16:15 | 52 11:50 (WEA 16) 17:03 | 40 09:39 (WEA 13) 17:55 | 32 08:11 (WEA 07) 19:49 | 20:40 | 21:27 | 21 06:28 (WEA 10) | | | | |
| 2 08:25 | 09:05 (WEA 14) 07:57 | 08:59 (WEA 13) 07:03 | 07:36 (WEA 12) 06:52 | 05:47 | 05:02 | 06:07 (WEA 10) | | | | |
| 16:16 | 52 11:50 (WEA 16) 17:05 | 39 09:38 (WEA 13) 17:57 | 34 08:10 (WEA 07) 19:51 | 20:42 | 21:28 | 20 06:27 (WEA 10) | | | | |
| 3 08:25 | 09:06 (WEA 14) 07:55 | 08:59 (WEA 13) 07:00 | 07:35 (WEA 12) 06:49 | 05:45 | 05:01 | 06:08 (WEA 10) | | | | |
| 16:17 | 51 11:50 (WEA 16) 17:07 | 39 09:38 (WEA 13) 17:58 | 32 08:07 (WEA 07) 19:53 | 20:44 | 21:29 | 18 06:26 (WEA 10) | | | | |
| 4 08:25 | 09:05 (WEA 14) 07:54 | 09:00 (WEA 13) 06:58 | 07:33 (WEA 12) 06:47 | 07:18 (WEA 11) 05:43 | 06:14 (WEA 10) 05:01 | 20 06:09 (WEA 10) | | | | |
| 16:18 | 50 11:49 (WEA 16) 17:08 | 39 09:39 (WEA 13) 18:00 | 26 07:59 (WEA 12) 19:54 | 13 07:31 (WEA 11) 20:46 | 5 06:19 (WEA 10) 21:30 | 17 06:26 (WEA 10) | | | | |
| 5 08:25 | 09:06 (WEA 14) 07:52 | 09:00 (WEA 13) 06:56 | 07:31 (WEA 12) 06:45 | 07:14 (WEA 11) 05:41 | 06:10 (WEA 10) 05:00 | 16 06:10 (WEA 10) | | | | |
| 16:19 | 48 11:49 (WEA 16) 17:10 | 38 09:38 (WEA 13) 18:02 | 29 08:00 (WEA 12) 19:56 | 19 07:33 (WEA 11) 20:47 | 13 06:23 (WEA 10) 21:31 | 15 06:25 (WEA 10) | | | | |
| 6 08:25 | 09:06 (WEA 14) 07:50 | 09:00 (WEA 13) 06:54 | 07:30 (WEA 12) 06:42 | 07:12 (WEA 11) 05:39 | 06:07 (WEA 10) 04:59 | 14 06:11 (WEA 10) | | | | |
| 16:21 | 46 11:48 (WEA 16) 17:12 | 38 09:38 (WEA 13) 18:04 | 31 08:01 (WEA 12) 19:58 | 23 07:35 (WEA 11) 20:49 | 17 06:24 (WEA 10) 21:32 | 14 06:25 (WEA 10) | | | | |
| 7 08:24 | 09:07 (WEA 14) 07:49 | 09:01 (WEA 13) 06:51 | 07:29 (WEA 12) 06:40 | 07:11 (WEA 11) 05:37 | 06:07 (WEA 10) 04:59 | 13 06:12 (WEA 10) | | | | |
| 16:22 | 43 11:47 (WEA 16) 17:14 | 36 09:37 (WEA 13) 18:06 | 32 08:01 (WEA 12) 19:59 | 25 07:36 (WEA 11) 20:50 | 20 06:27 (WEA 10) 21:33 | 11 06:23 (WEA 10) | | | | |
| 8 08:24 | 09:07 (WEA 14) 07:47 | 09:01 (WEA 13) 06:49 | 07:28 (WEA 12) 06:38 | 07:10 (WEA 11) 05:36 | 06:05 (WEA 10) 04:58 | 12 06:14 (WEA 10) | | | | |
| 16:23 | 38 11:45 (WEA 16) 17:16 | 36 09:37 (WEA 13) 18:07 | 33 08:01 (WEA 12) 20:01 | 27 07:37 (WEA 11) 20:52 | 22 06:27 (WEA 10) 21:34 | 9 06:23 (WEA 10) | | | | |
| 9 08:23 | 09:07 (WEA 14) 07:45 | 09:02 (WEA 13) 06:47 | 07:28 (WEA 12) 06:36 | 07:08 (WEA 11) 05:34 | 06:04 (WEA 10) 04:58 | 10 06:15 (WEA 10) | | | | |
| 16:25 | 29 09:36 (WEA 14) 17:18 | 34 09:36 (WEA 13) 18:09 | 34 08:02 (WEA 12) 20:03 | 29 07:37 (WEA 11) 20:54 | 24 06:28 (WEA 10) 21:34 | 6 06:18 (WEA 10) | | | | |
| 10 08:23 | 09:08 (WEA 14) 07:43 | 09:03 (WEA 13) 06:45 | 07:27 (WEA 12) 06:33 | 07:07 (WEA 11) 05:32 | 06:03 (WEA 10) 04:57 | 11 06:19 (WEA 10) | | | | |
| 16:26 | 29 09:37 (WEA 14) 17:20 | 32 09:35 (WEA 13) 18:11 | 35 08:02 (WEA 12) 20:05 | 31 07:38 (WEA 11) 20:55 | 26 06:29 (WEA 10) 21:35 | 1 06:19 (WEA 10) | | | | |
| 11 08:22 | 09:08 (WEA 14) 07:41 | 09:04 (WEA 13) 06:42 | 07:26 (WEA 12) 06:31 | 07:07 (WEA 11) 05:31 | 06:02 (WEA 10) 04:57 | | | | | |
| 16:27 | 29 09:37 (WEA 14) 17:22 | 30 09:34 (WEA 13) 18:13 | 35 08:01 (WEA 12) 20:06 | 31 07:38 (WEA 11) 20:57 | 27 06:29 (WEA 10) 21:36 | | | | | |
| 12 08:21 | 09:08 (WEA 14) 07:40 | 09:05 (WEA 13) 06:40 | 07:03 (WEA 06) 06:29 | 07:06 (WEA 11) 05:29 | 06:02 (WEA 10) 04:57 | | | | | |
| 16:29 | 29 09:37 (WEA 14) 17:23 | 27 09:32 (WEA 13) 18:15 | 45 08:01 (WEA 12) 20:08 | 32 07:38 (WEA 11) 20:59 | 28 06:30 (WEA 10) 21:37 | | | | | |
| 13 08:21 | 09:06 (WEA 14) 07:38 | 09:08 (WEA 13) 06:38 | 07:01 (WEA 06) 06:27 | 07:05 (WEA 11) 05:27 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:30 | 31 09:37 (WEA 14) 17:25 | 23 09:31 (WEA 13) 18:16 | 48 08:01 (WEA 12) 20:10 | 32 07:37 (WEA 11) 21:00 | 29 06:30 (WEA 10) 21:37 | | | | | |
| 14 08:20 | 09:04 (WEA 14) 07:36 | 09:09 (WEA 13) 06:36 | 06:58 (WEA 06) 06:24 | 07:05 (WEA 11) 05:26 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:32 | 34 09:38 (WEA 14) 17:27 | 19 09:28 (WEA 13) 18:18 | 52 08:00 (WEA 12) 20:11 | 32 07:37 (WEA 11) 21:02 | 30 06:31 (WEA 10) 21:38 | | | | | |
| 15 08:19 | 09:03 (WEA 14) 07:34 | 09:01 (WEA 13) 06:33 | 06:56 (WEA 06) 06:22 | 07:05 (WEA 11) 05:24 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:33 | 35 09:38 (WEA 14) 17:29 | 18 09:25 (WEA 13) 18:20 | 53 07:59 (WEA 12) 20:13 | 32 07:37 (WEA 11) 21:03 | 29 06:30 (WEA 10) 21:39 | | | | | |
| 16 08:18 | 09:03 (WEA 14) 07:32 | 07:57 (WEA 07) 06:31 | 06:56 (WEA 06) 06:20 | 07:05 (WEA 11) 05:22 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:35 | 35 09:38 (WEA 14) 17:31 | 13 08:10 (WEA 07) 18:22 | 53 07:58 (WEA 12) 20:15 | 32 07:37 (WEA 11) 21:05 | 30 06:31 (WEA 10) 21:39 | | | | | |
| 17 08:17 | 09:02 (WEA 14) 07:30 | 07:55 (WEA 07) 06:29 | 06:54 (WEA 06) 06:18 | 07:05 (WEA 11) 05:21 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:37 | 36 09:38 (WEA 14) 17:33 | 17 08:12 (WEA 07) 18:23 | 52 07:56 (WEA 12) 20:17 | 31 07:36 (WEA 11) 21:06 | 30 06:31 (WEA 10) 21:40 | | | | | |
| 18 08:16 | 09:01 (WEA 14) 07:28 | 07:54 (WEA 07) 06:26 | 06:54 (WEA 06) 06:16 | 07:05 (WEA 11) 05:19 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:38 | 38 09:39 (WEA 14) 17:35 | 19 08:13 (WEA 07) 18:25 | 50 07:55 (WEA 12) 20:18 | 31 07:36 (WEA 11) 21:08 | 30 06:31 (WEA 10) 21:40 | | | | | |
| 19 08:15 | 09:01 (WEA 14) 07:26 | 07:53 (WEA 07) 06:24 | 06:54 (WEA 06) 06:13 | 07:06 (WEA 11) 05:18 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:40 | 38 09:39 (WEA 14) 17:36 | 21 08:14 (WEA 07) 18:27 | 47 07:54 (WEA 12) 20:20 | 29 07:35 (WEA 11) 21:09 | 30 06:31 (WEA 10) 21:40 | | | | | |
| 20 08:14 | 09:01 (WEA 14) 07:24 | 07:52 (WEA 07) 06:22 | 06:53 (WEA 06) 06:11 | 07:06 (WEA 11) 05:17 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:42 | 38 09:39 (WEA 14) 17:38 | 23 08:15 (WEA 07) 18:29 | 43 07:51 (WEA 12) 20:22 | 28 07:34 (WEA 11) 21:11 | 30 06:31 (WEA 10) 21:41 | | | | | |
| 21 08:13 | 09:00 (WEA 14) 07:22 | 07:52 (WEA 07) 06:19 | 06:54 (WEA 06) 06:09 | 07:07 (WEA 11) 05:15 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:43 | 38 09:38 (WEA 14) 17:40 | 24 08:16 (WEA 07) 18:30 | 37 07:48 (WEA 12) 20:23 | 26 07:33 (WEA 11) 21:12 | 29 06:30 (WEA 10) 21:41 | | | | | |
| 22 08:12 | 09:00 (WEA 14) 07:20 | 07:52 (WEA 07) 06:17 | 06:55 (WEA 06) 06:07 | 07:08 (WEA 11) 05:14 | 06:01 (WEA 10) 04:56 | | | | | |
| 16:45 | 38 09:38 (WEA 14) 17:42 | 24 08:16 (WEA 07) 18:32 | 25 07:43 (WEA 12) 20:25 | 23 07:31 (WEA 11) 21:14 | 29 06:30 (WEA 10) 21:41 | | | | | |
| 23 08:11 | 09:00 (WEA 14) 07:18 | 07:51 (WEA 07) 06:15 | 06:55 (WEA 06) 06:05 | 07:09 (WEA 11) 05:13 | 06:02 (WEA 10) 04:56 | | | | | |
| 16:47 | 38 09:38 (WEA 14) 17:44 | 25 08:16 (WEA 07) 18:34 | 18 07:13 (WEA 06) 20:27 | 20 07:29 (WEA 11) 21:15 | 28 06:30 (WEA 10) 21:41 | | | | | |
| 24 08:10 | 08:59 (WEA 14) 07:16 | 07:51 (WEA 07) 06:12 | 06:56 (WEA 06) 06:03 | 07:11 (WEA 11) 05:11 | 06:02 (WEA 10) 04:57 | | | | | |
| 16:48 | 38 09:37 (WEA 14) 17:46 | 24 08:15 (WEA 07) 18:35 | 15 07:11 (WEA 06) 20:29 | 16 07:27 (WEA 11) 21:17 | 28 06:30 (WEA 10) 21:41 | | | | | |
| 25 08:08 | 08:59 (WEA 14) 07:13 | 07:51 (WEA 07) 06:10 | 06:59 (WEA 06) 06:01 | 07:14 (WEA 11) 05:10 | 06:02 (WEA 10) 04:57 | | | | | |
| 16:50 | 37 09:36 (WEA 14) 17:48 | 24 08:15 (WEA 07) 18:37 | 10 07:09 (WEA 06) 20:30 | 10 07:24 (WEA 11) 21:18 | 28 06:30 (WEA 10) 21:41 | | | | | |
| 26 08:07 | 08:58 (WEA 14) 07:11 | 07:51 (WEA 07) 06:08 | 06:59 (WEA 06) 06:01 | 07:15 (WEA 11) 05:11 | 06:03 (WEA 10) 04:57 | | | | | |
| 16:52 | 38 09:36 (WEA 14) 17:49 | 24 08:15 (WEA 07) 18:39 | 05:59 | 20:32 | 21:19 | 27 06:30 (WEA 10) 21:41 | | | | |
| 27 08:06 | 08:59 (WEA 14) 07:09 | 07:52 (WEA 07) 06:05 | 05:57 | 20:32 | 21:19 | 27 06:30 (WEA 10) 21:41 | | | | |
| 16:54 | 38 09:37 (WEA 14) 17:51 | 22 08:14 (WEA 07) 18:41 | 05:57 | 20:34 | 21:21 | 26 06:29 (WEA 10) 21:41 | | | | |
| 28 08:04 | 08:58 (WEA 14) 07:07 | 07:53 (WEA 07) 06:03 | 05:55 | 20:34 | 21:21 | 26 06:29 (WEA 10) 21:41 | | | | |
| 16:56 | 39 09:37 (WEA 14) 17:53 | 20 08:13 (WEA 07) 18:42 | 05:55 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 29 08:03 | 08:59 (WEA 14) 07:07 | 07:51 (WEA 07) 06:03 | 05:53 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 16:57 | 39 09:38 (WEA 14) 17:54 | 19 08:14 (WEA 07) 18:43 | 05:53 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 30 08:02 | 08:58 (WEA 14) 07:07 | 07:51 (WEA 07) 06:03 | 05:51 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 16:59 | 40 09:38 (WEA 14) 17:55 | 18 08:15 (WEA 07) 18:44 | 05:51 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 31 08:00 | 08:58 (WEA 14) 07:07 | 07:51 (WEA 07) 06:03 | 05:51 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| 17:01 | 40 09:38 (WEA 14) 17:56 | 17 08:16 (WEA 07) 18:45 | 05:51 | 20:35 | 21:22 | 25 06:29 (WEA 10) 21:41 | | | | |
| Sonnenscheinstunden | 258 | 277 | 367 | 416 | 486 | 500 | | | | |
| astr.max.mögl.Beschattung | 1204 | 768 | 901 | 572 | 710 | 132 | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | 0,25 | 0,29 | 0,37 | 0,45 | 0,40 | | | | |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | | | | |
| Reduktion Windrichtung | 0,56 | 0,59 | 0,65 | 0,71 | 0,72 | 0,72 | | | | |
| Gesamte Reduktion | 0,10 | 0,14 | 0,17 | 0,25 | 0,30 | 0,27 | | | | |
| Met.wahrsch.Beschattung | 116 | 105 | 157 | 140 | 213 | 35 | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d77 - Söllingen, Sonnenhof 1

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHEWIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe

226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|-------|--------|---------------------------|---------------------------|---------------------------|---------------------------|
| 1 | 05:00 | 05:37 | 06:13 (WEA 10) 06:27 | 07:05 (WEA 11) 07:16 | 07:41 (WEA 06) 07:10 | 08:32 (WEA 13) 08:02 |
| | 21:41 | 21:09 | 27 06:40 (WEA 10) 20:06 | 32 07:37 (WEA 11) 18:56 | 47 08:40 (WEA 12) 16:50 | 33 09:05 (WEA 13) 16:09 |
| 2 | 05:01 | 05:38 | 06:13 (WEA 10) 06:28 | 07:06 (WEA 11) 07:18 | 07:43 (WEA 06) 07:12 | 08:32 (WEA 13) 08:03 |
| | 21:40 | 21:07 | 26 06:39 (WEA 10) 20:04 | 31 07:37 (WEA 11) 18:54 | 42 08:40 (WEA 12) 16:48 | 33 09:05 (WEA 13) 16:09 |
| 3 | 05:01 | 05:40 | 06:14 (WEA 10) 06:30 | 07:06 (WEA 11) 07:19 | 08:05 (WEA 12) 07:14 | 08:31 (WEA 13) 08:04 |
| | 21:40 | 21:05 | 25 06:39 (WEA 10) 20:02 | 29 07:35 (WEA 11) 18:52 | 35 08:40 (WEA 12) 16:46 | 35 09:06 (WEA 13) 16:08 |
| 4 | 05:02 | 05:41 | 06:14 (WEA 10) 06:32 | 07:07 (WEA 11) 07:21 | 08:05 (WEA 12) 07:16 | 08:31 (WEA 13) 08:06 |
| | 21:40 | 21:03 | 24 06:38 (WEA 10) 19:59 | 27 07:34 (WEA 11) 18:49 | 35 08:40 (WEA 12) 16:44 | 36 09:07 (WEA 13) 16:07 |
| 5 | 05:03 | 05:43 | 06:15 (WEA 10) 06:33 | 07:07 (WEA 11) 07:23 | 08:05 (WEA 12) 07:18 | 08:30 (WEA 13) 08:07 |
| | 21:39 | 21:02 | 21 06:36 (WEA 10) 19:57 | 25 07:32 (WEA 11) 18:47 | 33 08:38 (WEA 12) 16:43 | 38 09:08 (WEA 13) 16:07 |
| 6 | 05:04 | 05:45 | 06:16 (WEA 10) 06:35 | 07:08 (WEA 11) 07:25 | 08:05 (WEA 12) 07:19 | 08:30 (WEA 13) 08:08 |
| | 21:39 | 21:00 | 20 06:36 (WEA 10) 19:55 | 23 07:31 (WEA 11) 18:45 | 33 08:38 (WEA 12) 16:41 | 38 09:08 (WEA 13) 16:06 |
| 7 | 05:05 | 05:46 | 06:18 (WEA 10) 06:37 | 07:09 (WEA 11) 07:26 | 08:06 (WEA 12) 07:21 | 08:30 (WEA 13) 08:10 |
| | 21:38 | 20:58 | 15 06:33 (WEA 10) 19:52 | 19 07:28 (WEA 11) 18:43 | 31 08:37 (WEA 12) 16:39 | 39 09:09 (WEA 13) 16:06 |
| 8 | 05:06 | 05:48 | 06:20 (WEA 10) 06:38 | 07:12 (WEA 11) 07:28 | 08:05 (WEA 12) 07:23 | 08:30 (WEA 13) 08:11 |
| | 21:37 | 20:56 | 11 06:31 (WEA 10) 19:50 | 14 07:26 (WEA 11) 18:40 | 30 08:35 (WEA 12) 16:37 | 39 09:09 (WEA 13) 16:06 |
| 9 | 05:07 | 05:49 | 06:40 | 07:18 (WEA 11) 07:30 | 08:06 (WEA 12) 07:25 | 08:30 (WEA 13) 08:12 |
| | 21:37 | 20:54 | 19:48 | 2 07:20 (WEA 11) 18:38 | 28 08:34 (WEA 12) 16:36 | 39 09:09 (WEA 13) 16:05 |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 08:08 (WEA 12) 07:27 | 08:30 (WEA 13) 08:13 |
| | 21:36 | 20:53 | 19:46 | 18:36 | 26 08:37 (WEA 12) 16:34 | 39 09:09 (WEA 13) 16:05 |
| 11 | 05:09 | 05:53 | 06:43 | 07:33 | 08:09 (WEA 12) 07:28 | 08:30 (WEA 13) 08:14 |
| | 21:35 | 20:51 | 19:43 | 18:34 | 33 08:42 (WEA 12) 16:33 | 40 09:10 (WEA 13) 16:05 |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 08:12 (WEA 12) 07:30 | 08:30 (WEA 13) 08:15 |
| | 21:34 | 20:49 | 19:41 | 18:31 | 33 08:45 (WEA 12) 16:31 | 40 09:10 (WEA 13) 16:05 |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 08:14 (WEA 12) 07:32 | 08:31 (WEA 13) 08:16 |
| | 21:33 | 20:47 | 19:39 | 18:29 | 29 08:45 (WEA 12) 16:30 | 39 09:10 (WEA 13) 16:05 |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 08:25 (WEA 12) 07:34 | 08:31 (WEA 13) 08:17 |
| | 21:32 | 20:45 | 19:36 | 18:27 | 21 08:46 (WEA 12) 16:28 | 39 09:10 (WEA 13) 16:05 |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 08:24 (WEA 12) 07:35 | 08:32 (WEA 13) 08:18 |
| | 21:31 | 20:43 | 19:34 | 18:25 | 23 08:47 (WEA 12) 16:27 | 38 09:10 (WEA 13) 16:05 |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 08:23 (WEA 12) 07:37 | 08:31 (WEA 13) 08:19 |
| | 21:30 | 20:41 | 19:32 | 18:23 | 24 08:47 (WEA 12) 16:25 | 38 09:09 (WEA 13) 16:05 |
| 17 | 05:16 | 06:02 | 06:53 | 07:43 | 08:23 (WEA 12) 07:39 | 08:32 (WEA 13) 08:20 |
| | 21:29 | 20:39 | 19:29 | 18:20 | 25 08:48 (WEA 12) 16:24 | 37 09:09 (WEA 13) 16:05 |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 08:22 (WEA 12) 07:41 | 08:33 (WEA 13) 08:21 |
| | 21:28 | 20:37 | 19:27 | 18:18 | 25 08:47 (WEA 12) 16:22 | 38 09:11 (WEA 13) 16:05 |
| 19 | 05:18 | 06:06 | 06:56 | 07:44 | 08:22 (WEA 12) 07:42 | 08:34 (WEA 13) 08:21 |
| | 21:27 | 20:35 | 17 07:33 (WEA 11) 19:24 | 14 07:58 (WEA 06) 18:16 | 25 08:47 (WEA 12) 16:21 | 38 09:12 (WEA 13) 16:06 |
| 20 | 05:19 | 06:07 | 06:58 | 07:42 | 08:22 (WEA 12) 07:44 | 08:35 (WEA 13) 08:22 |
| | 21:26 | 20:32 | 20 07:34 (WEA 11) 19:22 | 17 07:59 (WEA 06) 18:14 | 24 08:46 (WEA 12) 16:20 | 38 09:13 (WEA 13) 16:06 |
| 21 | 05:21 | 06:09 | 07:00 | 07:40 | 08:22 (WEA 12) 07:46 | 08:36 (WEA 13) 08:23 |
| | 21:25 | 20:30 | 23 07:36 (WEA 11) 19:20 | 20 08:00 (WEA 06) 18:12 | 24 08:46 (WEA 12) 16:19 | 38 09:14 (WEA 13) 16:06 |
| 22 | 05:22 | 06:10 | 07:01 | 07:39 | 08:23 (WEA 12) 07:47 | 08:37 (WEA 13) 08:23 |
| | 21:23 | 20:28 | 25 07:36 (WEA 11) 19:17 | 34 08:32 (WEA 12) 18:10 | 22 08:45 (WEA 12) 16:18 | 38 09:15 (WEA 13) 16:07 |
| 23 | 05:23 | 06:12 | 07:03 | 07:38 | 08:24 (WEA 12) 07:49 | 08:37 (WEA 13) 08:24 |
| | 21:22 | 20:26 | 28 07:38 (WEA 11) 19:15 | 42 08:35 (WEA 12) 18:08 | 21 08:45 (WEA 12) 16:16 | 38 09:15 (WEA 13) 16:07 |
| 24 | 05:25 | 06:14 | 07:04 | 07:38 | 08:25 (WEA 12) 07:51 | 08:38 (WEA 13) 08:24 |
| | 21:21 | 20:24 | 30 07:39 (WEA 11) 19:13 | 46 08:37 (WEA 12) 18:06 | 18 08:43 (WEA 12) 16:15 | 38 09:16 (WEA 13) 16:08 |
| 25 | 05:26 | 06:15 | 07:06 | 07:37 | 08:26 (WEA 12) 07:52 | 08:40 (WEA 13) 08:24 |
| | 21:19 | 20:22 | 30 07:38 (WEA 11) 19:10 | 50 08:38 (WEA 12) 17:04 | 16 07:42 (WEA 12) 16:14 | 37 09:17 (WEA 13) 16:09 |
| 26 | 05:28 | 06:17 | 07:08 | 07:37 | 08:27 (WEA 12) 07:54 | 08:42 (WEA 13) 08:25 |
| | 21:18 | 20:20 | 31 07:39 (WEA 11) 19:08 | 52 08:39 (WEA 12) 17:02 | 12 07:40 (WEA 12) 16:13 | 35 09:17 (WEA 13) 16:09 |
| 27 | 05:29 | 06:19 | 07:09 | 07:37 | 08:28 (WEA 12) 07:56 | 08:42 (WEA 13) 08:25 |
| | 21:16 | 20:17 | 33 07:39 (WEA 11) 19:06 | 53 08:40 (WEA 12) 17:00 | 14 08:56 (WEA 13) 16:12 | 35 09:17 (WEA 13) 16:10 |
| 28 | 05:31 | 06:20 | 07:11 | 07:37 | 08:28 (WEA 12) 07:57 | 08:44 (WEA 13) 08:25 |
| | 21:15 | 20:15 | 33 07:39 (WEA 11) 19:03 | 53 08:40 (WEA 12) 16:58 | 20 08:58 (WEA 13) 16:12 | 34 09:18 (WEA 13) 16:11 |
| 29 | 05:32 | 06:22 | 07:13 | 07:38 | 08:29 (WEA 12) 07:59 | 08:47 (WEA 13) 08:25 |
| | 21:13 | 20:13 | 32 07:38 (WEA 11) 19:01 | 52 08:38 (WEA 12) 16:56 | 24 09:00 (WEA 13) 16:11 | 32 09:19 (WEA 13) 16:12 |
| 30 | 05:34 | 06:24 | 07:14 | 07:40 | 08:35 (WEA 12) 08:00 | 08:48 (WEA 13) 08:26 |
| | 21:12 | 20:11 | 32 07:38 (WEA 11) 18:59 | 50 08:41 (WEA 12) 16:54 | 27 09:02 (WEA 13) 16:10 | 30 09:18 (WEA 13) 16:13 |
| 31 | 05:35 | 06:25 | 07:15 | 07:08 | 08:33 (WEA 12) 07:08 | 08:33 (WEA 13) 08:26 |
| | 21:10 | 20:08 | 32 07:37 (WEA 11) 18:57 | 16:52 | 30 09:03 (WEA 13) 16:14 | 54 11:50 (WEA 14) 16:14 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | 679 | 546 | 693 | 830 | 1109 | 1573 |
| Red.Sonnenscheinwahrsch. | 0,42 | 0,44 | 0,37 | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | 0,72 | 0,71 | 0,67 | 0,63 | 0,57 | 0,56 |
| Gesamte Reduktion | 0,28 | 0,29 | 0,23 | 0,18 | 0,11 | 0,07 |
| Met.wahrsch.Beschattung | 190 | 161 | 160 | 150 | 124 | 111 |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d79 - Söllingen, Tongrubenweg 2

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429

Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|-------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:25 (WEA 12) | 07:59 | 08:43 (WEA 11) | 07:05 | 07:52 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 20 09:45 (WEA 12) | 17:03 | 26 09:09 (WEA 11) | 17:55 | 25 08:17 (WEA 10) | 19:49 | 20:41 | 21:27 | | | |
| 2 | 08:26 | 09:26 (WEA 12) | 07:57 | 08:44 (WEA 11) | 07:03 | 07:53 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 20 09:46 (WEA 12) | 17:05 | 24 09:08 (WEA 11) | 17:57 | 23 08:16 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:27 (WEA 12) | 07:55 | 08:44 (WEA 11) | 07:00 | 07:55 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 19 09:46 (WEA 12) | 17:07 | 24 09:08 (WEA 11) | 17:58 | 20 08:15 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:27 (WEA 12) | 07:54 | 08:45 (WEA 11) | 06:58 | 07:56 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 19 09:46 (WEA 12) | 17:08 | 23 09:08 (WEA 11) | 18:00 | 17 08:13 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:28 (WEA 12) | 07:52 | 08:46 (WEA 11) | 06:56 | 07:58 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 18 09:46 (WEA 12) | 17:10 | 21 09:07 (WEA 11) | 18:02 | 12 08:10 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:29 (WEA 12) | 07:50 | 08:47 (WEA 11) | 06:54 | 06:42 | 05:39 | 04:59 | | | | |
| | 16:21 | 17 09:46 (WEA 12) | 17:12 | 19 09:06 (WEA 11) | 18:04 | 19:58 | 20:49 | 21:32 | | | | |
| 7 | 08:24 | 09:30 (WEA 12) | 07:49 | 08:48 (WEA 11) | 06:52 | 06:40 | 05:37 | 04:59 | | | | |
| | 16:22 | 16 09:46 (WEA 12) | 17:14 | 17 09:05 (WEA 11) | 18:06 | 20:00 | 20:51 | 21:33 | | | | |
| 8 | 08:24 | 09:31 (WEA 12) | 07:47 | 08:50 (WEA 11) | 06:49 | 06:38 | 05:36 | 04:58 | | | | |
| | 16:23 | 14 09:45 (WEA 12) | 17:16 | 13 09:03 (WEA 11) | 18:07 | 20:01 | 20:52 | 21:34 | | | | |
| 9 | 08:23 | 09:33 (WEA 12) | 07:45 | 08:53 (WEA 11) | 06:47 | 06:35 | 05:34 | 04:58 | | | | |
| | 16:24 | 13 09:46 (WEA 12) | 17:18 | 6 08:59 (WEA 11) | 18:09 | 20:03 | 20:54 | 21:35 | | | | |
| 10 | 08:23 | 09:34 (WEA 12) | 07:43 | 06:45 | 06:45 | 06:33 | 05:32 | 04:57 | | | | |
| | 16:26 | 11 09:45 (WEA 12) | 17:20 | 18:11 | 18:11 | 20:05 | 20:55 | 21:35 | | | | |
| 11 | 08:22 | 09:36 (WEA 12) | 07:41 | 06:42 | 06:42 | 06:31 | 05:30 | 04:57 | | | | |
| | 16:27 | 7 09:43 (WEA 12) | 17:22 | 18:13 | 18:13 | 20:06 | 20:57 | 21:36 | | | | |
| 12 | 08:21 | 07:40 | 07:40 | 06:40 | 06:40 | 06:29 | 05:29 | 04:56 | | | | |
| | 16:29 | 17:23 | 17:23 | 18:15 | 18:15 | 20:08 | 20:59 | 21:37 | | | | |
| 13 | 08:21 | 07:38 | 07:38 | 06:38 | 06:38 | 06:27 | 05:27 | 04:56 | | | | |
| | 16:30 | 17:25 | 17:25 | 18:16 | 18:16 | 20:10 | 21:00 | 21:37 | | | | |
| 14 | 08:20 | 07:36 | 07:36 | 06:36 | 06:36 | 06:24 | 05:26 | 04:56 | | | | |
| | 16:32 | 17:27 | 17:27 | 18:18 | 18:18 | 20:12 | 21:02 | 21:38 | | | | |
| 15 | 08:19 | 07:34 | 07:34 | 06:33 | 06:33 | 06:22 | 05:24 | 04:56 | | | | |
| | 16:33 | 17:29 | 17:29 | 18:20 | 18:20 | 20:13 | 21:03 | 21:39 | | | | |
| 16 | 08:18 | 07:32 | 07:32 | 08:01 (WEA 10) | 06:31 | 06:20 | 05:22 | 04:56 | | | | |
| | 16:35 | 17:31 | 17:31 | 10 08:11 (WEA 10) | 18:22 | 20:15 | 21:05 | 21:39 | | | | |
| 17 | 08:17 | 07:30 | 07:30 | 07:59 (WEA 10) | 06:29 | 06:18 | 05:21 | 04:56 | | | | |
| | 16:37 | 17:33 | 17:33 | 15 08:14 (WEA 10) | 18:23 | 20:17 | 21:06 | 21:40 | | | | |
| 18 | 08:16 | 08:49 (WEA 11) | 07:28 | 07:57 (WEA 10) | 06:26 | 06:16 | 05:19 | 04:56 | | | | |
| | 16:38 | 7 08:56 (WEA 11) | 17:35 | 19 08:16 (WEA 10) | 18:25 | 20:18 | 21:08 | 21:40 | | | | |
| 19 | 08:15 | 08:47 (WEA 11) | 07:26 | 07:55 (WEA 10) | 06:24 | 06:13 | 05:18 | 04:56 | | | | |
| | 16:40 | 12 08:59 (WEA 11) | 17:36 | 22 08:17 (WEA 10) | 18:27 | 20:20 | 21:09 | 21:40 | | | | |
| 20 | 08:14 | 08:46 (WEA 11) | 07:24 | 07:54 (WEA 10) | 06:22 | 06:11 | 05:17 | 04:56 | | | | |
| | 16:41 | 15 09:01 (WEA 11) | 17:38 | 24 08:18 (WEA 10) | 18:29 | 20:22 | 21:11 | 21:41 | | | | |
| 21 | 08:13 | 08:44 (WEA 11) | 07:22 | 07:54 (WEA 10) | 06:19 | 06:09 | 05:15 | 04:56 | | | | |
| | 16:43 | 17 09:01 (WEA 11) | 17:40 | 25 08:19 (WEA 10) | 18:30 | 20:23 | 21:12 | 21:41 | | | | |
| 22 | 08:12 | 08:44 (WEA 11) | 07:20 | 07:53 (WEA 10) | 06:17 | 06:07 | 05:14 | 04:56 | | | | |
| | 16:45 | 19 09:03 (WEA 11) | 17:42 | 27 08:20 (WEA 10) | 18:32 | 20:25 | 21:14 | 21:41 | | | | |
| 23 | 08:11 | 08:44 (WEA 11) | 07:18 | 07:53 (WEA 10) | 06:15 | 06:05 | 05:13 | 04:56 | | | | |
| | 16:47 | 20 09:04 (WEA 11) | 17:44 | 27 08:20 (WEA 10) | 18:34 | 20:27 | 21:15 | 21:41 | | | | |
| 24 | 08:10 | 08:43 (WEA 11) | 07:16 | 07:52 (WEA 10) | 06:12 | 06:03 | 05:11 | 04:57 | | | | |
| | 16:48 | 22 09:05 (WEA 11) | 17:46 | 27 08:19 (WEA 10) | 18:35 | 20:29 | 21:17 | 21:41 | | | | |
| 25 | 08:09 | 08:43 (WEA 11) | 07:13 | 07:52 (WEA 10) | 06:10 | 06:01 | 05:10 | 04:57 | | | | |
| | 16:50 | 23 09:06 (WEA 11) | 17:48 | 27 08:19 (WEA 10) | 18:37 | 20:30 | 21:18 | 21:42 | | | | |
| 26 | 08:07 | 08:42 (WEA 11) | 07:11 | 07:52 (WEA 10) | 06:08 | 05:59 | 05:09 | 04:57 | | | | |
| | 16:52 | 24 09:06 (WEA 11) | 17:49 | 27 08:19 (WEA 10) | 18:39 | 20:32 | 21:19 | 21:42 | | | | |
| 27 | 08:06 | 08:43 (WEA 11) | 07:09 | 07:52 (WEA 10) | 06:05 | 05:57 | 05:08 | 04:58 | | | | |
| | 16:54 | 24 09:07 (WEA 11) | 17:51 | 27 08:19 (WEA 10) | 18:41 | 20:34 | 21:21 | 21:41 | | | | |
| 28 | 08:04 | 08:42 (WEA 11) | 07:07 | 07:53 (WEA 10) | 06:03 | 05:55 | 05:07 | 04:58 | | | | |
| | 16:56 | 25 09:07 (WEA 11) | 17:53 | 26 08:19 (WEA 10) | 18:42 | 20:35 | 21:22 | 21:41 | | | | |
| 29 | 08:03 | 08:43 (WEA 11) | 07:01 | 07:01 | 07:01 | 05:53 | 05:06 | 04:59 | | | | |
| | 16:57 | 25 09:08 (WEA 11) | 17:54 | 19:44 | 19:44 | 20:37 | 21:23 | 21:41 | | | | |
| 30 | 08:02 | 08:42 (WEA 11) | 06:58 | 06:58 | 06:58 | 05:51 | 05:05 | 04:59 | | | | |
| | 16:59 | 26 09:08 (WEA 11) | 17:55 | 19:46 | 19:46 | 20:39 | 21:24 | 21:41 | | | | |
| 31 | 08:00 | 08:43 (WEA 11) | 06:56 | 06:56 | 06:56 | 05:49 | 05:04 | 04:57 | | | | |
| | 17:01 | 26 09:09 (WEA 11) | 17:56 | 19:47 | 19:47 | 20:40 | 21:26 | 21:41 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 459 | | 476 | | 97 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,58 | | 0,62 | | 0,63 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,17 | | | | | | | |
| Met.wahrsch.Beschattung | 47 | | 70 | | 17 | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d79 - Söllingen, Tongrubenweg 2

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember |
|---------------------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1 | 05:00 21:41 | 05:37 21:09 | 06:27 20:06 | 07:16 18:56 | 07:10 16:50 | 08:02 16:09 |
| 2 | 05:01 21:40 | 05:38 21:07 | 06:28 20:04 | 07:18 18:54 | 07:12 16:48 | 08:03 16:08 |
| 3 | 05:01 21:40 | 05:40 21:05 | 06:30 20:02 | 07:19 18:52 | 07:14 16:46 | 08:04 16:08 |
| 4 | 05:02 21:40 | 05:41 21:04 | 06:32 19:59 | 07:21 18:49 | 07:16 16:44 | 08:06 16:07 |
| 5 | 05:03 21:39 | 05:43 21:02 | 06:33 19:57 | 07:23 18:47 | 07:18 16:43 | 08:07 16:07 |
| 6 | 05:04 21:39 | 05:44 21:00 | 06:35 19:55 | 07:25 18:45 | 07:19 16:41 | 08:08 16:06 |
| 7 | 05:05 21:38 | 05:46 20:58 | 06:37 19:53 | 07:26 18:43 | 07:21 16:39 | 08:10 16:06 |
| 8 | 05:06 21:37 | 05:48 20:56 | 06:38 19:50 | 07:28 18:40 | 07:23 16:37 | 08:11 16:06 |
| 9 | 05:07 21:37 | 05:49 20:54 | 06:40 19:48 | 07:30 18:38 | 07:25 16:36 | 08:12 16:05 |
| 10 | 05:08 21:36 | 05:51 20:53 | 06:42 19:46 | 07:31 18:36 | 07:27 16:34 | 08:13 16:05 |
| 11 | 05:09 21:35 | 05:52 20:51 | 06:43 19:43 | 07:33 18:34 | 07:28 16:33 | 08:14 16:05 |
| 12 | 05:10 21:34 | 05:54 20:49 | 06:45 19:41 | 07:35 18:31 | 07:30 16:31 | 08:15 16:05 |
| 13 | 05:11 21:33 | 05:56 20:47 | 06:46 19:39 | 07:37 18:29 | 07:32 16:29 | 08:16 16:05 |
| 14 | 05:12 21:33 | 05:57 20:45 | 06:48 19:36 | 07:38 18:27 | 07:34 16:28 | 08:17 16:05 |
| 15 | 05:13 21:32 | 05:59 20:43 | 06:50 19:34 | 07:40 18:25 | 07:35 16:27 | 08:18 16:05 |
| 16 | 05:14 21:31 | 06:01 20:41 | 06:51 19:32 | 07:42 18:22 | 07:37 16:25 | 08:19 16:05 |
| 17 | 05:16 21:29 | 06:02 20:39 | 06:53 19:29 | 07:44 18:20 | 07:39 16:24 | 08:20 16:05 |
| 18 | 05:17 21:28 | 06:04 20:37 | 06:55 19:27 | 07:45 18:18 | 07:41 16:22 | 08:21 16:05 |
| 19 | 05:18 21:27 | 06:05 20:35 | 06:56 19:24 | 07:47 18:16 | 07:42 16:21 | 08:21 16:06 |
| 20 | 05:19 21:26 | 06:07 20:32 | 06:58 19:22 | 07:49 18:14 | 07:44 16:20 | 08:22 16:06 |
| 21 | 05:21 21:25 | 06:09 20:30 | 07:00 19:20 | 07:51 18:12 | 07:46 16:19 | 08:23 16:06 |
| 22 | 05:22 21:23 | 06:10 20:28 | 07:01 19:17 | 07:52 18:10 | 07:47 16:18 | 08:23 16:07 |
| 23 | 05:23 21:22 | 06:12 20:26 | 07:03 19:15 | 07:54 18:08 | 07:49 16:16 | 08:24 16:07 |
| 24 | 05:25 21:21 | 06:14 20:24 | 07:04 19:13 | 07:56 18:06 | 07:51 16:15 | 08:24 16:08 |
| 25 | 05:26 21:19 | 06:15 20:22 | 07:06 19:10 | 06:58 17:04 | 07:52 16:14 | 08:25 16:09 |
| 26 | 05:28 21:18 | 06:17 20:20 | 07:08 19:08 | 06:59 17:02 | 07:54 16:13 | 08:25 16:09 |
| 27 | 05:29 21:16 | 06:19 20:17 | 07:09 19:06 | 07:01 17:00 | 07:56 16:12 | 08:25 16:10 |
| 28 | 05:31 21:15 | 06:20 20:15 | 07:11 19:03 | 07:03 16:58 | 07:57 16:12 | 08:25 16:11 |
| 29 | 05:32 21:13 | 06:22 20:13 | 07:13 19:01 | 07:05 16:56 | 07:59 16:11 | 08:26 16:12 |
| 30 | 05:34 21:12 | 06:24 20:11 | 07:14 18:59 | 07:07 16:54 | 08:00 16:10 | 08:26 16:13 |
| 31 | 05:35 21:10 | 06:25 20:08 | 07:08 16:52 | 07:08 16:52 | 16:10 | 08:26 16:13 |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 |
| astr.max.mögl.Beschattung | | | | 412 | 461 | 608 |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | 0,14 |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | 0,96 |
| Reduktion Windrichtung | | | | 0,63 | 0,59 | 0,57 |
| Gesamte Reduktion | | | | 0,19 | 0,12 | 0,07 |
| Met.wahrsch.Beschattung | | | | 77 | 55 | 45 |

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

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

Projekt:

**Söllingen
Landwind Planung GmbH & Co.KG**

**Watenstedter Str. 11
38384 Gevensleben**

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d80 - Söllingen, Tongrubenweg 3

Voraussetzungen für Berechnung des Schattenwurfs Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | Januar | | Februar | | März | | April | | Mai | | Juni | |
|---------------------------|--------|-------------------|---------|-------------------|----------------|-------------------|-------|-------|-------|--|------|--|
| 1 | 08:26 | 09:18 (WEA 12) | 07:59 | 08:36 (WEA 11) | 07:05 | 07:41 (WEA 10) | 06:54 | 05:49 | 05:03 | | | |
| | 16:15 | 23 09:41 (WEA 12) | 17:03 | 25 09:01 (WEA 11) | 17:55 | 29 08:10 (WEA 10) | 19:49 | 20:40 | 21:27 | | | |
| 2 | 08:26 | 09:18 (WEA 12) | 07:57 | 08:35 (WEA 11) | 07:03 | 07:42 (WEA 10) | 06:52 | 05:47 | 05:02 | | | |
| | 16:16 | 24 09:42 (WEA 12) | 17:05 | 26 09:01 (WEA 11) | 17:57 | 28 08:10 (WEA 10) | 19:51 | 20:42 | 21:28 | | | |
| 3 | 08:25 | 09:19 (WEA 12) | 07:55 | 08:35 (WEA 11) | 07:00 | 07:42 (WEA 10) | 06:49 | 05:45 | 05:01 | | | |
| | 16:17 | 23 09:42 (WEA 12) | 17:07 | 26 09:01 (WEA 11) | 17:58 | 28 08:10 (WEA 10) | 19:53 | 20:44 | 21:29 | | | |
| 4 | 08:25 | 09:19 (WEA 12) | 07:54 | 08:36 (WEA 11) | 06:58 | 07:42 (WEA 10) | 06:47 | 05:43 | 05:01 | | | |
| | 16:18 | 23 09:42 (WEA 12) | 17:08 | 26 09:02 (WEA 11) | 18:00 | 27 08:09 (WEA 10) | 19:54 | 20:46 | 21:30 | | | |
| 5 | 08:25 | 09:20 (WEA 12) | 07:52 | 08:36 (WEA 11) | 06:56 | 07:42 (WEA 10) | 06:45 | 05:41 | 05:00 | | | |
| | 16:19 | 23 09:43 (WEA 12) | 17:10 | 26 09:02 (WEA 11) | 18:02 | 26 08:08 (WEA 10) | 19:56 | 20:47 | 21:31 | | | |
| 6 | 08:25 | 09:20 (WEA 12) | 07:50 | 08:36 (WEA 11) | 06:54 | 07:43 (WEA 10) | 06:42 | 05:39 | 04:59 | | | |
| | 16:21 | 22 09:42 (WEA 12) | 17:12 | 26 09:02 (WEA 11) | 18:04 | 24 08:07 (WEA 10) | 19:58 | 20:49 | 21:32 | | | |
| 7 | 08:24 | 09:21 (WEA 12) | 07:49 | 08:37 (WEA 11) | 06:52 | 07:44 (WEA 10) | 06:40 | 05:37 | 04:59 | | | |
| | 16:22 | 22 09:43 (WEA 12) | 17:14 | 24 09:01 (WEA 11) | 18:06 | 22 08:06 (WEA 10) | 20:00 | 20:51 | 21:33 | | | |
| 8 | 08:24 | 09:22 (WEA 12) | 07:47 | 08:37 (WEA 11) | 06:49 | 07:44 (WEA 10) | 06:38 | 05:36 | 04:58 | | | |
| | 16:23 | 21 09:43 (WEA 12) | 17:16 | 23 09:00 (WEA 11) | 18:07 | 20 08:04 (WEA 10) | 20:01 | 20:52 | 21:34 | | | |
| 9 | 08:23 | 09:23 (WEA 12) | 07:45 | 08:38 (WEA 11) | 06:47 | 07:46 (WEA 10) | 06:36 | 05:34 | 04:58 | | | |
| | 16:24 | 21 09:44 (WEA 12) | 17:18 | 22 09:00 (WEA 11) | 18:09 | 16 08:02 (WEA 10) | 20:03 | 20:54 | 21:35 | | | |
| 10 | 08:23 | 09:24 (WEA 12) | 07:43 | 08:39 (WEA 11) | 06:45 | 07:49 (WEA 10) | 06:33 | 05:32 | 04:57 | | | |
| | 16:26 | 19 09:43 (WEA 12) | 17:20 | 20 08:59 (WEA 11) | 18:11 | 10 07:59 (WEA 10) | 20:05 | 20:55 | 21:35 | | | |
| 11 | 08:22 | 09:24 (WEA 12) | 07:41 | 08:40 (WEA 11) | 06:42 | | 06:31 | 05:30 | 04:57 | | | |
| | 16:27 | 19 09:43 (WEA 12) | 17:22 | 17 08:57 (WEA 11) | 18:13 | | 20:06 | 20:57 | 21:36 | | | |
| 12 | 08:21 | 09:25 (WEA 12) | 07:40 | 08:43 (WEA 11) | 06:40 | | 06:29 | 05:29 | 04:56 | | | |
| | 16:29 | 18 09:43 (WEA 12) | 17:23 | 13 08:56 (WEA 11) | 18:15 | | 20:08 | 20:59 | 21:37 | | | |
| 13 | 08:21 | 09:26 (WEA 12) | 07:38 | 08:46 (WEA 11) | 06:38 | | 06:27 | 05:27 | 04:56 | | | |
| | 16:30 | 16 09:42 (WEA 12) | 17:25 | 7 08:53 (WEA 11) | 18:16 | | 20:10 | 21:00 | 21:37 | | | |
| 14 | 08:20 | 09:28 (WEA 12) | 07:36 | | 06:36 | | 06:24 | 05:26 | 04:56 | | | |
| | 16:32 | 13 09:41 (WEA 12) | 17:27 | | 18:18 | | 20:12 | 21:02 | 21:38 | | | |
| 15 | 08:19 | 09:29 (WEA 12) | 07:34 | | 06:33 | | 06:22 | 05:24 | 04:56 | | | |
| | 16:33 | 11 09:40 (WEA 12) | 17:29 | | 18:20 | | 20:13 | 21:03 | 21:39 | | | |
| 16 | 08:18 | 09:31 (WEA 12) | 07:32 | | 06:31 | | 06:20 | 05:22 | 04:56 | | | |
| | 16:35 | 8 09:39 (WEA 12) | 17:31 | | 18:22 | | 20:15 | 21:05 | 21:39 | | | |
| 17 | 08:17 | | 07:30 | | 06:29 | | 06:18 | 05:21 | 04:56 | | | |
| | 16:37 | | 17:33 | | 18:23 | | 20:17 | 21:06 | 21:40 | | | |
| 18 | 08:16 | | 07:28 | | 06:26 | | 06:16 | 05:19 | 04:56 | | | |
| | 16:38 | | 17:35 | | 18:25 | | 20:18 | 21:08 | 21:40 | | | |
| 19 | 08:15 | | 07:26 | | 06:24 | | 06:13 | 05:18 | 04:56 | | | |
| | 16:40 | | 17:36 | | 18:27 | | 20:20 | 21:09 | 21:40 | | | |
| 20 | 08:14 | | 07:24 | | 06:22 | | 06:11 | 05:17 | 04:56 | | | |
| | 16:41 | | 17:38 | | 18:29 | | 20:22 | 21:11 | 21:41 | | | |
| 21 | 08:13 | | 07:22 | | 06:19 | | 06:09 | 05:15 | 04:56 | | | |
| | 16:43 | | 17:40 | 12 | 08:03 (WEA 10) | 18:30 | 20:23 | 21:12 | 21:41 | | | |
| 22 | 08:12 | | 07:20 | | 06:17 | | 06:07 | 05:14 | 04:56 | | | |
| | 16:45 | | 17:42 | 16 | 08:05 (WEA 10) | 18:32 | 20:25 | 21:14 | 21:41 | | | |
| 23 | 08:11 | 08:44 (WEA 11) | 07:18 | | 06:15 | | 06:05 | 05:13 | 04:56 | | | |
| | 16:47 | 5 08:49 (WEA 11) | 17:44 | 20 | 08:07 (WEA 10) | 18:34 | 20:27 | 21:15 | 21:41 | | | |
| 24 | 08:10 | 08:40 (WEA 11) | 07:16 | | 06:12 | | 06:03 | 05:11 | 04:57 | | | |
| | 16:48 | 12 08:52 (WEA 11) | 17:46 | 23 | 08:08 (WEA 10) | 18:35 | 20:29 | 21:17 | 21:41 | | | |
| 25 | 08:09 | 08:39 (WEA 11) | 07:13 | | 06:10 | | 06:01 | 05:10 | 04:57 | | | |
| | 16:50 | 15 08:54 (WEA 11) | 17:48 | 25 | 08:09 (WEA 10) | 18:37 | 20:30 | 21:18 | 21:42 | | | |
| 26 | 08:07 | 08:38 (WEA 11) | 07:11 | | 06:08 | | 05:59 | 05:09 | 04:57 | | | |
| | 16:52 | 17 08:55 (WEA 11) | 17:49 | 26 | 08:09 (WEA 10) | 18:39 | 20:32 | 21:19 | 21:42 | | | |
| 27 | 08:06 | 08:37 (WEA 11) | 07:09 | | 06:05 | | 05:57 | 05:08 | 04:58 | | | |
| | 16:54 | 20 08:57 (WEA 11) | 17:51 | 27 | 08:10 (WEA 10) | 18:41 | 20:34 | 21:21 | 21:41 | | | |
| 28 | 08:04 | 08:36 (WEA 11) | 07:07 | | 06:03 | | 05:55 | 05:07 | 04:58 | | | |
| | 16:56 | 22 08:58 (WEA 11) | 17:53 | 27 | 08:10 (WEA 10) | 18:42 | 20:35 | 21:22 | 21:41 | | | |
| 29 | 08:03 | 08:36 (WEA 11) | | | 07:01 | | 05:53 | 05:06 | 04:59 | | | |
| | 16:57 | 23 08:59 (WEA 11) | | | 19:44 | | 20:37 | 21:23 | 21:41 | | | |
| 30 | 08:02 | 08:36 (WEA 11) | | | 06:58 | | 05:51 | 05:05 | 04:59 | | | |
| | 16:59 | 24 09:00 (WEA 11) | | | 19:46 | | 20:39 | 21:24 | 21:41 | | | |
| 31 | 08:00 | 08:36 (WEA 11) | | | 06:56 | | | 05:04 | | | | |
| | 17:01 | 25 09:01 (WEA 11) | | | 19:47 | | | 21:26 | | | | |
| Sonnenscheinstunden | 258 | | 277 | | 367 | | 416 | 486 | 500 | | | |
| astr.max.mögl.Beschattung | 469 | | 457 | | 230 | | | | | | | |
| Red.Sonnenscheinwahrsch. | 0,18 | | 0,25 | | 0,29 | | | | | | | |
| Reduktion Betriebsdauer | 0,96 | | 0,96 | | 0,96 | | | | | | | |
| Reduktion Windrichtung | 0,58 | | 0,61 | | 0,64 | | | | | | | |
| Gesamte Reduktion | 0,10 | | 0,15 | | 0,18 | | | | | | | |
| Met.wahrsch.Beschattung | 47 | | 66 | | 40 | | | | | | | |

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

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

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwass.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IOSchattenrezeptor: IO d80 - Söllingen, Tongrubenweg 3

Voraussetzungen für Berechnung des Schattenwurfs

Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]

Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsdauer je Sektor

N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
226 228 328 604 614 711 519 1.152 1.454 1.306 873 414 8.429
Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

| | July | August | September | Oktober | November | Dezember | |
|---------------------------|-------|--------|-----------|---------|------------------------|---------------------------|-------------------|
| 1 | 05:00 | 05:37 | 06:27 | 07:16 | 07:10 | 08:08 (WEA 11) 08:02 | |
| | 21:41 | 21:09 | 20:06 | 18:56 | 16:50 | 20 08:28 (WEA 11) 16:09 | |
| 2 | 05:01 | 05:38 | 06:28 | 07:18 | 07:12 | 08:07 (WEA 11) 08:03 | |
| | 21:40 | 21:07 | 20:04 | 18:54 | 16:48 | 22 08:29 (WEA 11) 16:08 | |
| 3 | 05:01 | 05:40 | 06:30 | 07:19 | 07:14 | 08:07 (WEA 11) 08:04 | |
| | 21:40 | 21:05 | 20:02 | 18:52 | 16:46 | 23 08:30 (WEA 11) 16:08 | |
| 4 | 05:02 | 05:41 | 06:32 | 07:21 | 07:16 | 08:06 (WEA 11) 08:06 | |
| | 21:40 | 21:04 | 19:59 | 18:49 | 16:44 | 25 08:31 (WEA 11) 16:07 | |
| 5 | 05:03 | 05:43 | 06:33 | 07:23 | 07:18 | 08:06 (WEA 11) 08:07 | |
| | 21:39 | 21:02 | 19:57 | 18:47 | 16:43 | 25 08:31 (WEA 11) 16:07 | |
| 6 | 05:04 | 05:44 | 06:35 | 07:25 | 07:19 | 08:06 (WEA 11) 08:08 | |
| | 21:39 | 21:00 | 19:55 | 18:45 | 16:41 | 26 08:32 (WEA 11) 16:06 | |
| 7 | 05:05 | 05:46 | 06:37 | 07:26 | 07:21 | 08:06 (WEA 11) 08:10 | |
| | 21:38 | 20:58 | 19:53 | 18:43 | 16:39 | 26 08:32 (WEA 11) 16:06 | |
| 8 | 05:06 | 05:48 | 06:38 | 07:28 | 07:23 | 08:06 (WEA 11) 08:11 | |
| | 21:37 | 20:56 | 19:50 | 18:40 | 16:37 | 26 08:32 (WEA 11) 16:06 | |
| 9 | 05:07 | 05:49 | 06:40 | 07:30 | 07:25 | 08:06 (WEA 11) 08:12 | |
| | 21:37 | 20:54 | 19:48 | 18:38 | 16:36 | 26 08:32 (WEA 11) 16:05 | |
| 10 | 05:08 | 05:51 | 06:42 | 07:31 | 07:27 | 08:06 (WEA 11) 08:13 | |
| | 21:36 | 20:53 | 19:46 | 18:36 | 16:34 | 26 08:32 (WEA 11) 16:05 | |
| 11 | 05:09 | 05:52 | 06:43 | 07:33 | 07:28 | 08:07 (WEA 11) 08:14 | |
| | 21:35 | 20:51 | 19:43 | 18:34 | 16:33 | 25 08:32 (WEA 11) 16:05 | |
| 12 | 05:10 | 05:54 | 06:45 | 07:35 | 07:30 | 08:08 (WEA 11) 08:15 | |
| | 21:34 | 20:49 | 19:41 | 18:31 | 16:31 | 24 08:32 (WEA 11) 16:05 | |
| 13 | 05:11 | 05:56 | 06:46 | 07:37 | 07:32 | 08:08 (WEA 11) 08:16 | |
| | 21:33 | 20:47 | 19:39 | 18:29 | 16:29 | 23 08:31 (WEA 11) 16:05 | |
| 14 | 05:12 | 05:57 | 06:48 | 07:38 | 07:34 | 08:09 (WEA 11) 08:17 | |
| | 21:33 | 20:45 | 19:36 | 18:27 | 16:28 | 22 08:31 (WEA 11) 16:05 | |
| 15 | 05:13 | 05:59 | 06:50 | 07:40 | 07:35 | 08:10 (WEA 11) 08:18 | |
| | 21:32 | 20:43 | 19:34 | 18:25 | 16:27 | 20 08:30 (WEA 11) 16:05 | |
| 16 | 05:14 | 06:01 | 06:51 | 07:42 | 07:37 | 08:12 (WEA 11) 08:19 | |
| | 21:31 | 20:41 | 19:32 | 18:22 | 16:25 | 17 08:29 (WEA 11) 16:05 | |
| 17 | 05:16 | 06:02 | 06:53 | 07:44 | 07:39 | 08:12 (WEA 11) 08:20 | |
| | 21:29 | 20:39 | 19:29 | 18:20 | 16:24 | 15 08:27 (WEA 11) 16:05 | |
| 18 | 05:17 | 06:04 | 06:55 | 07:45 | 07:41 | 08:14 (WEA 11) 08:21 | |
| | 21:28 | 20:37 | 19:27 | 18:18 | 16:22 | 12 08:26 (WEA 11) 16:05 | |
| 19 | 05:18 | 06:05 | 06:56 | 07:47 | 07:42 | 08:18 (WEA 11) 08:21 | |
| | 21:27 | 20:35 | 19:24 | 18:16 | 16:21 | 5 08:23 (WEA 11) 16:06 | |
| 20 | 05:19 | 06:07 | 06:58 | 07:49 | 07:44 | 08:22 (WEA 11) 08:22 | |
| | 21:26 | 20:32 | 19:22 | 18:14 | 16:20 | 16:06 | 24 09:36 (WEA 12) |
| 21 | 05:21 | 06:09 | 07:00 | 07:51 | 07:46 | 08:23 (WEA 11) 08:23 | |
| | 21:25 | 20:30 | 19:20 | 18:12 | 16:19 | 16:06 | 24 09:37 (WEA 12) |
| 22 | 05:22 | 06:10 | 07:01 | 07:52 | 07:47 | 08:23 (WEA 11) 08:23 | |
| | 21:23 | 20:28 | 19:17 | 18:10 | 16:18 | 16:07 | 24 09:37 (WEA 12) |
| 23 | 05:23 | 06:12 | 07:03 | 07:54 | 07:49 | 08:24 (WEA 11) 08:24 | |
| | 21:22 | 20:26 | 19:15 | 18:08 | 16:16 | 16:07 | 24 09:37 (WEA 12) |
| 24 | 05:25 | 06:14 | 07:04 | 07:56 | 07:51 | 08:24 (WEA 11) 08:24 | |
| | 21:21 | 20:24 | 19:13 | 18:06 | 16:15 | 16:08 | 24 09:38 (WEA 12) |
| 25 | 05:26 | 06:15 | 07:06 | 06:58 | 07:52 | 08:25 (WEA 11) 08:25 | |
| | 21:19 | 20:22 | 19:10 | 17:04 | 16:14 | 16:09 | 24 09:38 (WEA 12) |
| 26 | 05:28 | 06:17 | 07:08 | 06:59 | 07:54 | 09:11 (WEA 12) 08:25 | |
| | 21:18 | 20:20 | 19:08 | 17:02 | 16:13 | 7 09:18 (WEA 12) 16:09 | |
| 27 | 05:29 | 06:19 | 07:09 | 07:01 | 07:56 | 09:09 (WEA 12) 08:25 | |
| | 21:16 | 20:17 | 19:06 | 17:00 | 16:12 | 11 09:20 (WEA 12) 16:10 | |
| 28 | 05:31 | 06:20 | 07:11 | 07:03 | 07:57 | 09:08 (WEA 12) 08:25 | |
| | 21:15 | 20:15 | 19:03 | 16:58 | 16:12 | 13 09:21 (WEA 12) 16:11 | |
| 29 | 05:32 | 06:22 | 07:13 | 07:05 | 07:59 | 09:07 (WEA 12) 08:25 | |
| | 21:13 | 20:13 | 19:01 | 16:56 | 16:11 | 16 09:23 (WEA 12) 16:12 | |
| 30 | 05:34 | 06:24 | 07:14 | 07:07 | 08:00 | 09:06 (WEA 12) 08:26 | |
| | 21:12 | 20:11 | 18:59 | 16:54 | 16:10 | 18 09:24 (WEA 12) 16:13 | |
| 31 | 05:35 | 06:25 | 07:15 | 07:08 | 08:09 (WEA 11) 08:26 | | |
| | 21:10 | 20:08 | 18:57 | 16:52 | 16:10 | 18 08:27 (WEA 11) 16:13 | |
| Sonnenscheinstunden | 503 | 454 | 381 | 331 | 266 | 243 | |
| astr.max.mögl.Beschattung | | | | 453 | 473 | 718 | |
| Red.Sonnenscheinwahrsch. | | | | 0,31 | 0,21 | 0,14 | |
| Reduktion Betriebsdauer | | | | 0,96 | 0,96 | 0,96 | |
| Reduktion Windrichtung | | | | 0,63 | 0,59 | 0,57 | |
| Gesamte Reduktion | | | | 0,19 | 0,12 | 0,07 | |
| Met.wahrsch.Beschattung | | | | 84 | 57 | 53 | |

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

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

Projekt:

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Landwind Planung GmbH & Co.KG

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Lizenzierter Anwender:

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Andreas Schulze / gutachten@sowiwas.de

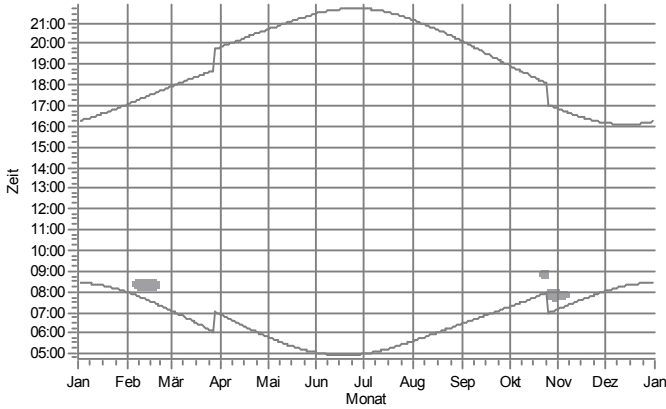
Berechnet:

17.11.2021 11:42/3.4.424

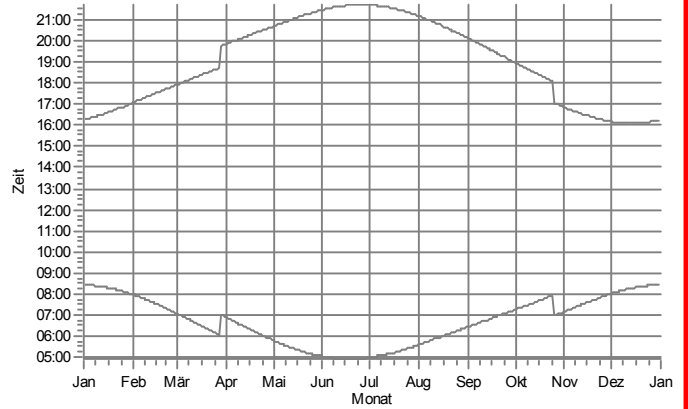
SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

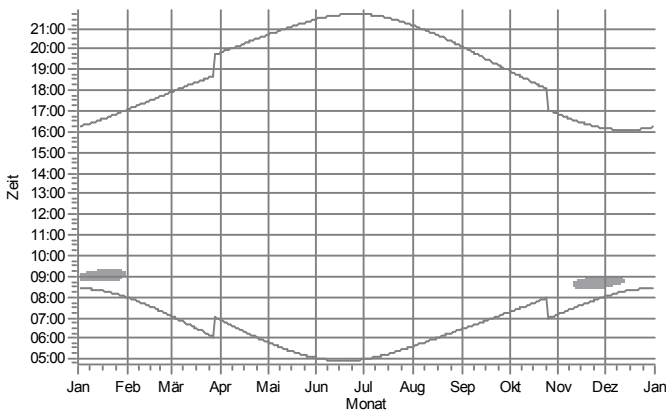
IO d01: Jerxheim, Am Pflingstgras 16



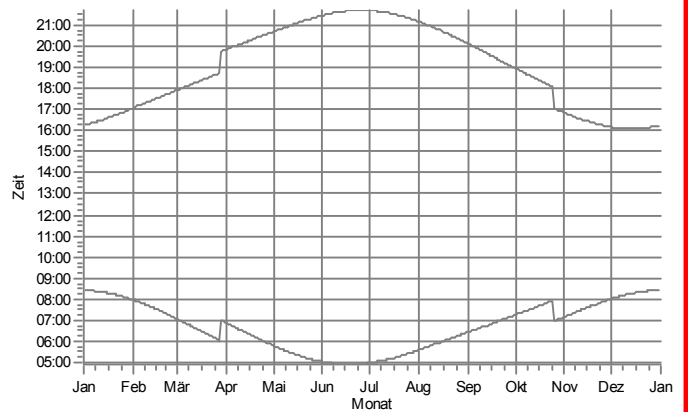
IO d02: Jerxheim, Halberstädter Str. 6B



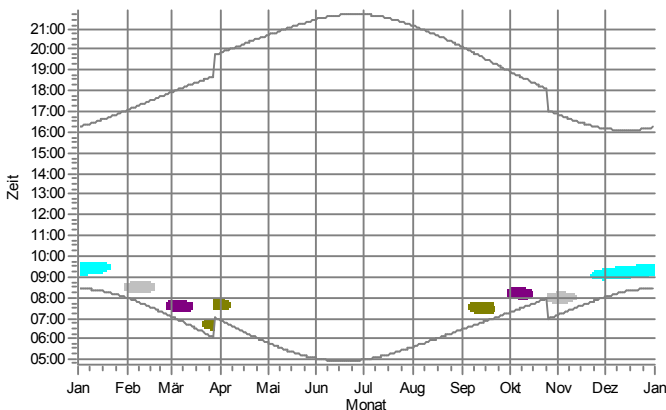
IO d03: Jerxheim, Helmstedter Str. 162



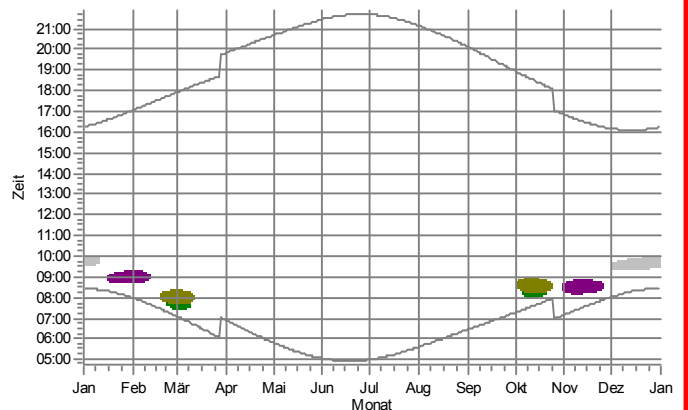
IO d04: Ohrleben, Wiesenweg 1



IO d08: Söllingen, An der Schäferei 5



IO d09: Söllingen, Bahnhofstraße 4



WEA

- WEA 01: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (409)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)
- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)

- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)
- WEA 16: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (424)

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

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38384 Gevensleben

Lizenzierter Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11

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+49 0 53 54 / 99 06 - 235

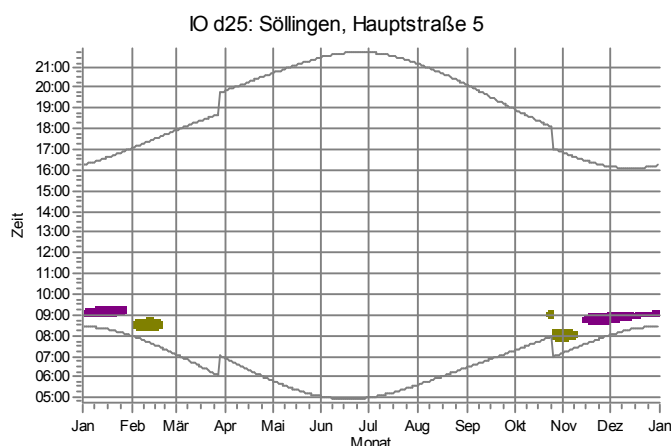
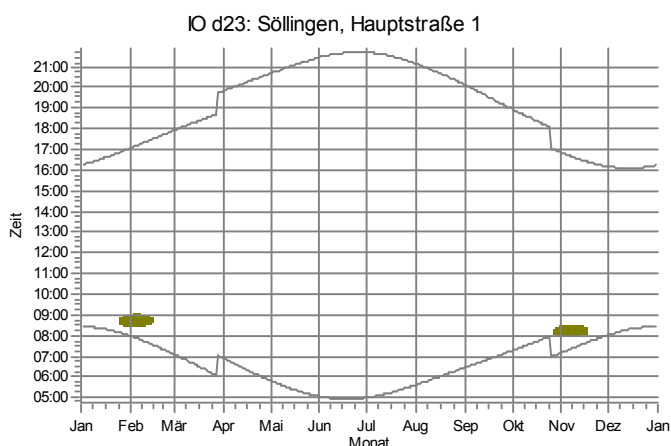
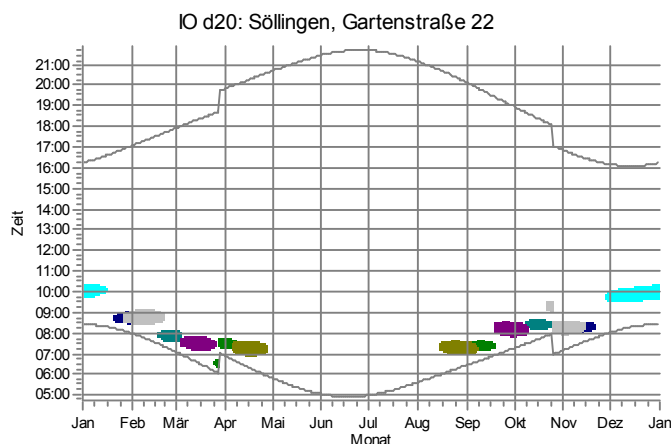
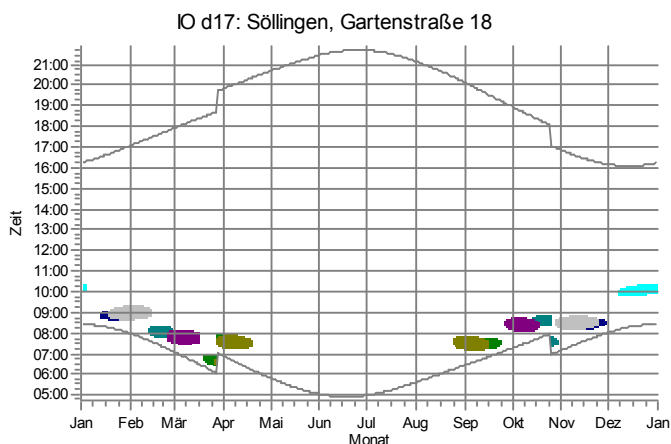
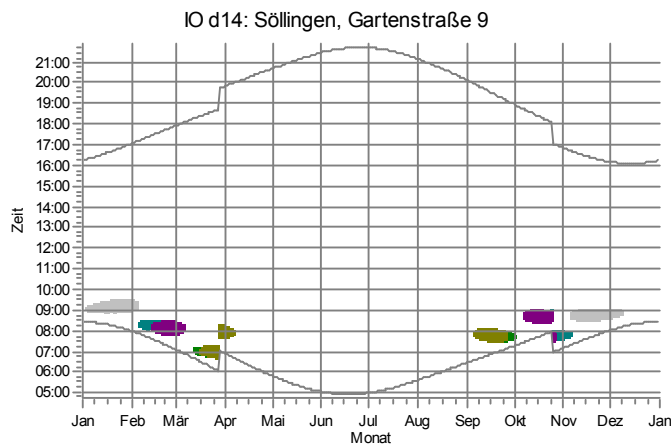
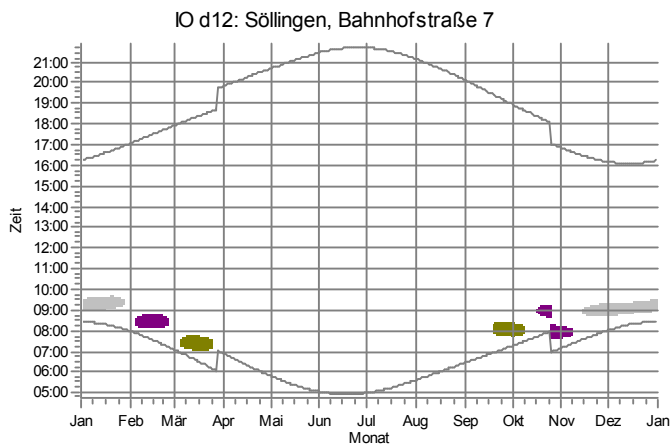
Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO



WEA

- WEA 01: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (409)
- WEA 06: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414)
- WEA 07: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (415)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)

- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)
- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)

Projekt:

Söllingen
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Lizenzierter Anwender:

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Andreas Schulze / gutachten@sowiwas.de

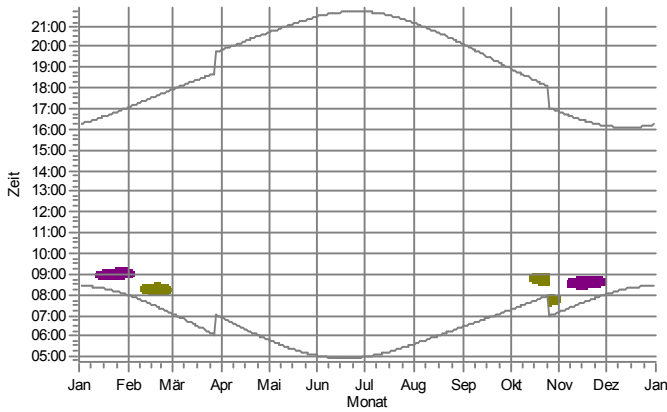
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17.11.2021 11:42/3.4.424

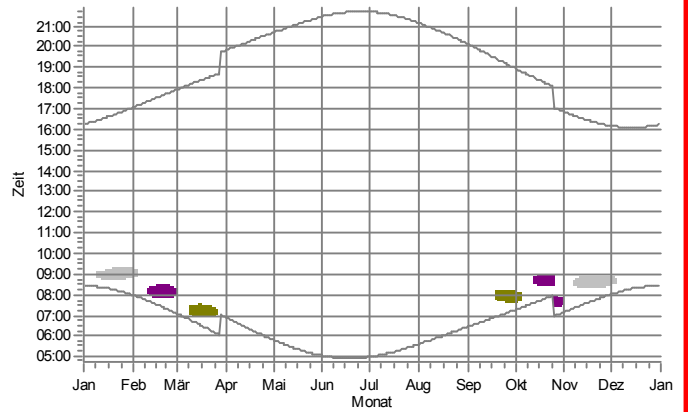
SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

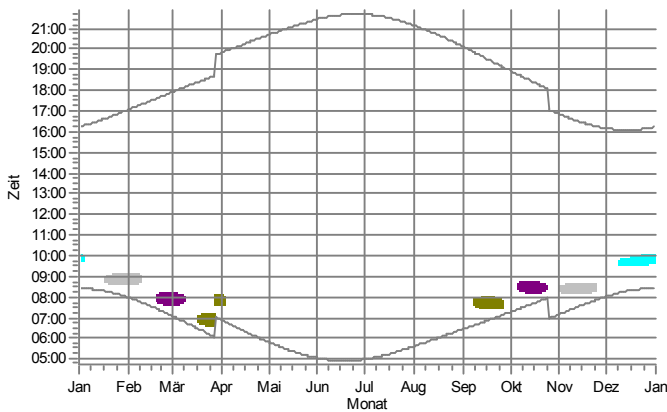
IO d28: Söllingen, Hauptstraße 12



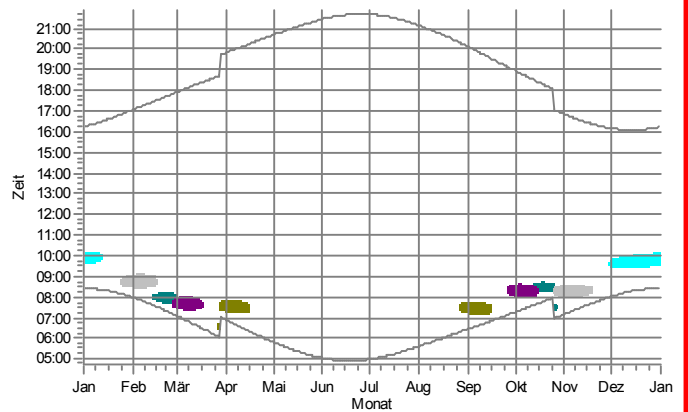
IO d32: Söllingen, Hauptstraße 24



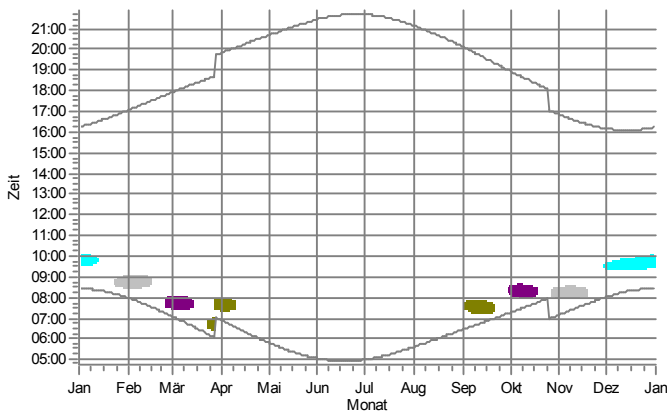
IO d35: Söllingen, Hauptstraße 30



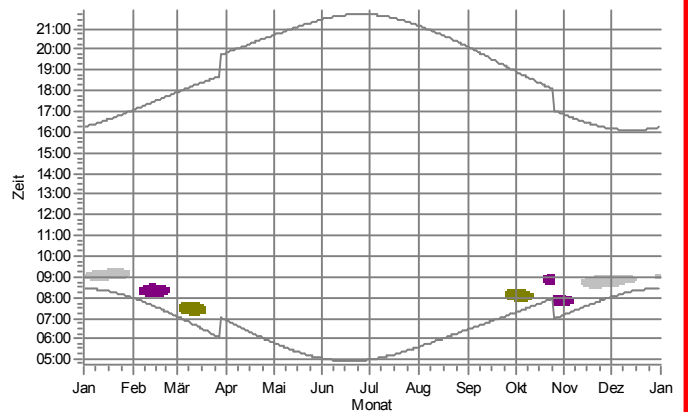
IO d37: Söllingen, Hauptstraße 36



IO d39: Söllingen, Hauptstraße 40



IO d40: Söllingen, Hauptstraße 52



WEA

- WEA 06: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)
- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)

- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)

Projekt:

Söllingen
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Lizenzierter Anwender:

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+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

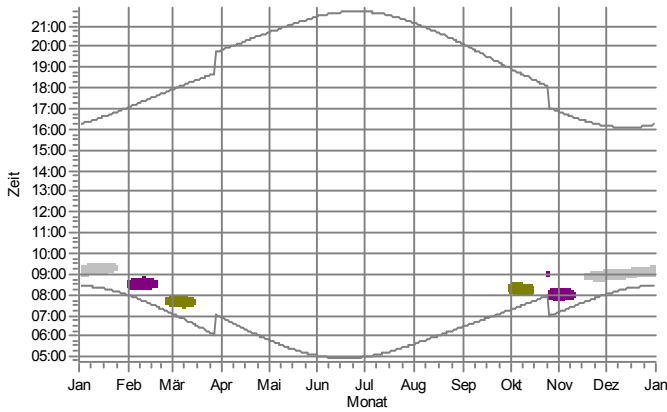
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17.11.2021 11:42/3.4.424

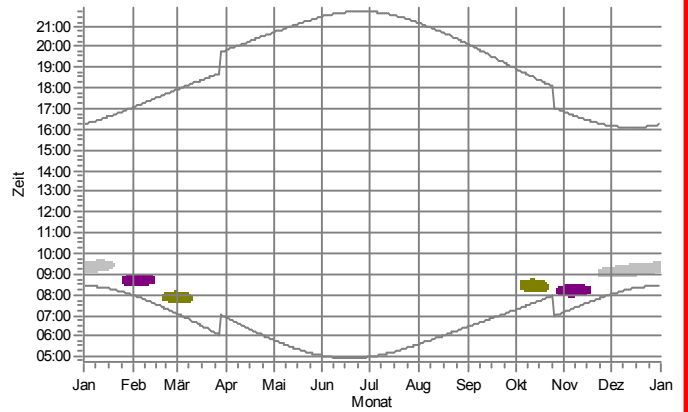
SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

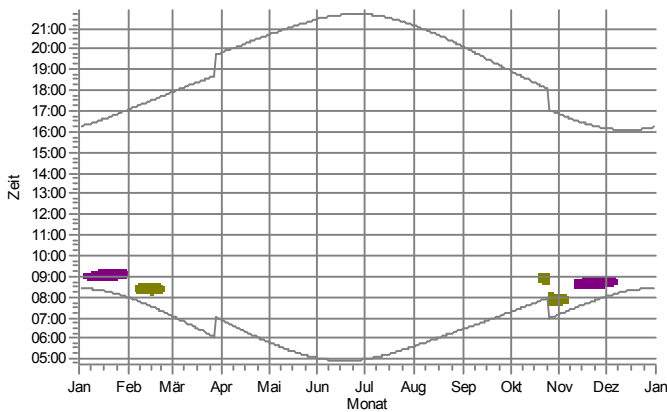
IO d42: Söllingen, Hauptstraße 56



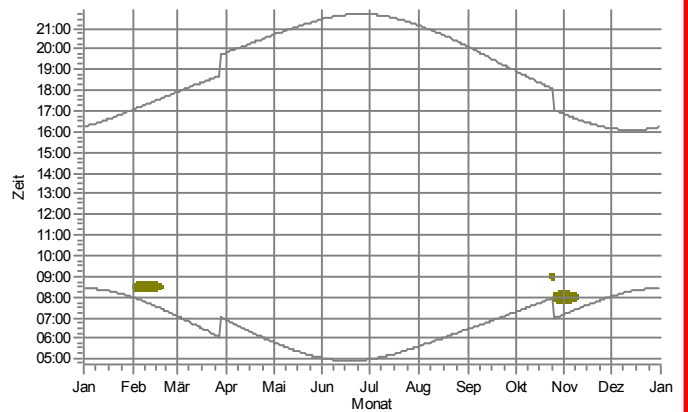
IO d44: Söllingen, Hauptstraße 60



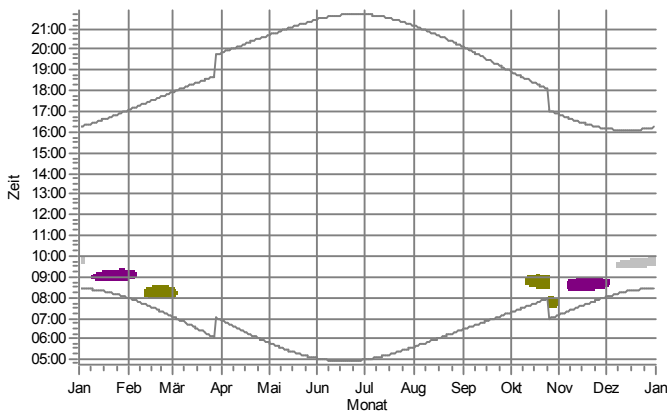
IO d45: Söllingen, Hauptstraße 70



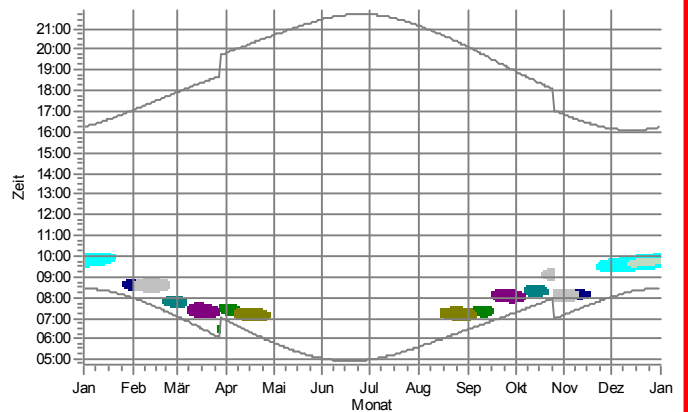
IO d46: Söllingen, Hauptstraße 72



IO d48: Söllingen, Mühlenhof 3



IO d51: Söllingen, Pabstorfer Weg 10



WEA

- WEA 01: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (409)
- WEA 06: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414)
- WEA 07: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (415)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)

- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)
- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)
- WEA 14: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (422)

Projekt:

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Landwind Planung GmbH & Co.KG

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Lizenzierter Anwender:

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DE-38384 Gevensleben
+49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

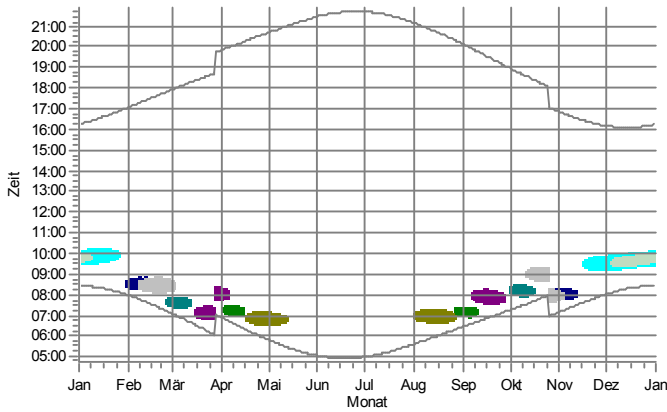
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17.11.2021 11:42/3.4.424

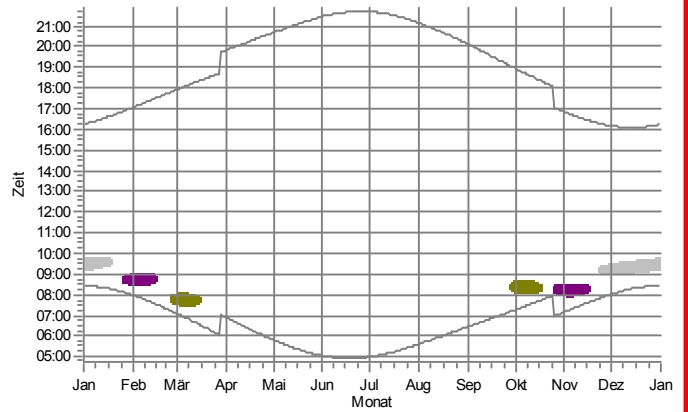
SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

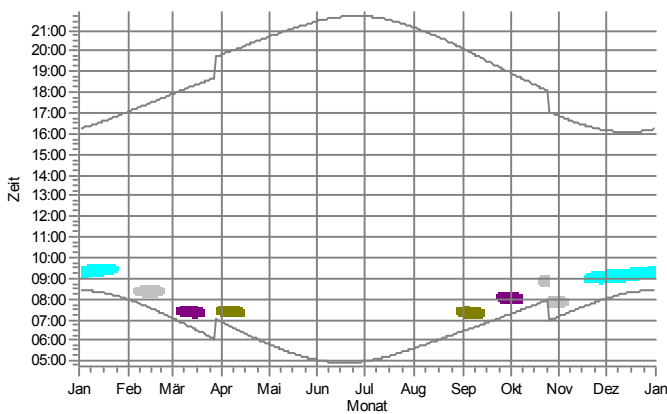
IO d54: Söllingen, Pabstorfer Weg 15



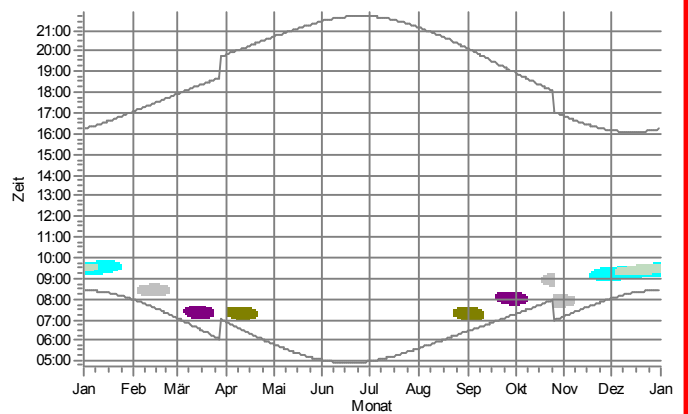
IO d56: Söllingen, Poststraße 4



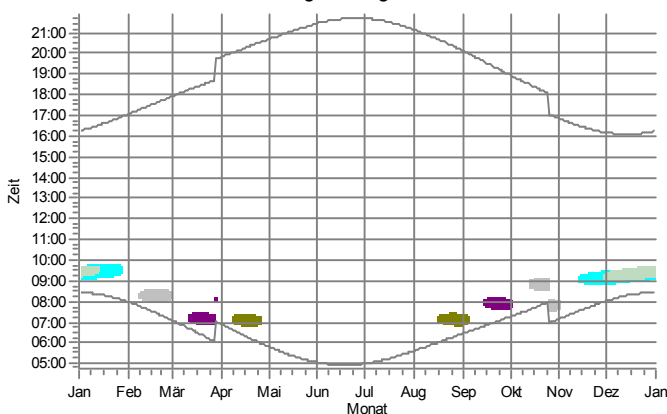
IO d57: Söllingen, Ringstraße 5



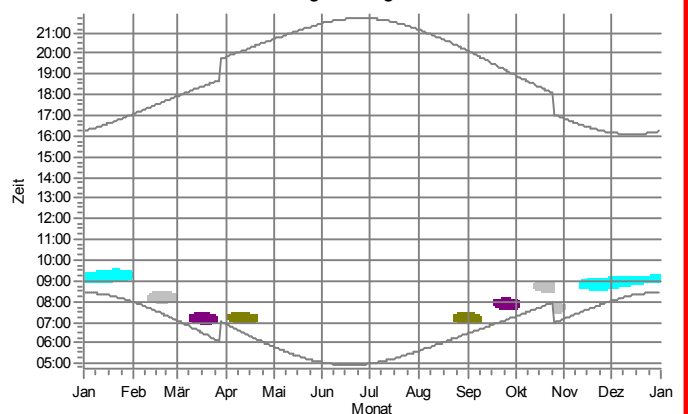
IO d60: Söllingen, Ringstraße 15



IO d61: Söllingen, Ringstraße 16



IO d63: Söllingen, Ringstraße 21



WEA

- WEA 01: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (409)
- WEA 06: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414)
- WEA 07: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (415)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)

- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)
- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)
- WEA 14: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (422)

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenzierter Anwender:

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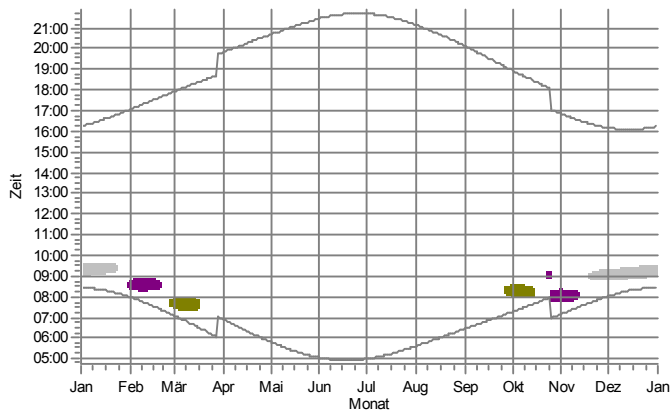
Berechnet:

17.11.2021 11:42/3.4.424

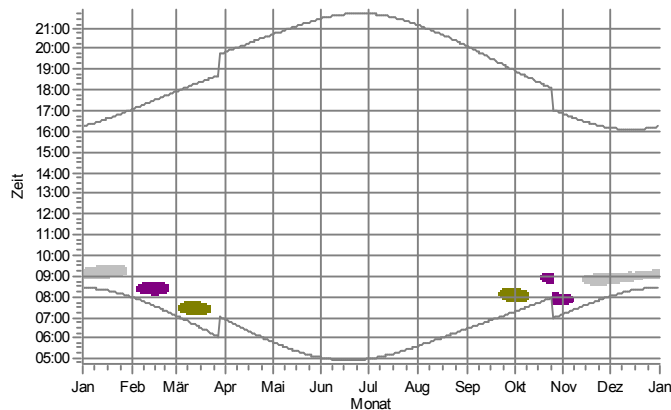
SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO

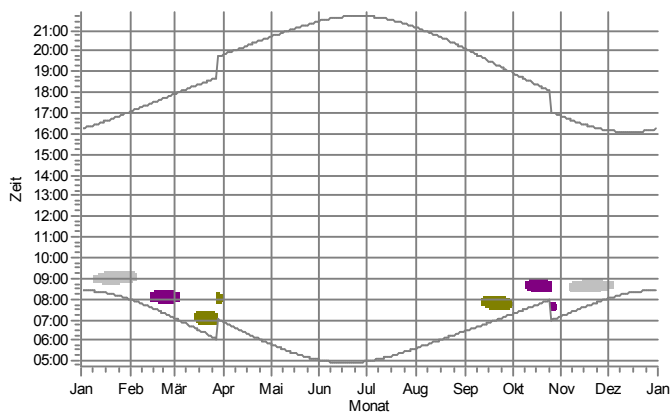
IO d67: Söllingen, Schulstraße 1



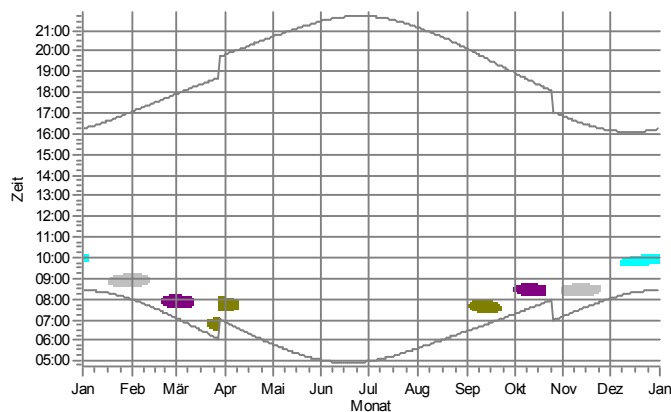
IO d69: Söllingen, Schulstraße 3



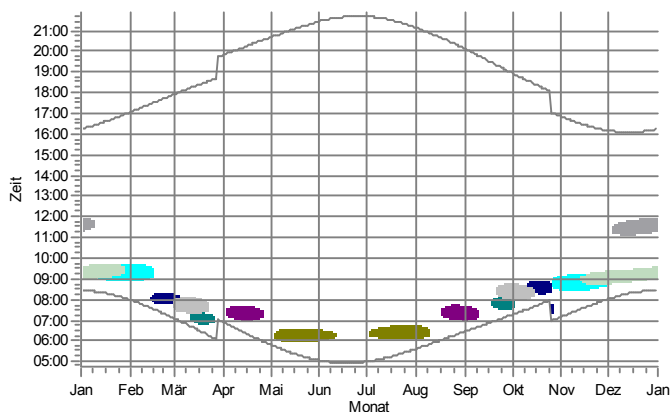
IO d71: Söllingen, Schulstraße 6



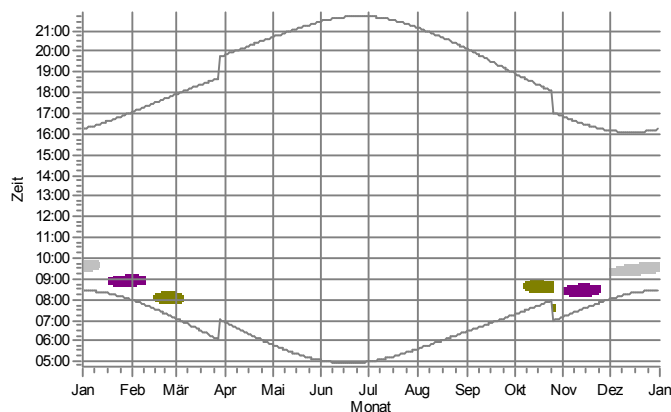
IO d75: Söllingen, Schulstraße 14



IO d77: Söllingen, Sonnenhof 1



IO d79: Söllingen, Tongrubenweg 2



WEA

- WEA 06: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414)
- WEA 07: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (415)
- WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)
- WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)

- WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)
- WEA 13: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (421)
- WEA 14: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (422)
- WEA 16: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (424)

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

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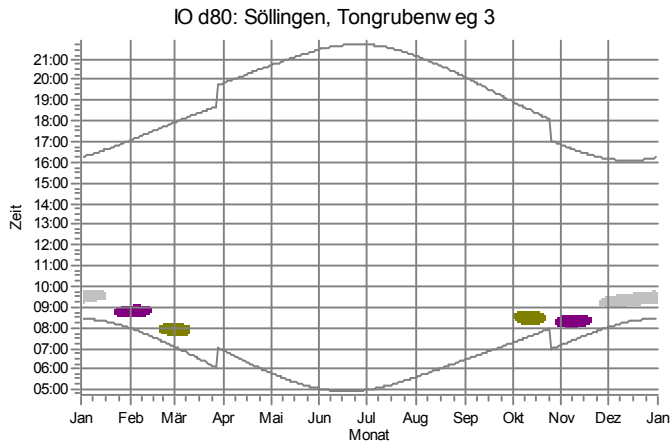
Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Grafischer Kalender

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO



WEA



WEA 10: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (418)

WEA 11: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (419)



WEA 12: NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (420)

Projekt:

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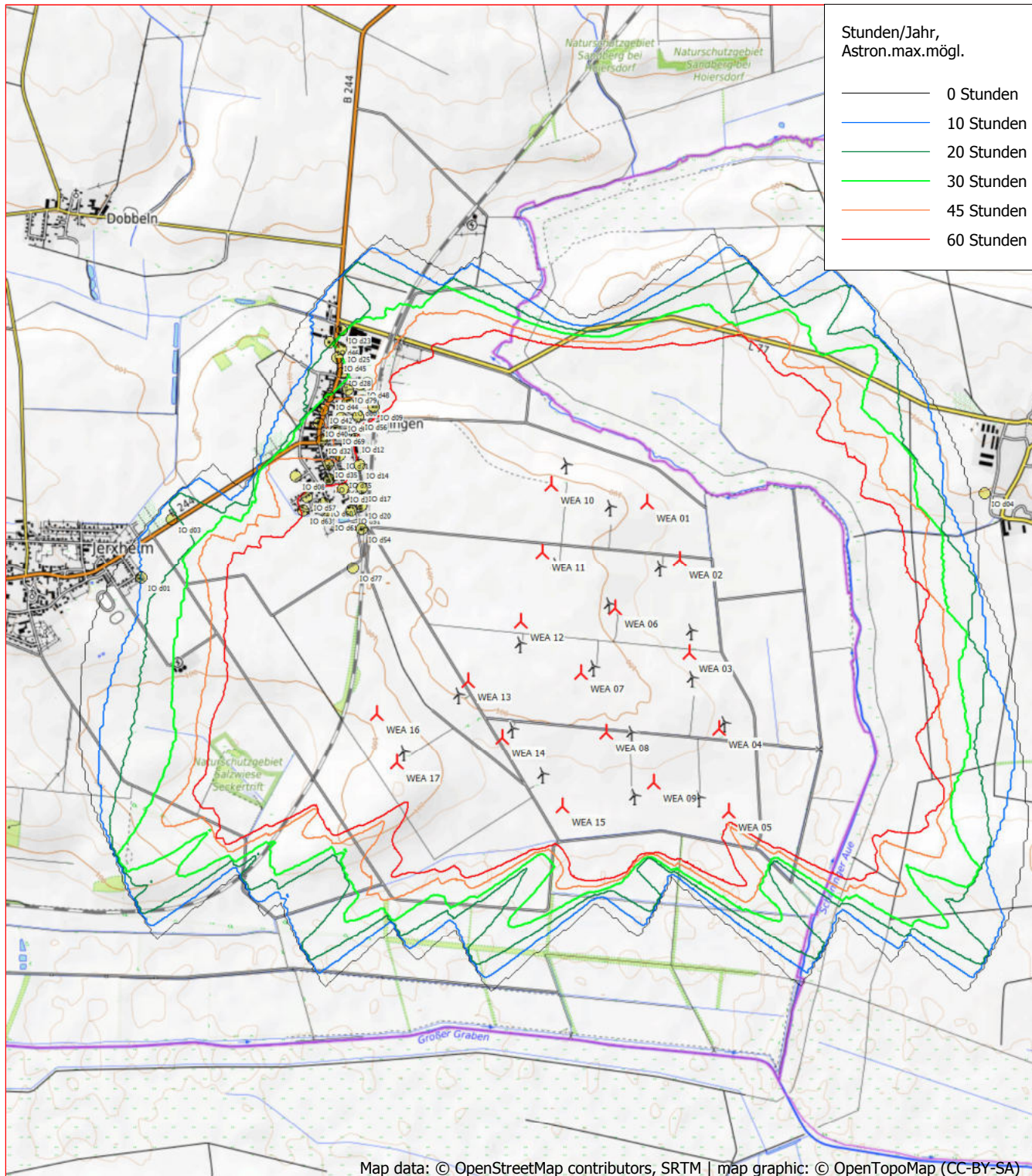
Andreas Schulze / gutachten@sowiwas.de

Berechnet:

17.11.2021 11:42/3.4.424

SHADOW - Karte

Berechnung: GB 17x N163 5,7MW, 202110, meteorologisch, 37 IO



0 500 1000 1500 2000 m

Karte: OpenTopoMap.org , Maßstab 1:35.000, Mitte: UTM (north)-WGS84 Zone: 32 Ost: 632.974 Nord: 5.771.920

⚡ Neue WEA

📍 Schattenrezeptor

Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (2)

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

Hauptergebnis

3 Seiten

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

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 Berechnet:
 22.11.2021 18:54/3.4.424

SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

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

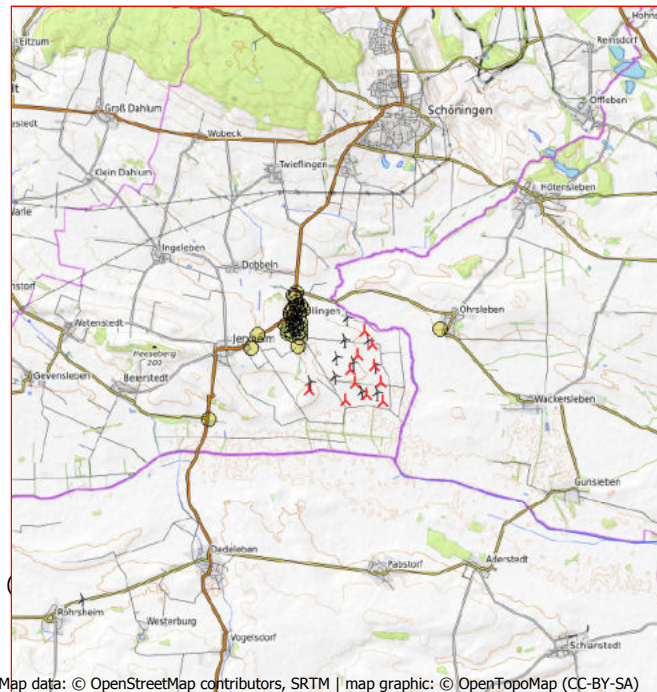
Sonnenscheinwahrscheinlichkeit S (Mittlere tägliche Sonnenstunden) [BRAUNSCHWEIG]
 Jan Feb Mär Apr Mai Jun Jul Aug Sep Okt Nov Dez
 1,53 2,47 3,43 5,17 7,00 6,63 6,76 6,51 4,71 3,31 1,88 1,07

Betriebsstunden ermittelt aus WEA in Berechnung und Windverteilung:
 Söllingen

Betriebsdauer je Sektor
 N NNO ONO O OSO SSO S SSW WSW W WNW NNW Summe
 226 228 329 604 613 711 519 1.152 1.454 1.305 872 414 8.428
 Startwindgeschwindigkeit: Startwindgeschw. aus Leistungskennlinie

Eine WEA wird nicht berücksichtigt, wenn sie von keinem Teil der Rezeptorfläche aus sichtbar ist. Die Sichtbarkeitsberechnung basiert auf den folgenden Annahmen:
 Verwendete Höhenlinien: HOHENLINIEN: CONTOURLINE_ONLINEDATA_0.wpo
 Hindernisse in Berechnung verwendet
 Berechnungshöhe ü.Gr. für Karte: 1,5 m
 Rasterauflösung: 1,0 m

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



Map data: © OpenStreetMap contributors, SRTM | map graphic: © OpenTopoMap (CC-BY-SA)

Maßstab 1:200.000

Neue WEA

Schattenrezeptor

WEA

| | Ost | Nord | Z | Beschreibung | WEA-Typ | | | Nennleistung | Rotor-durchmesser | Nabenhöhe | Schattendaten | |
|--------|---------|-----------|-------|-----------------------------|---------|------------|----------------|--------------|-------------------|-----------|-------------------|---------|
| | | | | | Aktuell | Hersteller | Typ | | | | Beschatt.-Bereich | U/min |
| | | | [m] | | | | | [kW] | [m] | [m] | [m] | [U/min] |
| WEA 01 | 633.817 | 5.772.562 | 94,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 02 | 634.022 | 5.772.222 | 87,5 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 03 | 634.097 | 5.771.663 | 86,6 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 04 | 634.287 | 5.771.215 | 88,4 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 05 | 634.358 | 5.770.716 | 81,4 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 06 | 633.641 | 5.771.919 | 97,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 07 | 633.447 | 5.771.526 | 104,6 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 08 | 633.609 | 5.771.171 | 98,3 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 09 | 633.904 | 5.770.878 | 88,1 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 15 | 633.359 | 5.770.720 | 83,9 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |
| WEA 17 | 632.355 | 5.770.957 | 105,0 | NORDEX N163/5.X 5700 1...Ja | | NORDEX | N163/5.X-5.700 | 5.700 | 163,0 | 164,0 | 1.784 | 10,7 |

Schattenrezeptor-Eingabe

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) | |
|--------|---------------------------------|---------|-----------|-------|--------|------|------------|----------------------|---------------------|-----------------|-----|
| | | | | | | | | | | ü.Gr. | [m] |
| IO d01 | Jerxheim, Am Pflingstgras 16 | 630.789 | 5.772.027 | 105,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d02 | Jerxheim, Halberstädter Str. 6B | 629.709 | 5.770.108 | 87,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d03 | Jerxheim, Helmstedter Str. 162 | 630.964 | 5.772.381 | 103,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d04 | Ohrsleben, Wiesenweg 1 | 635.847 | 5.772.667 | 100,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d08 | Söllingen, An der Schäferei 5 | 631.703 | 5.772.658 | 104,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d09 | Söllingen, Bahnhofstraße 4 | 632.158 | 5.773.086 | 98,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d12 | Söllingen, Bahnhofstraße 7 | 632.052 | 5.772.892 | 105,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d14 | Söllingen, Gartenstraße 9 | 632.082 | 5.772.738 | 104,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d17 | Söllingen, Gartenstraße 18 | 632.103 | 5.772.598 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d20 | Söllingen, Gartenstraße 22 | 632.104 | 5.772.495 | 103,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d23 | Söllingen, Hauptstraße 1 | 631.953 | 5.773.544 | 90,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d25 | Söllingen, Hauptstraße 5 | 631.953 | 5.773.432 | 92,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d28 | Söllingen, Hauptstraße 12 | 631.963 | 5.773.285 | 94,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |
| IO d32 | Söllingen, Hauptstraße 24 | 631.853 | 5.772.876 | 103,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 | |

(Fortsetzung nächste Seite)...

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

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Andreas Schulze / gutachten@sowiwass.de

Berechnet:

22.11.2021 18:54/3.4.424

SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

...(Fortsetzung von vorheriger Seite)

| Nr. | Name | Ost | Nord | Z | Breite | Höhe | Höhe ü.Gr. | Neigung des Fensters | Ausrichtungsmodus | Augenhöhe (ZVI) ü.Gr. |
|--------|------------------------------|---------|-----------|-------|--------|------|---------------|-------------------------|---------------------|--------------------------|
| | | | | [m] | [m] | [m] | [m] | [°] | | [m] |
| IO d35 | Söllingen, Hauptstraße 30 | 631.898 | 5.772.736 | 104,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d37 | Söllingen, Hauptstraße 36 | 631.989 | 5.772.594 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d39 | Söllingen, Hauptstraße 40 | 631.905 | 5.772.648 | 104,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d40 | Söllingen, Hauptstraße 52 | 631.830 | 5.772.982 | 99,9 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d42 | Söllingen, Hauptstraße 56 | 631.858 | 5.773.059 | 97,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d44 | Söllingen, Hauptstraße 60 | 631.892 | 5.773.140 | 95,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d45 | Söllingen, Hauptstraße 70 | 631.931 | 5.773.378 | 93,4 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d46 | Söllingen, Hauptstraße 72 | 631.885 | 5.773.470 | 92,4 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d48 | Söllingen, Mühlenhof 3 | 632.076 | 5.773.219 | 94,6 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d51 | Söllingen, Pabstorfer Weg 10 | 632.043 | 5.772.465 | 103,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d54 | Söllingen, Pabstorfer Weg 15 | 632.109 | 5.772.353 | 102,5 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d56 | Söllingen, Poststraße 4 | 632.065 | 5.773.026 | 101,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d57 | Söllingen, Ringstraße 5 | 631.772 | 5.772.539 | 104,1 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d60 | Söllingen, Ringstraße 15 | 631.874 | 5.772.502 | 103,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d61 | Söllingen, Ringstraße 16 | 631.903 | 5.772.422 | 103,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d63 | Söllingen, Ringstraße 21 | 631.751 | 5.772.458 | 103,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d67 | Söllingen, Schulstraße 1 | 631.966 | 5.773.014 | 100,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d69 | Söllingen, Schulstraße 3 | 631.937 | 5.772.940 | 102,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d71 | Söllingen, Schulstraße 6 | 631.963 | 5.772.790 | 104,8 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d75 | Söllingen, Schulstraße 14 | 631.981 | 5.772.678 | 104,2 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d77 | Söllingen, Sonnenhof 1 | 632.058 | 5.772.117 | 101,3 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d79 | Söllingen, Tongrubenweg 2 | 632.002 | 5.773.184 | 95,0 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |
| IO d80 | Söllingen, Tongrubenweg 3 | 632.003 | 5.773.111 | 95,7 | 0,1 | 0,1 | 2,0 | 0,0 | "Gewächshaus-Modus" | 2,0 |

Berechnungsergebnisse

Schattenrezeptor

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | | met. wahrsch. Beschattungsdauer | |
|--------|---------------------------------|--------------------------------------|-------------------|-----------------------|---------------------------------|--|
| | | Stunden/Jahr | Schattentage/Jahr | Max.Schattendauer/Tag | Stunden/Jahr | |
| | | [h/a] | [d/a] | [h/d] | [h/a] | |
| IO d01 | Jerxheim, Am Pfingstgras 16 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d02 | Jerxheim, Halberstädter Str. 6B | 0:00 | 0 | 0:00 | 0:00 | |
| IO d03 | Jerxheim, Helmstedter Str. 162 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d04 | Ohrleben, Wiesenweg 1 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d08 | Söllingen, An der Schäferlei 5 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d09 | Söllingen, Bahnhofstraße 4 | 7:38 | 28 | 0:22 | 1:22 | |
| IO d12 | Söllingen, Bahnhofstraße 7 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d14 | Söllingen, Gartenstraße 9 | 15:18 | 58 | 0:22 | 2:50 | |
| IO d17 | Söllingen, Gartenstraße 18 | 28:55 | 103 | 0:23 | 4:33 | |
| IO d20 | Söllingen, Gartenstraße 22 | 28:36 | 99 | 0:23 | 4:48 | |
| IO d23 | Söllingen, Hauptstraße 1 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d25 | Söllingen, Hauptstraße 5 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d28 | Söllingen, Hauptstraße 12 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d32 | Söllingen, Hauptstraße 24 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d35 | Söllingen, Hauptstraße 30 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d37 | Söllingen, Hauptstraße 36 | 7:27 | 29 | 0:21 | 1:16 | |
| IO d39 | Söllingen, Hauptstraße 40 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d40 | Söllingen, Hauptstraße 52 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d42 | Söllingen, Hauptstraße 56 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d44 | Söllingen, Hauptstraße 60 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d45 | Söllingen, Hauptstraße 70 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d46 | Söllingen, Hauptstraße 72 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d48 | Söllingen, Mühlenhof 3 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d51 | Söllingen, Pabstorfer Weg 10 | 26:05 | 93 | 0:23 | 4:32 | |
| IO d54 | Söllingen, Pabstorfer Weg 15 | 28:50 | 96 | 0:25 | 5:23 | |
| IO d56 | Söllingen, Poststraße 4 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d57 | Söllingen, Ringstraße 5 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d60 | Söllingen, Ringstraße 15 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d61 | Söllingen, Ringstraße 16 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d63 | Söllingen, Ringstraße 21 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d67 | Söllingen, Schulstraße 1 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d69 | Söllingen, Schulstraße 3 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d71 | Söllingen, Schulstraße 6 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d75 | Söllingen, Schulstraße 14 | 0:00 | 0 | 0:00 | 0:00 | |

(Fortsetzung nächste Seite)...

Projekt:

Söllingen
Landwind Planung GmbH & Co.KG

Watenstedter Str. 11
38384 Gevensleben

Lizenziertes Anwender:

SOWIWAS - Energie GmbH

Watenstedter Straße 11
 DE-38384 Gevensleben
 +49 0 53 54 / 99 06 - 235

Andreas Schulze / gutachten@sowiwas.de

Berechnet:

22.11.2021 18:54/3.4.424

SHADOW - Hauptergebnis

Berechnung: GB 17x N163 5,7MW, 202110, ohne 10-14 und 16

...(Fortsetzung von vorheriger Seite)

| Nr. | Name | astron. max. mögl. Beschattungsdauer | | | met. wahrsch. Beschattungsdauer | |
|--------|---------------------------|--------------------------------------|----------------------------|--------------------------------|---------------------------------|--|
| | | Stunden/Jahr [h/a] | Schattentage/Jahr [d/a] | Max.Schattendauer/Tag [h/d] | Stunden/Jahr [h/a] | |
| IO d77 | Söllingen, Sonnenhof 1 | 19:47 | 63 | 0:25 | 3:45 | |
| IO d79 | Söllingen, Tongrubenweg 2 | 0:00 | 0 | 0:00 | 0:00 | |
| IO d80 | Söllingen, Tongrubenweg 3 | 0:00 | 0 | 0:00 | 0:00 | |

Gesamtdauer Beschattung an Rezeptoren pro WEA

| Nr. | Name | Maximal [h/a] | Erwartet [h/a] |
|--------|--|------------------|-------------------|
| | | | |
| WEA 02 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (410) | 0:00 | 0:00 |
| WEA 03 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (411) | 0:00 | 0:00 |
| WEA 04 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (412) | 0:00 | 0:00 |
| WEA 05 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (413) | 0:00 | 0:00 |
| WEA 06 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (414) | 39:18 | 7:08 |
| WEA 07 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (415) | 41:18 | 5:48 |
| WEA 08 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (416) | 0:00 | 0:00 |
| WEA 09 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (417) | 0:00 | 0:00 |
| WEA 15 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (423) | 0:00 | 0:00 |
| WEA 17 | NORDEX N163/5.X 5700 163.0 !O! NH: 164,0 m (Ges:245,5 m) (425) | 0:00 | 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.

