

4.7 Sonstige Emissionen

Anlagen:

- BER_LQ13955.2_01.pdf

BERICHT ZUR SCHATTENWURF-UNTERSUCHUNG NR. LQ13955.2/01

zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen
im Vorrangstandort für Windenergiegewinnung "südlich Hörsten"
südöstlich von Fürstenau-Hollenstede

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- IMMISSIONSSCHUTZ**
- BAUPHYSIK**
- PRÜFLABORE**

Zusammenfassung

Die Windenergie Hollenstede 18 Planungsgesellschaft mbH plant im Bereich des Vorrangstandortes für Windenergiegewinnung "südlich Hörsten" (18-2013) südöstlich von Fürstenau-Hollenstede die Errichtung von vier Windenergieanlagen vom Typ Enercon E-138 EP3 E2 mit Trailing Edge Serrations (Hinterkanten-Verzahnungen) mit einer Nennleistung von jeweils 4.200 kW.

Im Rahmen des hierfür erforderlichen Genehmigungsverfahrens war zu prüfen und bewerten, welche Auswirkungen die geplanten Windenergieanlagen hinsichtlich der zu erwartenden Beschattungsdauer in der Nachbarschaft haben. Hierzu wurde die im vorliegenden Bericht dokumentierte schattenwurftechnische Untersuchung durchgeführt. Grundlage hierfür sind die "Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise)" des Länderausschusses für Immissionsschutz (LAI) sowie des Windenergieerlasses des Landes Niedersachsen.

Bei den Prognoseberechnungen wurde in Abstimmung mit dem Landkreis Osnabrück die Beschattungsgesamtbelastung durch alle insgesamt sieben von der Windenergie Hollenstede 17 Planungsgesellschaft mbH sowie der Windenergie Hollenstede 18 Planungsgesellschaft mbH geplanten Windenergieanlagen auf den Vorrangflächen 17 und 18 der Samtgemeinde Fürstenau in einer gemeinsamen Berechnung ermittelt.

Die vorliegende Untersuchung hat ergeben, dass durch den Betrieb der sieben geplanten Windenergieanlagen an den betrachteten Immissionspunkten südlich von Hollenstede Beeinträchtigungen durch periodischen Schattenwurf zu erwarten sind. Diese Bewertung beruht auf Berechnungen der astronomisch maximal möglichen Beschattungsdauer für die Gesamtbelastung.

Zur Einhaltung der Immissionsrichtwerte gemäß der WEA-Schattenwurf-Hinweise des Länderausschusses für Immissionsschutz (LAI) sowie des Windenergieerlasses des Landes Niedersachsen ist eine Minderung durch die gezielte Anlagenabschaltung für Zeiten real auftretenden oder astronomisch möglichen Schattenwurfs an den betreffenden Immissionsorten vorzunehmen. Die erforderlichen Einschränkungen der Nutzungszeit für die geplanten Windenergieanlagen wurden im Rahmen der gegenständlichen Untersuchungen rechnerisch ermittelt. Die entsprechenden Zeitparameter sind detailliert den Anlagen zu entnehmen.

Bei den ermittelten Beschattungszeiten handelt es sich um die astronomisch maximal möglichen Zeiten mit Beschattung. Durch Einsatz einer elektronischen Steuerung können die Einsatzzeiten der geplanten Windenergieanlagen ggf. verlängert werden, indem die Windenergieanlage durch die Steuerung nur dann außer Betrieb genommen wird, wenn zum einen eine unzulässige Beschattung eines Immissionspunktes zu erwarten ist und zum anderen auch tatsächlich eine bestimmte Lichtintensität - gemäß dem Länderausschuss für Immissionsschutz bei Sonneneinstrahlung auf der zur Einfallrichtung normalen Ebene von mehr als 120 W/m^2 - erreicht bzw. überschritten wird sowie die gemäß der WEA-Schattenwurf-Hinweise des Länderausschusses für Immissionsschutz (LAI) sowie des Windenergieerlasses des Landes Niedersachsen maximal zulässige Beschattungsdauer für den jeweils betroffenen Immissionspunkt in dem dann aktuellen Kalenderjahr bereits ausgeschöpft wurde.

Die ermittelte Beschattungsdauer an den betrachteten Immissionspunkten ist nur in der in dieser Untersuchung zu Grunde gelegten Konfiguration der geplanten Windenergieanlagen gültig. Eine Änderung der geografischen Daten, der Nabenhöhe und/oder des Anlagentyps erfordert eine Neuberechnung der Beschattungssituation.

Der nachfolgende Bericht wurde nach bestem Wissen und Gewissen mit größter Sorgfalt erstellt. Dieser Bericht besteht aus 24 Seiten und 10 Anlagen.

Lingen, den 19.12.2018 Wi/LR/wi (E)

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Messstelle nach § 29b BImSchG für
Geräusche, Erschütterungen
und Luftinhaltsstoffe
(Gruppen I (G, P) IV (P), V und VI)

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1 Situation und Aufgabenstellung

Die Windenergie Hollenstede 18 Planungsgesellschaft mbH plant im Bereich des Vorrangstandortes für Windenergiegewinnung "südlich Hörsten" (18-2013) südöstlich von Fürstenau-Hollenstede die Errichtung von vier Windenergieanlagen vom Typ Enercon E-138 EP3 E2 mit Trailing Edge Serrations (Hinterkanten-Verzahnungen) mit einer Nennleistung von jeweils 4.200 kW.

Im Rahmen des hierfür erforderlichen Genehmigungsverfahrens ist zu prüfen und bewerten, welche Auswirkungen die geplanten Windenergieanlagen hinsichtlich der zu erwartenden Beschattungsdauer in der Nachbarschaft haben. Grundlage hierfür sind die "Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise)" [2] des Länderausschusses für Immissionsschutz (LAI) sowie des Windenergieerlasses des Landes Niedersachsen [3].

Bei den Prognoseberechnungen wird in Abstimmung mit dem Landkreis Osnabrück [7] sowie dem projektbegleitenden Ingenieurbüro [6] die Beschattungsgesamtbelastung durch 3 von der Windenergie Hollenstede 17 Planungsgesellschaft mbH sowie durch 4 von der Windenergie Hollenstede 18 Planungsgesellschaft mbH geplanten Windenergieanlagen auf den Vorrangflächen 17 und 18 der Samtgemeinde Fürstenau in einer gemeinsamen Berechnung ermittelt.

Für den Fall, dass die schattenwurftechnischen Anforderungen des LAI [2] bzw. des Landes Niedersachsen [3] bei Betrieb der Windenergieanlagen nicht erfüllt werden, sind Angaben erforderlich, an welchen Tagen und zu welchen Uhrzeiten die geplanten Windenergieanlagen außer Betrieb genommen werden müssen, um diese Anforderungen einhalten zu können.

Der vorliegende gutachtliche Bericht dokumentiert die durchgeführten Untersuchungen sowie deren Ergebnisse und Beurteilungen.

2 Beurteilungsgrundlagen

Die Grundlage zur Ermittlung und zur Beurteilung des Schattenwurfes von Windenergieanlagen bildet im vorliegenden Fall der Windenergieerlass des niedersächsischen Ministeriums für Umwelt, Energie und Umweltschutz [3] in Verbindung mit den "Hinweisen zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise)" des Länderausschusses für Immissionsschutz (LAI) [2]. Neben dem Verfahren zur Ermittlung der Beschattungsdauer nennen die "WEA-Schattenwurf-Hinweise" [2] Immissionsrichtwerte, bei deren Einhaltung erhebliche Belästigungen durch periodischen Schattenwurf nicht vorliegen. Die Immissionsrichtwerte sind dabei unabhängig von der Gebietsnutzung und sind durch die Summe der Beschattungszeiten aller relevant einwirkenden Windenergieanlagen einzuhalten.

2.1 Allgemeine Hinweise

Durch die Bewegung des Rotorblattes wird bei Windenergieanlagen ein periodischer Wechsel von Licht und Schatten bewirkt. Dieser stellt eine qualitative Veränderung der natürlichen Lichtverhältnisse dar. Das Ausmaß dieser qualitativen Veränderung für die betroffene Nachbarschaft ist im Sinne des BImSchG [1] hinsichtlich schädlicher Umwelteinwirkungen zu prüfen.

Schattenwurf von geringer Dauer ist hinzunehmen bzw. kann vernachlässigt werden. Es muss jedoch sichergestellt sein, dass die im Kapitel 2.3 genannten Immissionsrichtwerte für die astronomisch maximal mögliche Beschattungsdauer nicht überschritten werden.

Die Einhaltung der Immissionsschutzanforderungen ist durch geeignete Maßnahmen zu gewährleisten, z. B. durch eine Abschaltautomatik, welche meteorologische Parameter (z. B. Intensität des Sonnenlichtes) berücksichtigt.

In den Anlagen sowie dem schriftlichen Teil dieser Untersuchung werden u. a. die folgenden Begriffe benutzt:

- Schattenrezeptor: Die verwendete Software zur Berechnung der Beschattungsdauer "WindPRO 3.0.654" [4] bezeichnet die Immissionspunkte nach [2] als Schattenrezeptoren.

- mittlere Blatttiefe: $Br_{\text{mittel}} = (0,5 \cdot (\text{maximale Blatttiefe})) + (0,5 \cdot (\text{Blatttiefe bei } 90 \% \text{ Rotorlänge}))$ in m
- Beschattungsbereich: Der Bereich, in dem durch einen Windenergieanlagentyp unter Berücksichtigung der mittleren Blatttiefe der Rotorblätter ein Schattenwurf zu erwarten ist.
 $Dist_{\text{max}} = (5 \cdot Br_{\text{mittel}} \cdot D) / K$ in m
mit
 - mittlerer Abstand zur Sonne: $D = 150.000.000$ km
 - Konstante: $K = 1.097.780$ km
- astronomisch maximal mögliche Beschattungsdauer (worst case): Die Zeit, in der die Sonne theoretisch während der gesamten Zeit zwischen Sonnenauf- und Sonnenuntergang durchgehend bei wolkenlosem Himmel scheint, die Rotorfläche senkrecht zur Sonneneinstrahlung steht und die Windenergieanlage in Betrieb ist [2].
- tatsächliche Beschattungsdauer: Die vor Ort real ermittelte und aufsummierte Einwirkzeit an periodischem Schattenwurf. Beträgt die Bestrahlungsstärke der direkten Sonneneinstrahlung auf der zur Einfallrichtung normalen Ebene mehr als 120 W/m^2 , so ist Sonnenschein mit Schattenwurf anzunehmen [2].
- meteorologisch wahrscheinliche Beschattungsdauer: Die Zeit, für die der Schattenwurf unter Berücksichtigung der üblichen Witterungsbedingungen berechnet wird. Als Grundlage dienen die langfristigen Messreihen des Deutschen Wetterdienstes (DWD) [2].
- Gültigkeit über mehrere Kalenderjahre: Da die Ergebnisse nicht nur für ein Jahr gültig sein sollen, wird in den Berechnungen die Tagesanzahl im Jahr auf 365,25 Tage gemittelt. Dadurch können sich die Ergebnisse innerhalb eines Zeitraums von vier Jahren um bis zu einem Tag verschieben. In der vorliegenden Untersuchung zum Schattenwurf wird das Jahr 2018 als Basisjahr berücksichtigt.

2.2 Immissionspunkte

Im Umfeld der geplanten Windenergieanlagen der Windenergie Hollenstede 17 Planungsgesellschaft mbH auf der Vorrangfläche 17 sowie der Windenergie Hollenstede 18 Planungsgesellschaft mbH auf der Vorrangfläche 18 befinden sich Räume, die gemäß den WEA-Schattenwurf-Hinweisen des Länderausschusses für Immissionsschutz [2] als schutzbedürftig gegenüber dem periodischen Schattenwurf durch Windenergieanlagen zu betrachten sind. In der Tabelle 1 sind die in der vorliegenden Untersuchung betrachteten Immissionspunkte zusammengefasst. Die Lage dieser Immissionspunkte kann der Anlage 2 entnommen werden.

Tabelle 1 Immissionsorte und deren geografischen Lagekoordinaten (Angaben in m)

Immissionspunkt	UTM-Koordinaten (ETRS89)	
	Rechtswert	Hochwert
IP 01 - Welperort 1	32.408.023	5.815.895
IP 02 - Welperort 4	32.408.004	5.815.689
IP 03 - Welperort 7	32.408.037	5.815.694
IP 04 - Welperort 7	32.408.176	5.815.560
IP 05 - Welperort 10	32.408.127	5.815.415
IP 06 - Welperort 14	32.408.060	5.815.099
IP 07 - Welperort 16	32.407.956	5.815.007
IP 08 - Welperort 24	32.407.901	5.814.722
IP 09 - Welperort 20	32.408.073	5.814.655
IP 10 - Welperort 19	32.408.243	5.814.763
IP 11a - Große Haar 2/Ost	32.409.747	5.814.699
IP 11b - Große Haar 2/West	32.409.739	5.814.703
IP 12a - Holle 10/Ost	32.409.875	5.814.923
IP 12b - Holle 10/West	32.409.862	5.814.922

<wird fortgesetzt>

Tabelle 1 Immissionsorte und deren geografischen Lagekoordinaten (Angaben in m)
<Fortsetzung>

Immissionspunkt	UTM-Koordinaten (ETRS89)	
	Rechtswert	Hochwert
IP 13a - Holle 9/Ost	32.409.951	5.815.066
IP 13b - Holle 9/West	32.409.935	5.815.068
IP 14a - Holle 7/Ost	32.409.993	5.815.141
IP 14b - Holle 7/West	32.409.973	5.815.144
IP 15a - Holle 5/Süd	32.409.998	5.815.387
IP 15b - Holle 5/West	32.409.993	5.815.391
IP 16 - Holle 2	32.409.628	5.815.875
IP 17a - Neuenstadt 25/Südost	32.408.902	5.815.894
IP 17b - Neuenstadt 25/Südwest	32.408.895	5.815.892
IP 18a - Neuenstadt 25A/Südost	32.408.874	5.815.875
IP 18b - Neuenstadt 25/Südwest	32.408.865	5.815.873
IP 19 - Holle 2/Südost	32.410.021	5.815.749
IP 20a - Zur Dasslage 1/Südost	32.410.263	5.815.503
IP 20b - Zur Dasslage 1/Südwest	32.410.252	5.815.511
IP 21a - Zur Dasslage 3/Südost	32.410.314	5.815.361
IP 21b - Zur Dasslage 3/Südwest	32.410.306	5.815.360
IP 22a - Zur Dasslage 4/Südost	32.410.459	5.814.851
IP 22b - Zur Dasslage 4/Nordwest	32.410.443	5.814.879
IP 23a - Große Haar 9/Nordwest	32.410.422	5.814.524
IP 23b - Große Haar 9/Südost	32.410.440	5.814.523
IP 24a - Große Haar 7/Nordwest	32.410.087	5.814.270
IP 24b - Große Haar 7/Südost	32.410.104	5.814.259

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Tabelle 1 Immissionsorte und deren geografischen Lagekoordinaten (Angaben in m)
<Fortsetzung>

Immissionspunkt	UTM-Koordinaten (ETRS89)	
	Rechtswert	Hochwert
IP 25a - Zur Daslage 7A/Nordwest	32.410.775	5.814.440
IP 25b - Zur Daslage 7A/Südost	32.410.781	5.814.432
IP 26a - Zur Daslage 7/Nordwest	32.410.761	5.814.431
IP 26b - Zur Daslage 7/Südost	32.410.771	5.814.414
IP 27a - Zur Daslage 7/Nordwest	32.410.754	5.814.366
IP 27b - Zur Daslage 8/Südost	32.410.766	5.814.351
IP 28a - Hörsten 6/Südost	32.411.258	5.814.900
IP 28b - Hörsten 6/West	32.411.246	5.814.895
IP 29a - Zur Daslage 6/Nordost	32.411.061	5.814.321
IP 29b - Zur Daslage 6/Südwest	32.411.075	5.814.304
IP 30a - Zur Daslage 11/Südost	32.410.863	5.814.106
IP 30b - Zur Daslage 11/Südwest	32.410.838	5.814.116
IP 31a - Zur Daslage 13/Nordwest	32.410.760	5.813.946
IP 31b - Zur Daslage 13/Südost	32.410.768	5.813.939
IP 32 - Große Harr 13	32.410.467	5.813.511
IP 33a - Große Haar 15/Nordost	32.410.668	5.813.352
IP 33b - Große Haar 15A/Südost	32.410.668	5.813.348
IP 34a - Große Haar 15/Nordost	32.410.670	5.813.317
IP 34b - Große Haar 15/Südost	32.410.672	5.813.315
IP 35 - Pius 24	32.410.703	5.812.756
IP 36 - Bruchstraße 6	32.412.091	5.813.109

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Tabelle 1 Immissionsorte und deren geografischen Lagekoordinaten (Angaben in m)
<Fortsetzung>

Immissionspunkt	UTM-Koordinaten (ETRS89)	
	Rechtswert	Hochwert
IP 37a - Bruchstraße 4/Nordwest	32.412.568	5.813.471
IP 37b - Bruchstraße 4/Südwest	32.412.566	5.813.464
IP 38 - Wielage 5	32.412.556	5.814.279
IP 39 - Wielage 4	32.412.724	5.814.455

In der vorliegenden Untersuchung zum Schattenwurf der geplanten Windenergieanlage werden nur relevante Immissionspunkte betrachtet, die sich innerhalb bzw. am Rand des Beschattungsbereichs mit zu erwartenden Überschreitungen der Immissionsrichtwerte gemäß [2; 3] durch den Betrieb der geplanten Windenergieanlagen (Anlagen 4.2 und 4.2) befinden.

"WEA-Schattenwurf-Hinweise " [2] gelten die folgenden Räume als schutzwürdig und damit als maßgebliche Immissionsorte:

- Wohnräume, einschließlich Wohndielen
- Schlafräume, einschließlich Übernachtungsräume in Beherbergungsstätten und Bettenräume in Krankenhäusern und Sanatorien
- Unterrichtsräume in Schulen, Hochschulen und ähnlichen Einrichtungen
- Büroräume, Praxisräume, Arbeitsräume, Schulungsräume und ähnliche Arbeitsräume

Küchenräume werden in [2] nicht explizit aufgeführt, sollten aber zumindest dann als schützenswert angesehen werden, wenn diese - z. B. Wohnküchen - als Wohnräume anzusehen sind.

Schützenswert sind auch direkt an Gebäude angrenzende Außenflächen wie Terrassen und Balkone, die in der Zeit von 06:00 Uhr bis 22:00 Uhr den o. g. Räumen gleichgestellt sind [2].

Unbebaute Flächen sind in einer Bezugshöhe von 2,0 m über Grund dann schützenswert, wenn auf ihnen nach Bau- oder Planungsrecht Gebäude mit schutzwürdigen Räumen zulässig sind [2].

2.3 Immissionsrichtwerte

Gemäß der WEA-Schattenwurf-Hinweise des Länderausschusses für Immissionsschutz [2] gelten für die in Kapitel 2.1 definierten schützenswerten Räume die folgenden Immissionsrichtwerte:

- Die astronomisch maximal mögliche Beschattungsdauer darf durch die Gesamtbelastung den Immissionsrichtwert von 30 Minuten pro Tag nicht überschreiten.
- Die astronomisch maximal mögliche Beschattungsdauer darf durch die Gesamtbelastung den Immissionsrichtwert von 30 Stunden pro Kalenderjahr nicht überschreiten.

Die genannten Immissionsrichtwerte gelten für alle schützenswerten Räume unabhängig von der Gebietsnutzung und davon, ob die Gebäude in beplanten oder unbeplanten Bereichen liegen. Eine Sonderfallbetrachtung - von z. B. Gemengelagen - ist gemäß [2] nicht vorgesehen.

Die Gesamtbelastung darf die angegebenen Immissionsrichtwerte nicht überschreiten. Überschreitet eine WEA die zulässigen Immissionsrichtwerte, so ist eine Immissionsminderung durchzuführen, die die überprüfbare Einhaltung der Immissionsrichtwerte zum Ziel hat. Diese Minderung erfolgt durch die gezielte Anlagenabschaltung für Zeiten real auftretenden oder astronomisch möglichen Schattenwurfs an den betreffenden Immissionsorten. Bei der Festlegung der genauen Abschaltzeiten ist die räumliche Ausdehnung am Immissionsort (z. B. Fenster- oder Balkonfläche) zu berücksichtigen.

Eine Vorbelastung durch weitere Windenergieanlagen - außer den hier in den Windvorrangszonen 17 und 18 betrachteten Anlagen - liegt nach Feststellung im Zuge eines Ortstermins [5] nicht vor.

3 Berechnungsgrundlagen

Bei der Berechnung der Beschattungsdauer an den einzelnen Immissionspunkten werden - als konservativster Ansatz im Sinne eines Schutzes der schutzwürdigen Räume - in allen Belangen Maximalbetrachtungen vorgenommen. Hierzu zählen:

- An jedem Tag im Kalenderjahr scheint zwischen Sonnenauf- bis Sonnenuntergang die Sonne ununterbrochen von wolkenlosem Himmel.
- Es wird keine meteorologische Korrektur in Form von meteorologisch wahrscheinlichen Beschattungen auf Basis von Statistiken oder Zeitreihen vorgenommen.
- Die Windrichtung zeigt exakt vom Immissionspunkt zur jeweiligen Windenergieanlage oder um 180° umgekehrt, sodass die Rotorfläche eine maximale Beschattungsfläche zu jedem Immissionspunkt ergibt.
- Die betrachtete Windenergieanlage ist dauerhaft in Betrieb.

Weiterhin werden bei den Berechnungen gemäß [2] die folgenden Randbedingungen berücksichtigt:

- Es werden keine Hindernisse wie z. B. Gebäude, Bewuchs etc. berücksichtigt.
- Die Berechnungen schließen einen Schattenwurf aus, wenn die Sonne weniger als 3° über dem Horizont steht, da die Sonneneinstrahlung dann auf Grund der atmosphärischen Diffusion nicht mehr relevant ist.
- Die Beschattung ist nur relevant, wenn die Sonne durch ein Rotorblatt um mehr als 20 % verdeckt wird.
- Die Sonne wird als punktförmige Quelle angenähert; d. h., dass keine Unterscheidung in Kern- und Halbschatten getroffen wird.
- Es wird die astronomisch maximal mögliche Beschattungsdauer ermittelt.

Für die grafische Darstellung der Beschattungsdauer wird ein Punktraster von 5 m x 5 m gewählt. Die Rasterberechnung erfolgt bei einer Schrittweite von 1 Tag in 1-Minuten-Zeitsprüngen.

4 Planungsdaten für die Windenergieanlagen

Die Windenergie Hollenstede 18 Planungsgesellschaft mbH plant im Bereich des Vorrangstandortes für Windenergiegewinnung "südlich Hörsten" (18-2013) südöstlich von Fürstenau-Hollenstede die Errichtung von vier Windenergieanlagen vom Typ Enercon E-138 EP3 E2 mit Trailing Edge Serrations (Hinterkanten-Verzahnungen) mit einer Nennleistung von jeweils 4.200 kW.

Bei den Prognoseberechnungen wird in Abstimmung mit dem Landkreis Osnabrück [7] sowie dem projektbegleitenden Ingenieurbüro [6] die Beschattungsgesamtbelastung durch 4 von der Windenergie Hollenstede 18 Planungsgesellschaft mbH sowie durch 3 von der Windenergie Hollenstede 17 Planungsgesellschaft mbH geplanten Windenergieanlagen auf den Vorrangflächen 17 und 18 der Samtgemeinde Fürstenau in einer gemeinsamen Berechnung ermittelt. Die Windenergie Hollenstede 17 Planungsgesellschaft mbH plant ebenfalls Windenergieanlagen vom Typ Enercon E-138 EP3 E2 mit Trailing Edge Serrations.

In den folgenden Tabellen 2 und 3 sind die geografischen Daten der geplanten Windenergieanlagen [10] sowie die Rotorblattdaten angegeben [9].

Tabelle 2 geografische Daten der geplanten Windenergieanlagen

Bezeichnung	Typ	UTM-Koordinaten in m		
		Rechtswert	Hochwert	Nabenhöhe
WEA 17-1	E-138 EP3 E2	32.409.261	5.815.378	160,0
WEA 17-2	E-138 EP3 E2	32.408.752	5.815.215	160,0
WEA 17-3	E-138 EP3 E2	32.409.155	5.814.940	160,0
WEA 18-1	E-138 EP3 E2	32.411.682	5.814.008	160,0
WEA 18-2	E-138 EP3 E2	32.411.992	5.813.886	160,0
WEA 18-3	E-138 EP3 E2	32.411.288	5.813.534	160,0
WEA 18-4	E-138 EP3 E2	32.411.624	5.813.436	160,0

Tabelle 3 Rotorblattdaten der geplanten Windenergieanlagen

Typ	Blattlänge in mm	Blatttiefe in mm		Beschattungsbereich in m
		maximal	bei 90%	
E-138 EP3-RB-01	66.885	3.956	1.024	1.689

5 Berechnungsergebnisse

Unter Berücksichtigung der in Kapitel 3 genannten Berechnungsgrundlagen sowie der in Kapitel 4 angegebenen Planungsdaten für die geplanten Windenergieanlagen ergeben sich die in der Tabelle 4 zusammengefassten Beschattungsdauern an den betrachtete Immissionspunkte als Gesamtbelastung durch alle insgesamt sieben auf den Vorrangflächen 17 und 18 der Samtgemeinde Fürstentau geplanten Windenergieanlagen. Die in Tabelle 4 aufgeführten Berechnungsergebnisse sind auch der Anlagen 3 zu entnehmen.

Die in der Tabelle 4 hellgrau unterlegten Zellen weisen auf eine Überschreitung eines der beiden Immissionsrichtwerte nach [2; 3] hin (vgl. Kapitel 2.3).

Im Anhang des vorliegenden Berichtes werden die Ergebnisse der Schattenwurfberechnungen in Tabellenform als Ausdruck des Berechnungsprogramms [4] sowie in Form von Isolinien und Rasterflächen dargestellt. Die Linien und Flächen sind im Anhang als farbige Iso-Schattenlinienkarte dargestellt.

Tabelle 4 Immissionspunkte und ermittelte Beschattungsdauer

Immissionspunkt	Stunden pro Jahr in Std./Jahr	Minuten pro Tag in Std./Tag
IP 01 - Welperort 1	40:01	00:44
IP 02 - Welperort 4	37:20	00:36
IP 03 - Welperort 7	39:40	00:38
IP 04 - Welperort 7	58:30	00:47
IP 05 - Welperort 10	63:44	01:03
IP 06 - Welperort 14	73:52	01:01
IP 07 - Welperort 16	60:57	00:45
IP 08 - Welperort 24	42:47	00:28
IP 09 - Welperort 20	34:16	00:30
IP 10 - Welperort 19	40:20	00:35

<wird fortgesetzt>

Tabelle 4 Immissionspunkte und ermittelte Beschattungsdauer <Fortsetzung>

Immissionspunkt	Stunden pro Jahr in Std./Jahr	Minuten pro Tag in Std./Tag
IP 11a - Große Haar 2/Ost	00:00	00:00
IP 11b - Große Haar 2/West	92:02	01:16
IP 12a - Holle 10/Ost	00:00	00:00
IP 12b - Holle 10/West	53:39	01:04
IP 13a - Holle 9/Ost	00:00	00:00
IP 13b - Holle 9/West	89:36	00:46
IP 14a - Holle 7/Ost	00:00	00:00
IP 14b - Holle 7/West	99:47	00:44
IP 15a - Holle 5/Süd	62:38	00:43
IP 15b - Holle 5/West	63:31	00:43
IP 16 - Holle 2	100:51	01:21
IP 17a - Neuenstadt 25/Südost	115:11	01:16
IP 17b - Neuenstadt 25/Südwest	114:30	01:15
IP 18a - Neuenstadt 25A/Südost	119:00	01:14
IP 18b - Neuenstadt 25/Südwest	118:40	01:16
IP 19 - Holle 2/Südost	50:12	00:50
IP 20a - Zur Dasslage 1/Südost	12:02	00:26
IP 20b - Zur Dasslage 1/Südwest	34:27	00:32
IP 21a - Zur Dasslage 3/Südost	00:00	00:00
IP 21b - Zur Dasslage 3/Südwest	34:33	00:31
IP 22a - Zur Dasslage 4/Südost	15:26	00:23
IP 22b - Zur Dasslage 4/Nordwest	29:22	00:27

<wird fortgesetzt>

Tabelle 4 Immissionspunkte und ermittelte Beschattungsdauer <Fortsetzung>

Immissionspunkt	Stunden pro Jahr in Std./Jahr	Minuten pro Tag in Std./Tag
IP 23a - Große Haar 9/Nordwest	16:17	00:25
IP 23b - Große Haar 9/Südost	48:42	00:44
IP 24a - Große Haar 7/Nordwest	09:38	00:19
IP 24b - Große Haar 7/Südost	16:52	00:24
IP 25a - Zur Dasslage 7A/Nordwest	00:00	00:00
IP 25b - Zur Dasslage 7A/Südost	76:59	00:57
IP 26a - Zur Dasslage 7/Nordwest	07:48	00:20
IP 26b - Zur Dasslage 7/Südost	78:27	00:56
IP 27a - Zur Dasslage 7/Nordwest	00:00	00:00
IP 27b - Zur Dasslage 8/Südost	80:41	00:59
IP 28a - Hörsten 6/Südost	53:01	01:01
IP 28b - Hörsten 6/West	00:00	00:00
IP 29a - Zur Dasslage 6/Nordost	00:00	00:00
IP 29b - Zur Dasslage 6/Südwest	111:26	01:15
IP 30a - Zur Dasslage 11/Südost	106:46	01:18
IP 30b - Zur Dasslage 11/Südwest	00:00	00:00
IP 31a - Zur Dasslage 13/Nordwest	00:00	00:00
IP 31b - Zur Dasslage 13/Südost	91:06	01:15
IP 32 - Große Harr 13	65:29	00:53
IP 33a - Große Haar 15/Nordost	117:54	01:12
IP 33b - Große Haar 15A/Südost	116:12	01:12
IP 34a - Große Haar 15/Nordost	102:52	01:07

<wird fortgesetzt>

Tabelle 4 Immissionspunkte und ermittelte Beschattungsdauer <Fortsetzung>

Immissionspunkt	Stunden pro Jahr in Std./Jahr	Minuten pro Tag in Std./Tag
IP 34b - Große Haar 15/Südost	102:39	01:07
IP 35 - Pius 24	00:00	00:00
IP 36 - Bruchstraße 6	36:15	00:38
IP 37a - Bruchstraße 4/Nordwest	51:04	00:50
IP 37b - Bruchstraße 4/Südwest	49:24	00:50
IP 38 - Wielage 5	84:35	01:01
IP 39 - Wielage 4	51:40	00:38

Wie die Tabelle 4 zeigt, wird an mehreren - für die Ermittlung der Beschattungsdauer relevanten - Immissionspunkten der Immissionsrichtwert gemäß [2; 3] überschritten. Die Anlage 5 zeigt in einer grafischen Darstellung die Zeiten, in denen durch die geplanten Windenergieanlagen an den mit unterschiedlichen Farben gekennzeichneten Immissionspunkten an den vorhandenen Gebäuden - unter den in Kapitel 5 dargestellten Maximalbetrachtungen - eine Beschattung zu erwarten ist.

Aufgrund der festgestellten Überschreitungen der Immissionsrichtwerte ist eine Immissionsminderung durchzuführen. Zur Einhaltung der Immissionsrichtwerte ist die erforderliche Minderung durch die gezielte Anlagenabschaltung für Zeiten real auftretenden oder astronomisch möglichen Schattenwurfs an den betreffenden Immissionsorten vorzunehmen.

Wie in Kapitel 3 beschrieben, wurden die Berechnungen der zu erwartenden - astronomisch maximal möglichen - Beschattungsdauer unter den Maximalbetrachtungen durchgeführt. Um eine Abschaltung der geplanten Windenergieanlagen zu jedem theoretisch möglichen Beschattungszeitraum zu vermeiden, ist der Einsatz einer Abschalteinrichtung mit Erfassung der tatsächlich lokal vorliegenden Meteorologiedaten möglich. Mit Hilfe einer derartigen Steuerung kann in den Zeiträumen, in denen eine Beschattung eines Immissionspunktes zu erwarten ist - unter Berücksichtigung der aktuellen lokalen Wetterlage und bei Unterschreitung der Sonneneinstrahlung auf der zur Einfallrichtung normalen Ebene von 120 W/m^2 -, die Außerbetriebnahme der jeweiligen Windenergieanlage verhindert werden. Gemäß [2] ist erst ab diesem Wert mit Sonnenschein und daher mit Schattenwurf zu rechnen.

6 Berechnungs- und Beurteilungsgrundlagen, Literatur

Für die Ermittlung und Beurteilung der Geräuschsituation werden folgende Normen, Richtlinien, Verordnungen und Unterlagen herangezogen:

	Literatur	Beschreibung	Datum
[1]	Bundes-Immissionsschutzgesetz in der Fassung der Bekanntmachung vom 17. Mai 2013 (BGBl. I S. 1274)	Gesetz zum Schutz vor schädlichen Umwelteinwirkungen durch Luftverunreinigungen, Geräusche, Erschütterungen und ähnliche Vorgänge	17. Mai 2013
[2]	Länderausschuss für Immissionsschutz (LAI)	Hinweise zur Ermittlung und Beurteilung der optischen Immissionen von Windenergieanlagen (WEA-Schattenwurf-Hinweise)	13.03.2002
[3]	Niedersächsisches Ministerium für Umwelt, Energie und Umweltschutz	Planung und Genehmigung von Windenergieanlagen an Land (Windenergieerlass), veröffentlicht im Niedersächsischen Ministerialblatt Nummer 7	24.02.2016
[4]	EMD International A/S	Software zur Ermittlung von Schattenwurf durch Windenergieanlagen WindPRO	Version 3.0.654

	Zusätzliche Beurteilungs- grundlagen	Beschreibung	Datum
[5]	Ortstermin	Zur Ermittlung der Bebauung so- wie der topografischen Gegeben- heiten im Bereich der geplanten 7 Windenergieanlagen	19.05.2015
[6]	Agrowea GmbH & Co. KG	Telefonat mit Herrn Tannen be- züglich der gemeinsamen Be- trachtung der auf den Vorrangflä- chen 17 und 18 geplanten sieben Windenergieanlagen	28.05.2015
[7]	Landkreis Osnabrück	E-Mail von Frau Beimesche be- züglich der gemeinsamen Be- trachtung der auf den Vorrangflä- chen 17 und 18 geplanten sieben Windenergieanlagen	29.05.2015
[8]	Samtgemeinde Fürstenau	Bebauungsplan Nr. 50 "Wohn- baufläche östlich der Dorfstrasse K 114" der Stadt Fürstenau per E-Mail	26.01.2017
		Flächennutzungsplan der Samt- gemeinde Fürstenau, 45. Ände- rung (Entwurf)	Stand 2018-11

-
- | | | | |
|------|-----------------------|---|--------------|
| [9] | ENERCON GmbH | Datenblatt zum Rotorblatt E-138 EP3-RB-01 mit Hinterkantenkamm (TES) | 03.11.2017 |
| [10] | Agrowea GmbH & Co. KG | Lageplan zum Windpark Holtenstede "Welperort" und "südlich Hörsten", Standortkoordinaten für drei bzw. 4 geplante Windenergieanlagen vom Typ Enercon E-138 EP3 E2 mit einer Nabenhöhe von 160 m | Oktober 2018 |

7 Anlagen

- Anlage 1: Lageplan mit Darstellung der geplanten Windenergieanlagen
- Anlage 2: digitales Rechenmodell
- Anlage 3: Berechnungsdatenblätter
- Anlage 4: Lagepläne mit Darstellung des Schattenwurfes 4.1 astronomisch maximal mögliche Stunden pro Jahr 4.2 astronomisch maximal mögliche Minuten pro Tag
- Anlage 5: Grafische Darstellung der Beschattungszeiten an der Immissionspunkten für die jeweilige Windenergieanlage
- Anlage 6: Grafische Darstellung der Beschattungszeiten durch die Windenergieanlagen an den einzelnen Immissionspunkten
- Anlage 7: Tabellarische Darstellung der Beschattungszeiten an der Immissionspunkten für die jeweilige Windenergieanlage
- Anlage 8: Tabellarische Darstellung der Beschattungszeiten durch die Windenergieanlagen an den einzelnen Immissionspunkten (Auszug)
- Anlage 9: Rotordatenblätter ENERCON E-138 EP3-RB-01
- Anlage 10: Standortkoordinaten der geplanten Windenergieanlagen

Anlage 1: Lageplan mit Darstellung der geplanten Windenergieanlagen



Quelle: Auszug aus den Geobasisdaten der Nds. Vermessungs- und Katasterverwaltung, © 2015

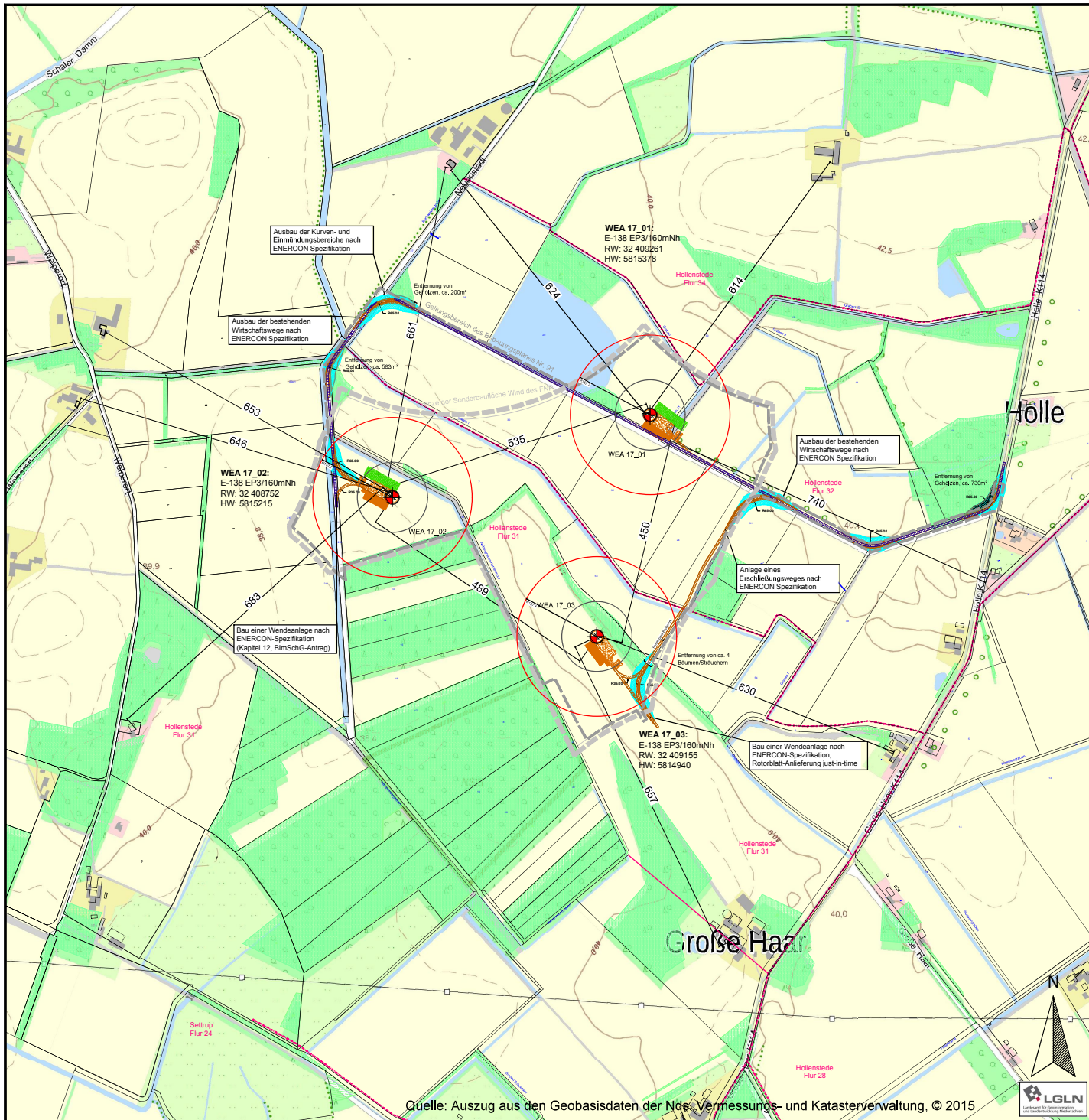
Legende

- Zuwegung Neubau
- Zuwegung Bestand
- Kranstellfläche
- Montagefläche
- Zuwegung Temporär
- Überschwenkbereich
- Lagerfläche
- Containerfläche
- Potenzialfläche
- Fläche RROP-Gebiet
- Freileitung
- Windenergieanlage Rotor/ Grenzabstand
- Bestand



ENERCON GmbH
Dreerkamp 5, 26605 Aurich
Tel.: 0 49 41 / 927-0, Fax: 0 49 41 / 927-109

Bauherr: Windenergie Hollenstede 18 PlanungsGmbH Zur Dasselage 11 49584 Fürstenau OT Hollenstede		Standort: Windpark Hollenstede Teiffäche 18 des RROP Osnabrück		Entwurfsverfasser:	
Bauvorhaben: 4x ENERCON E-138 EP3 mit 160mNh		Zeichnung: Lageplan		Vorabzug	
Gez: JBERLIN	Datum: 16.05.2017	geändert: JBERLIN	Datum: 12.10.2018	O-Nummer: 4905	W-Nummer: XXXXX
			Maßstab: 1:7500	Blatt: A3	Rev.: 1-8



Legende

- Zuwegung Neubau
- Kranstellfläche
- Zuwegung Temporär
- Lagerfläche
- Potenzialfläche
- Windenergieanlage Rotor/ Grenzabstand
- Zuwegung Bestand
- Montagefläche
- Überschwenkbereich
- Containerfläche
- Fläche RROP- Gebiet
- Bestand
- Freileitung



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Bauherr: Windenergie Hollenstede 18 PlanungsGmbH Zur Dasslage 11 49584 Fürstenau OT Hollenstede		Standort: Windpark Hollenstede Welperort Teilfläche 17 des RROP Osnabrück		Entwurfsverfasser:	
Bauvorhaben: 3x ENERCON E-138 EP3 mit 160mNh		Zeichnung: Lageplan Zuwegung mit Überschwenkbereichen		Vorabzug	
Gez: JBERLIN	Datum: 16.05.2017	geändert: JBERLIN	Datum: 12.10.2018	Maßstab: 1:7500	Blatt: A3
				O-Nummer: 4084	W-Nummer: XXXXX
				Rev.: 1-8	

Anlage 2: digitales Rechenmodell

Anlage 3: Berechnungsdatenblätter

SHADOW - Hauptergebnis

Berechnung: Windenergie Hollenstede 2018-12

Voraussetzungen für Berechnung des Schattenwurfs

Beschattungsbereich der WEA

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

Siehe WEA-Tabelle

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

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

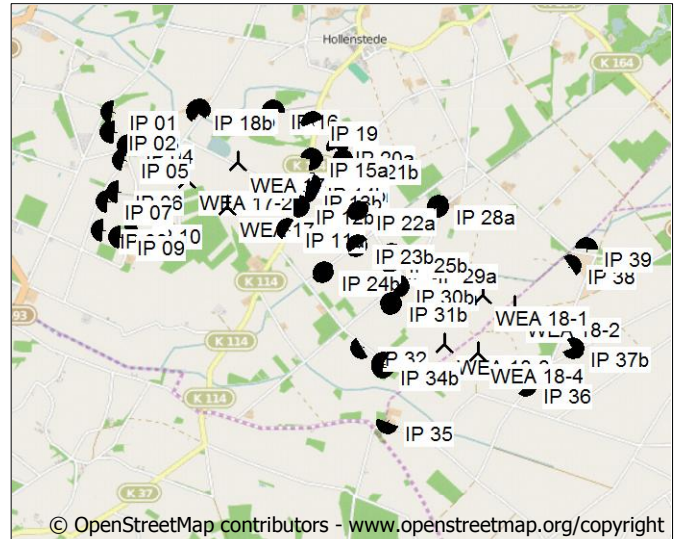
Verwendete Höhenlinien: Höhenlinien: Höhendaten 2017-01.wpo (16)

Hindernisse in Berechnung verwendet

Augenhöhe: 1,5 m

Rasterauflösung: 10,0 m

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



Maßstab 1:75.000
 ⚓ Neue WEA 🕒 Schattenrezeptor

WEA

Ost	Nord	Z	Beschreibung	WEA-Typ			Nennleistung [kW]	Rotor-durchmesser [m]	Nabenhöhe [m]	Schattendaten	
				Aktuell	Hersteller	Typ				Beschatt.-Bereich [m]	U/min [U/min]
409.261	5.815.378	40,0	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
408.752	5.815.215	38,4	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
409.155	5.814.940	40,0	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
411.682	5.814.008	38,3	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
411.992	5.813.886	39,7	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
411.288	5.813.534	39,9	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1
411.624	5.813.436	39,6	E-138 EP3 E...	Ja	ENERCON	E-138 EP3 E2-4.200	4.200	138,6	160,0	1.689	11,1

Schattenrezeptor-Eingabe

Nr.	Name	Ost	Nord	Z	Breite [m]	Höhe [m]	Höhe über Grund [m]	Azimutwinkel (von Süd) [°]	Neigung des Fensters [°]	Ausrichtungsmodus
IP 01	Welperort 1	408.023	5.815.895	40,0	1,0	1,0	1,5	-80,6	90,0	Feste Richtung
IP 02	Welperort 4	408.004	5.815.689	39,0	1,0	1,0	1,5	-95,6	90,0	Feste Richtung
IP 03	Welperort 7	408.037	5.815.694	39,3	1,0	1,0	1,5	-86,2	90,0	Feste Richtung
IP 04	Welperort 7	408.176	5.815.560	40,0	1,0	1,0	1,5	-74,6	90,0	Feste Richtung
IP 05	Welperort 10	408.127	5.815.415	40,0	1,0	1,0	1,5	-76,3	90,0	Feste Richtung
IP 06	Welperort 14	408.060	5.815.099	40,0	1,0	1,0	1,5	-86,2	90,0	Feste Richtung
IP 07	Welperort 16	407.956	5.815.007	39,7	1,0	1,0	1,5	-86,2	90,0	Feste Richtung
IP 08	Welperort 24	407.901	5.814.722	38,6	1,0	1,0	1,5	-86,2	90,0	Feste Richtung
IP 09	Welperort 20	408.073	5.814.655	40,0	1,0	1,0	1,5	-86,2	90,0	Feste Richtung
IP 10	Welperort 19	408.243	5.814.763	40,0	1,0	1,0	1,5	-117,0	90,0	Feste Richtung
IP 11a	Große Haar 2/Ost	409.747	5.814.699	40,0	1,0	1,0	1,5	-57,3	90,0	Feste Richtung
IP 11b	Große Haar 2/West	409.739	5.814.703	40,0	1,0	1,0	1,5	-240,2	90,0	Feste Richtung
IP 12a	Holle 10/Ost	409.875	5.814.923	40,0	1,0	1,0	1,5	-84,9	90,0	Feste Richtung
IP 12b	Holle 10/West	409.862	5.814.922	40,0	1,0	1,0	1,5	-260,1	90,0	Feste Richtung
IP 13a	Holle 9/Ost	409.951	5.815.066	40,0	1,0	1,0	1,5	-82,0	90,0	Feste Richtung
IP 13b	Holle 9/West	409.935	5.815.068	40,0	1,0	1,0	1,5	-259,6	90,0	Feste Richtung
IP 14a	Holle 7/Ost	409.993	5.815.141	40,0	1,0	1,0	1,5	-70,1	90,0	Feste Richtung
IP 14b	Holle 7/West	409.973	5.815.144	40,0	1,0	1,0	1,5	-245,9	90,0	Feste Richtung
IP 15a	Holle 5/Süd	409.998	5.815.387	40,3	1,0	1,0	1,5	10,0	90,0	Feste Richtung
IP 15b	Holle 5/West	409.993	5.815.391	40,3	1,0	1,0	1,5	-261,9	90,0	Feste Richtung
IP 16	Holle 2	409.628	5.815.875	40,5	1,0	1,0	1,5	7,5	90,0	Feste Richtung
IP 17a	Neuenstadt 25/Südost	408.902	5.815.894	38,9	1,0	1,0	1,5	-59,6	90,0	Feste Richtung
IP 17b	Neuenstadt 25/Südwest	408.895	5.815.892	38,9	1,0	1,0	1,5	34,6	90,0	Feste Richtung
IP 18a	Neuenstadt 25A/Südost	408.874	5.815.875	38,8	1,0	1,0	1,5	-59,6	90,0	Feste Richtung
IP 18b	Neuenstadt 25/Südwest	408.865	5.815.873	38,8	1,0	1,0	1,5	34,6	90,0	Feste Richtung

(Fortsetzung nächste Seite)...

SHADOW - Hauptergebnis**Berechnung: Windenergie Hollenstede 2018-12**

...(Fortsetzung von letzter Seite)

Nr.	Name	Ost	Nord	Z	Breite	Höhe	Höhe über Grund	Azimutwinkel (von Süd)	Neigung des Fensters	Ausrichtungsmodus
				[m]	[m]	[m]	[m]	[°]	[°]	
IP 19	Holle 2/Südost	410.021	5.815.749	41,2	1,0	1,0	1,5	-20,0	90,0	Feste Richtung
IP 20a	Zur Dasslage 1/Südost	410.263	5.815.503	41,1	1,0	1,0	1,5	-20,0	90,0	Feste Richtung
IP 20b	Zur Dasslage 1/Südwest	410.252	5.815.511	41,1	1,0	1,0	1,5	70,0	90,0	Feste Richtung
IP 21a	Zur Dasslage 3/Südost	410.314	5.815.361	40,6	1,0	1,0	1,5	-45,0	90,0	Feste Richtung
IP 21b	Zur Dasslage 3/Südwest	410.306	5.815.360	40,6	1,0	1,0	1,5	45,0	90,0	Feste Richtung
IP 22a	Zur Dasslage 4/Südost	410.459	5.814.851	39,5	1,0	1,0	1,5	-30,0	90,0	Feste Richtung
IP 22b	Zur Dasslage 4/Nordwest	410.443	5.814.879	39,5	1,0	1,0	1,5	150,0	90,0	Feste Richtung
IP 23a	Große Haar 9/Nordwest	410.422	5.814.524	40,0	1,0	1,0	1,5	-215,9	90,0	Feste Richtung
IP 23b	Große Haar 9/Südost	410.440	5.814.523	40,0	1,0	1,0	1,5	-37,4	90,0	Feste Richtung
IP 24a	Große Haar 7/Nordwest	410.087	5.814.270	40,0	1,0	1,0	1,5	-212,4	90,0	Feste Richtung
IP 24b	Große Haar 7/Südost	410.104	5.814.259	40,0	1,0	1,0	1,5	-37,8	90,0	Feste Richtung
IP 25a	Zur Dasslage 7A/Nordwest	410.775	5.814.440	40,0	1,0	1,0	1,5	-210,9	90,0	Feste Richtung
IP 25b	Zur Dasslage 7A/Südost	410.781	5.814.432	40,0	1,0	1,0	1,5	-30,5	90,0	Feste Richtung
IP 26a	Zur Dasslage 7/Nordwest	410.761	5.814.431	40,0	1,0	1,0	1,5	-210,9	90,0	Feste Richtung
IP 26b	Zur Dasslage 7/Südost	410.771	5.814.414	40,0	1,0	1,0	1,5	-30,5	90,0	Feste Richtung
IP 27a	Zur Dasslage 7/Nordwest	410.754	5.814.366	40,0	1,0	1,0	1,5	-210,9	90,0	Feste Richtung
IP 27b	Zur Dasslage 8/Südost	410.766	5.814.351	40,0	1,0	1,0	1,5	-39,9	90,0	Feste Richtung
IP 28a	Hörsten 6/Südost	411.258	5.814.900	39,0	1,0	1,0	1,5	-30,0	90,0	Feste Richtung
IP 28b	Hörsten 6/West	411.246	5.814.895	39,0	1,0	1,0	1,5	90,0	90,0	Feste Richtung
IP 29a	Zur Dasslage 6/Nordost	411.061	5.814.321	39,6	1,0	1,0	1,5	-219,9	90,0	Feste Richtung
IP 29b	Zur Dasslage 6/Südwest	411.075	5.814.304	39,7	1,0	1,0	1,5	-39,4	90,0	Feste Richtung
IP 30a	Zur Dasslage 11/Südost	410.863	5.814.106	40,0	1,0	1,0	1,5	-56,1	90,0	Feste Richtung
IP 30b	Zur Dasslage 11/Südwest	410.838	5.814.116	40,0	1,0	1,0	1,5	-229,1	90,0	Feste Richtung
IP 31a	Zur Dasslage 13/Nordwest	410.760	5.813.946	40,0	1,0	1,0	1,5	-225,0	90,0	Feste Richtung
IP 31b	Zur Dasslage 13/Südost	410.768	5.813.939	40,0	1,0	1,0	1,5	-54,5	90,0	Feste Richtung
IP 32	Große Harr 13	410.467	5.813.511	40,0	1,0	1,0	1,5	-120,0	90,0	Feste Richtung
IP 33a	Große Haar 15/Nordost	410.668	5.813.352	40,0	1,0	1,0	1,5	-140,0	0,0	Feste Richtung
IP 33b	Große Haar 15A/Südost	410.668	5.813.348	40,0	1,0	1,0	1,5	-55,0	0,0	Feste Richtung
IP 34a	Große Haar 15/Nordost	410.670	5.813.317	40,0	1,0	1,0	1,5	-176,2	90,0	Feste Richtung
IP 34b	Große Haar 15/Südost	410.672	5.813.315	40,0	1,0	1,0	1,5	-86,5	90,0	Feste Richtung
IP 35	Pius 24	410.703	5.812.756	40,2	1,0	1,0	1,5	-162,4	90,0	Feste Richtung
IP 36	Bruchstraße 6	412.091	5.813.109	41,9	1,0	1,0	1,5	-228,7	90,0	Feste Richtung
IP 37a	Bruchstraße 4/Nordwest	412.568	5.813.471	42,7	1,0	1,0	1,5	-204,5	90,0	Feste Richtung
IP 37b	Bruchstraße 4/Südwest	412.566	5.813.464	42,7	1,0	1,0	1,5	60,4	90,0	Feste Richtung
IP 38	Wielage 5	412.556	5.814.279	42,5	1,0	1,0	1,5	55,9	90,0	Feste Richtung
IP 39	Wielage 4	412.724	5.814.455	42,6	1,0	1,0	1,5	3,0	90,0	Feste Richtung

Berechnungsergebnisse

Schattenrezeptor

Nr.	Name	astron. max. mögl. Beschattungsdauer		
		Stunden/Jahr	Schattentage/a	Max.Schatten Stunden/Tag
		[Std/Jahr]	[Tage/Jahr]	[Std/Tag]
IP 01	Welperort 1	40:01	86	0:44
IP 02	Welperort 4	37:20	92	0:36
IP 03	Welperort 7	39:40	93	0:38
IP 04	Welperort 7	58:30	109	0:47
IP 05	Welperort 10	63:44	108	1:03
IP 06	Welperort 14	73:52	122	1:01
IP 07	Welperort 16	60:57	124	0:45
IP 08	Welperort 24	42:47	116	0:28
IP 09	Welperort 20	34:16	97	0:30
IP 10	Welperort 19	40:20	100	0:35
IP 11a	Große Haar 2/Ost	0:00	0	0:00
IP 11b	Große Haar 2/West	92:02	83	1:16
IP 12a	Holle 10/Ost	0:00	0	0:00
IP 12b	Holle 10/West	53:39	81	1:04
IP 13a	Holle 9/Ost	0:00	0	0:00
IP 13b	Holle 9/West	89:36	157	0:46
IP 14a	Holle 7/Ost	0:00	0	0:00
IP 14b	Holle 7/West	99:47	188	0:44
IP 15a	Holle 5/Süd	62:38	135	0:43
IP 15b	Holle 5/West	63:31	136	0:43

(Fortsetzung nächste Seite)...

SHADOW - Hauptergebnis**Berechnung: Windenergie Hollenstede 2018-12**

...(Fortsetzung von letzter Seite)

Nr.	Name	astron. max. mögl. Beschattungsdauer		
		Stunden/Jahr	Schattentage/a	Max.Schatten Stunden/Tag
		[Std/Jahr]	[Tage/Jahr]	[Std/Tag]
IP 16	Holle 2	100:51	123	1:21
IP 17a	Neuenstadt 25/Süddost	115:11	123	1:16
IP 17b	Neuenstadt 25/Süddwest	114:30	124	1:15
IP 18a	Neuenstadt 25A/Süddost	119:00	129	1:14
IP 18b	Neuenstadt 25/Süddwest	118:40	130	1:16
IP 19	Holle 2/Süddost	50:12	105	0:50
IP 20a	Zur Dasslage 1/Süddost	12:02	35	0:26
IP 20b	Zur Dasslage 1/Süddwest	34:27	93	0:32
IP 21a	Zur Dasslage 3/Süddost	0:00	0	0:00
IP 21b	Zur Dasslage 3/Süddwest	34:33	99	0:31
IP 22a	Zur Dasslage 4/Süddost	15:26	60	0:23
IP 22b	Zur Dasslage 4/Nordwest	29:22	90	0:27
IP 23a	Große Haar 9/Nordwest	16:17	61	0:25
IP 23b	Große Haar 9/Süddost	48:42	120	0:44
IP 24a	Große Haar 7/Nordwest	9:38	38	0:19
IP 24b	Große Haar 7/Süddost	16:52	58	0:24
IP 25a	Zur Dasslage 7A/Nordwest	0:00	0	0:00
IP 25b	Zur Dasslage 7A/Süddost	76:59	120	0:57
IP 26a	Zur Dasslage 7/Nordwest	7:48	31	0:20
IP 26b	Zur Dasslage 7/Süddost	78:27	123	0:56
IP 27a	Zur Dasslage 7/Nordwest	0:00	0	0:00
IP 27b	Zur Dasslage 8/Süddost	80:41	135	0:59
IP 28a	Hörsten 6/Süddost	53:01	65	1:01
IP 28b	Hörsten 6/West	0:00	0	0:00
IP 29a	Zur Dasslage 6/Nordost	0:00	0	0:00
IP 29b	Zur Dasslage 6/Süddwest	111:26	134	1:15
IP 30a	Zur Dasslage 11/Süddost	106:46	162	1:18
IP 30b	Zur Dasslage 11/Süddwest	0:00	0	0:00
IP 31a	Zur Dasslage 13/Nordwest	0:00	0	0:00
IP 31b	Zur Dasslage 13/Süddost	91:06	140	1:15
IP 32	Große Harr 13	65:29	144	0:53
IP 33a	Große Haar 15/Nordost	117:54	149	1:12
IP 33b	Große Haar 15A/Süddost	116:12	147	1:12
IP 34a	Große Haar 15/Nordost	102:52	140	1:07
IP 34b	Große Haar 15/Süddost	102:39	140	1:07
IP 35	Pius 24	0:00	0	0:00
IP 36	Bruchstraße 6	36:15	68	0:38
IP 37a	Bruchstraße 4/Nordwest	51:04	99	0:50
IP 37b	Bruchstraße 4/Süddwest	49:24	96	0:50
IP 38	Wielage 5	84:35	141	1:01
IP 39	Wielage 4	51:40	122	0:38

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal	Erwartet
		[Std/Jahr]	[Std/Jahr]
WEA 17-1	E-138 EP3 E2 TES	429:49	
WEA 17-2	E-138 EP3 E2 TES	395:29	
WEA 17-3	E-138 EP3 E2 TES	354:12	
WEA 18-1	E-138 EP3 E2 TES	223:28	
WEA 18-2	E-138 EP3 E2 TES	155:05	
WEA 18-3	E-138 EP3 E2 TES	366:05	
WEA 18-4	E-138 EP3 E2 TES	199:55	

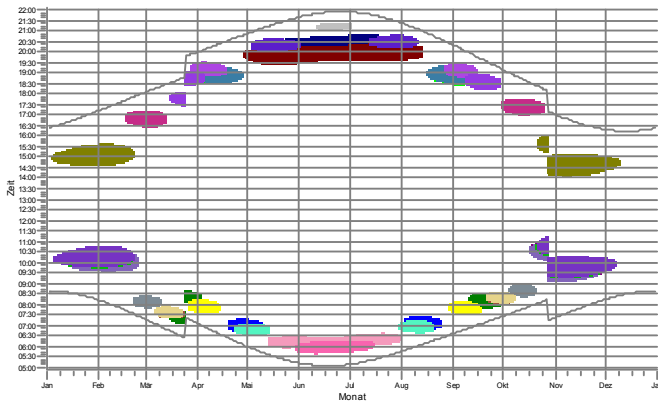
Anlage 4: Lagepläne mit Darstellung des Schattenwurfes 4.1 astronomisch maximal mögliche Stunden pro Jahr 4.2 astronomisch maximal mögliche Minuten pro Tag

Anlage 5: Grafische Darstellung der Beschattungszeiten an der Immissionspunkten für die jeweilige Windenergieanlage

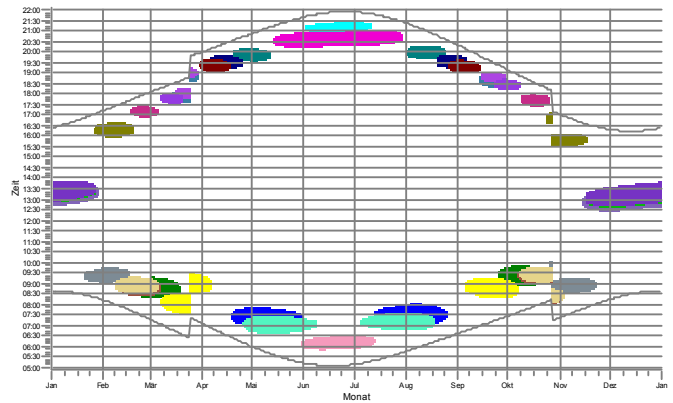
SHADOW - Grafischer Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12

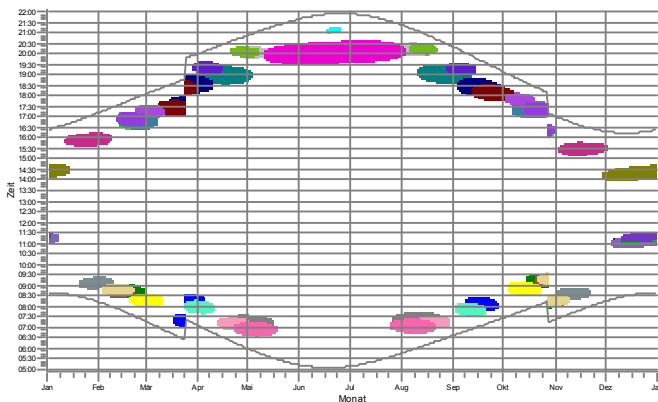
WEA 17-1: E-138 EP3 E2 TES



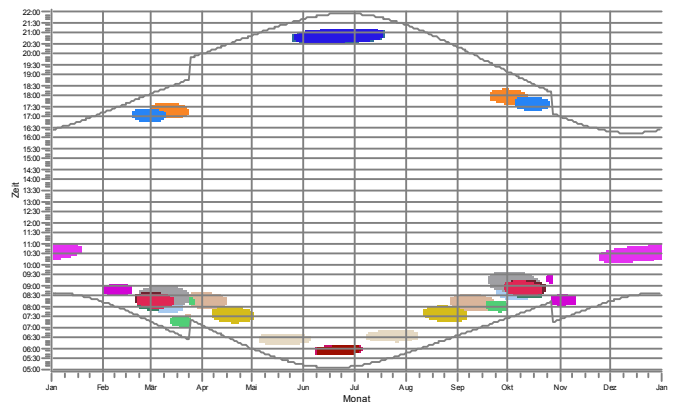
WEA 17-2: E-138 EP3 E2 TES



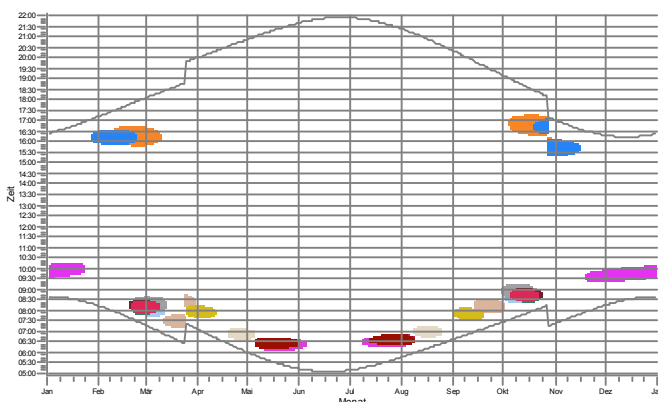
WEA 17-3: E-138 EP3 E2 TES



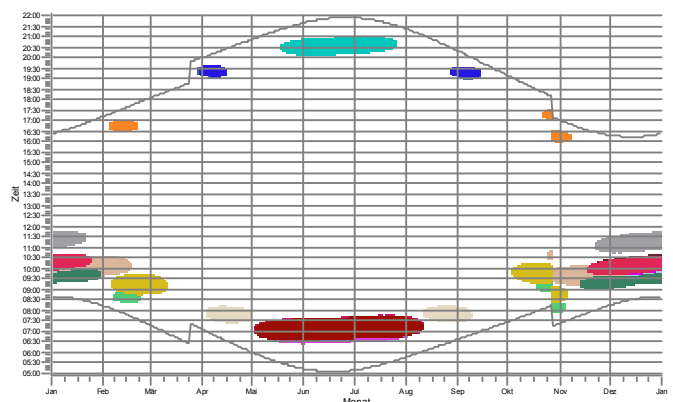
WEA 18-1: E-138 EP3 E2 TES



WEA 18-2: E-138 EP3 E2 TES



WEA 18-3: E-138 EP3 E2 TES



Schattenrezeptoren

- | | | | | |
|--------------------------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|
| IP 04: Welperort 7 | IP 23a: Große Haar 9/Nordwest | IP 24b: Große Haar 7/Süddost | IP 02: Welperort 4 | IP 26a: Zur Dasslage 7/Nordwest |
| IP 05: Welperort 10 | IP 24a: Große Haar 9/Nordwest | IP 23b: Große Haar 9/Süddost | IP 22a: Zur Dasslage 4/Süddost | IP 26b: Zur Dasslage 7/Süddost |
| IP 06: Welperort 14 | IP 27b: Zur Dasslage 8/Süddost | IP 31b: Zur Dasslage 13/Süddost | IP 22b: Zur Dasslage 4/Nordwest | IP 17b: Neuenstadt 25/Süddost |
| IP 10: Welperort 19 | IP 29b: Zur Dasslage 6/Süddost | IP 25b: Zur Dasslage 7A/Süddost | IP 21b: Zur Dasslage 3/Süddost | IP 17a: Neuenstadt 25/Süddost |
| IP 12b: Holle 10/West | IP 30a: Zur Dasslage 11/Süddost | IP 18b: Neuenstadt 25/Süddost | IP 20a: Zur Dasslage 1/Süddost | IP 07: Welperort 16 |
| IP 13b: Holle 9/West | IP 34a: Große Haar 15/Nordost | IP 34b: Große Haar 15/Süddost | IP 20b: Zur Dasslage 1/Süddost | IP 19: Holle 2/Süddost |
| IP 14b: Holle 7/West | IP 36: Bruchstraße 4/Süddost | IP 37b: Bruchstraße 4/Süddost | IP 28a: Hörsten 6/Süddost | IP 03: Welperort 7 |
| IP 15b: Holle 5/West | IP 37a: Bruchstraße 4/Nordwest | IP 15a: Holle 5/Süddost | IP 32: Große Harr 13 | IP 08: Welperort 24 |
| IP 16: Holle 2 | IP 38: Wielage 5 | IP 01: Welperort 1 | IP 01: Welperort 1 | IP 09: Welperort 20 |
| IP 18a: Neuenstadt 25A/Süddost | IP 11b: Große Haar 2/West | IP 39: Wielage 4 | IP 33b: Große Haar 15A/Süddost | |

Projekt:

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

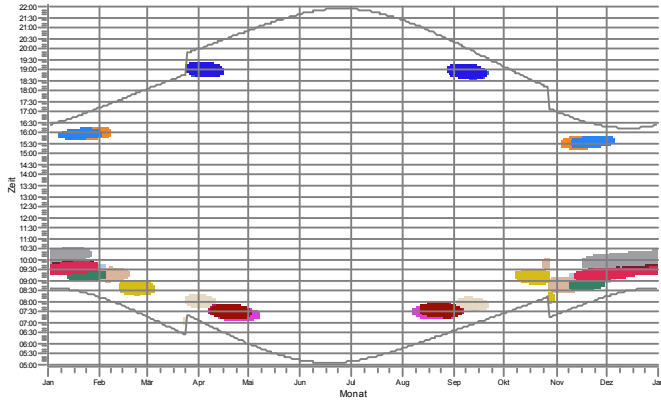
Lizenziertes Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Grafischer Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12

WEA 18-4: E-138 EP3 E2 TES



Schattenrezeptoren

IP 27b: Zur Dasslage 8/Südost
 IP 29b: Zur Dasslage 6/Südwest
 IP 30a: Zur Dasslage 11/Südost
 IP 34a: Große Haar 15/Nordost

IP 37a: Bruchstraße 4/Nordwest
 IP 38: Wielage 5
 IP 23b: Große Haar 9/Südost
 IP 31b: Zur Dasslage 13/Südost

IP 25b: Zur Dasslage 7A/Südost
 IP 34b: Große Haar 15/Südost
 IP 37b: Bruchstraße 4/Südwest
 IP 39: Wielage 4

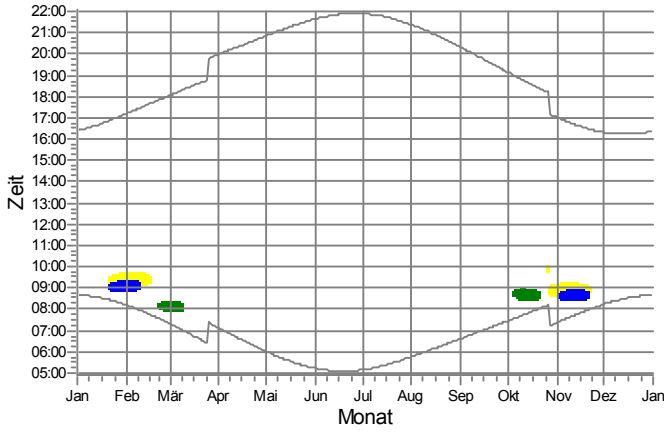
IP 32: Große Harr 13
 IP 33a: Große Haar 15/Nordost
 IP 33b: Große Haar 15A/Südost
 IP 26b: Zur Dasslage 7/Südost

Anlage 6: Grafische Darstellung der Beschattungszeiten durch die Windenergieanlagen an den einzelnen Immissionspunkten

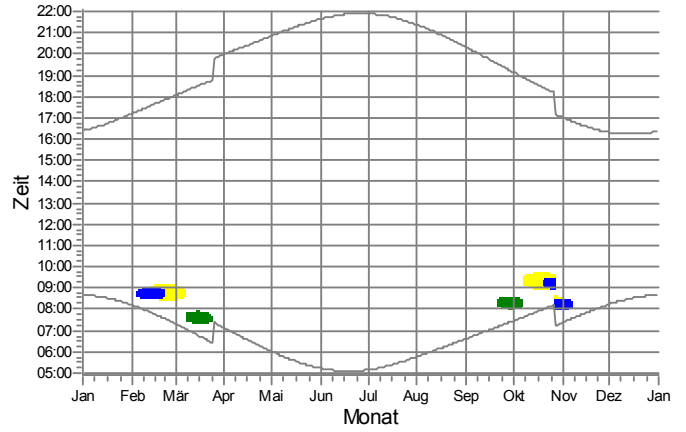
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

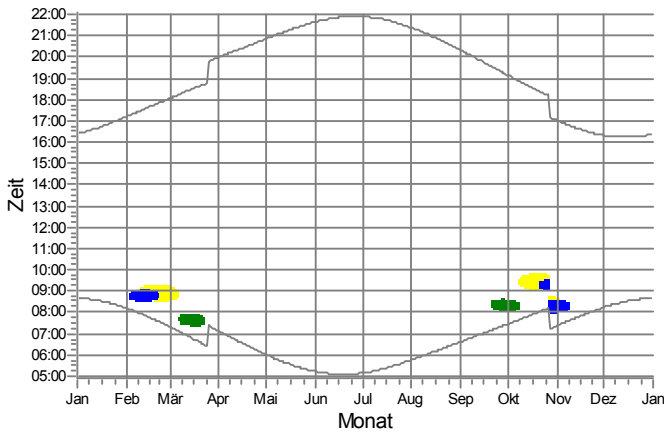
IP 01: Welperort 1



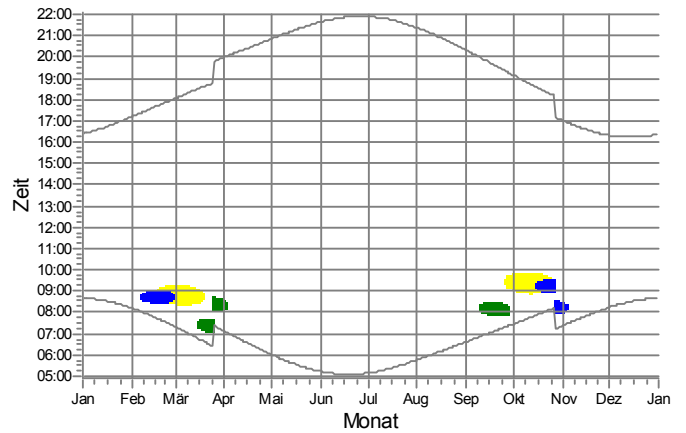
IP 02: Welperort 4



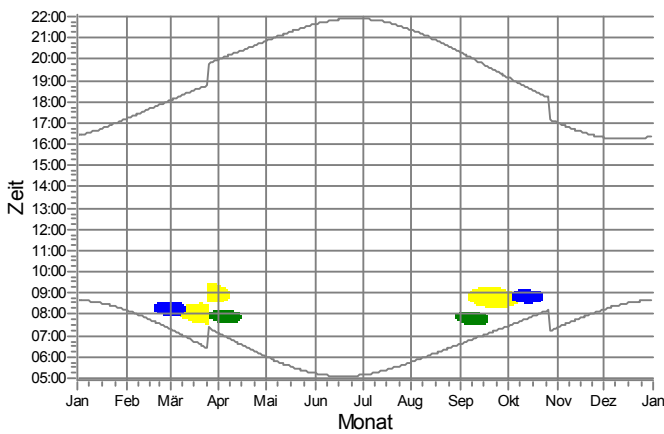
IP 03: Welperort 7



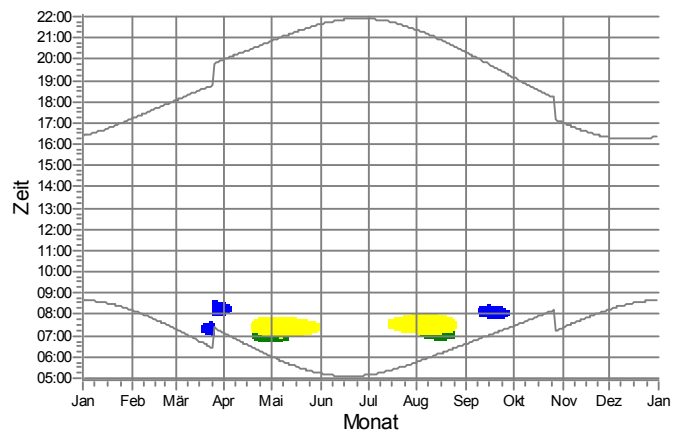
IP 04: Welperort 7



IP 05: Welperort 10



IP 06: Welperort 14



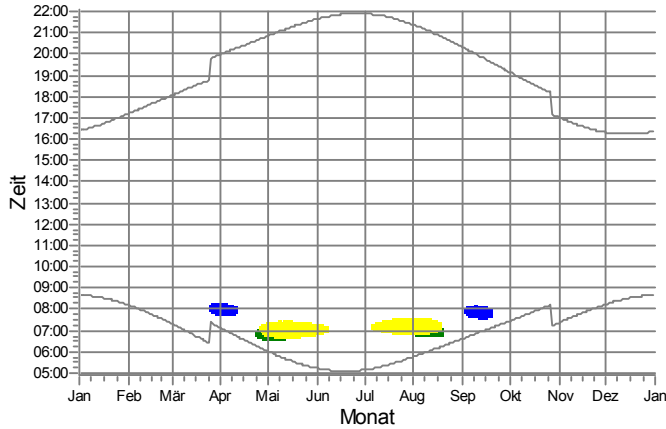
WEA

- WEA 17-1: E-138 EP3 E2 TES
- WEA 17-2: E-138 EP3 E2 TES
- WEA 17-3: E-138 EP3 E2 TES

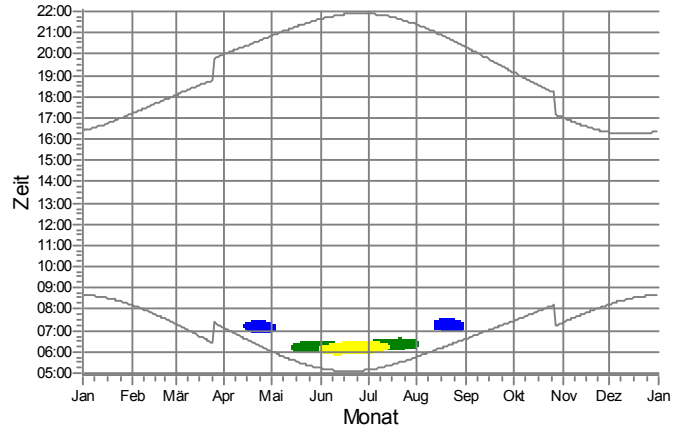
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

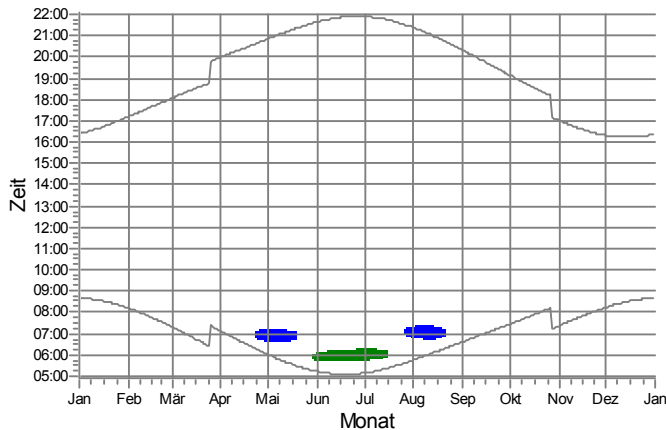
IP 07: Welperort 16



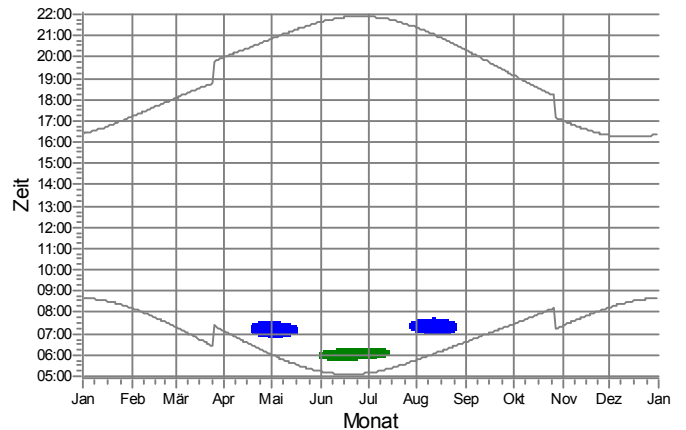
IP 08: Welperort 24



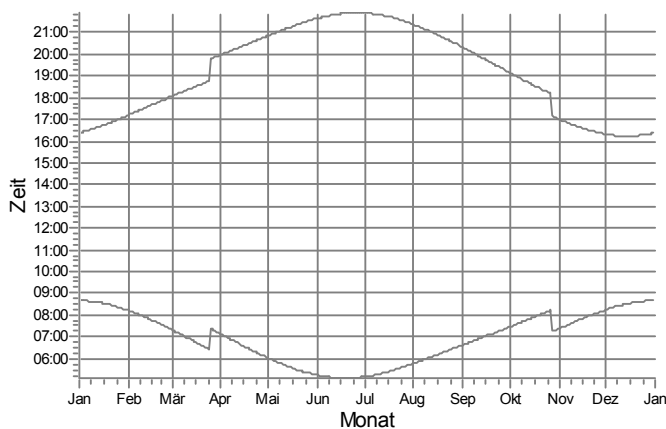
IP 09: Welperort 20



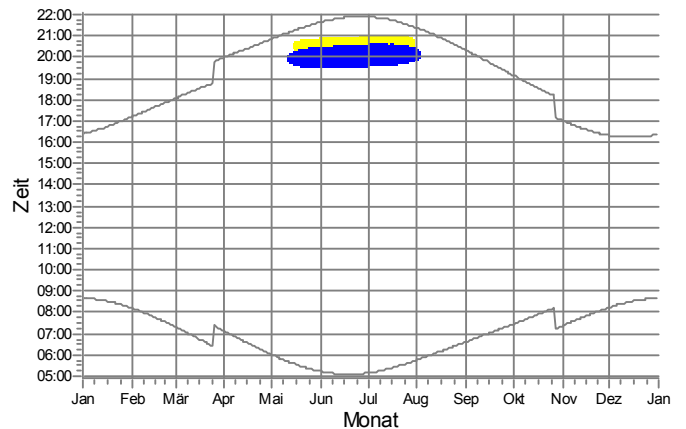
IP 10: Welperort 19



IP 11a: Große Haar 2/Ost



IP 11b: Große Haar 2/West



WEA

WEA 17-1: E-138 EP3 E2 TES

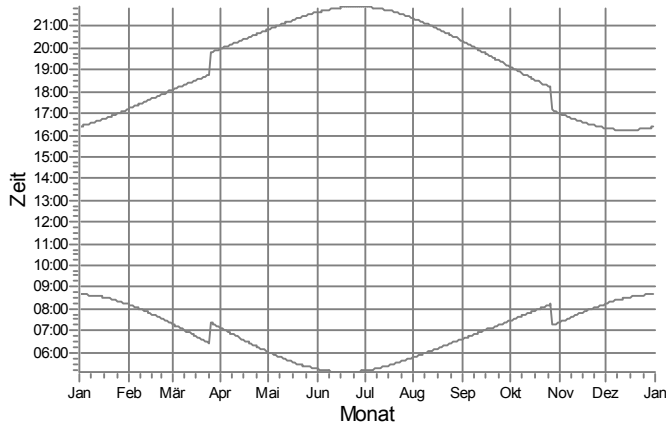
WEA 17-2: E-138 EP3 E2 TES

WEA 17-3: E-138 EP3 E2 TES

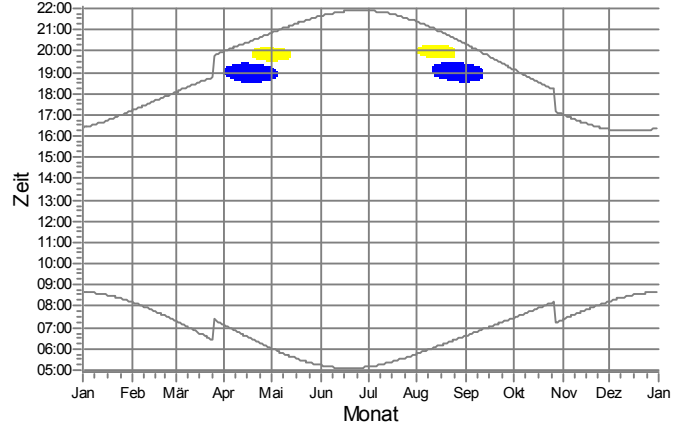
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

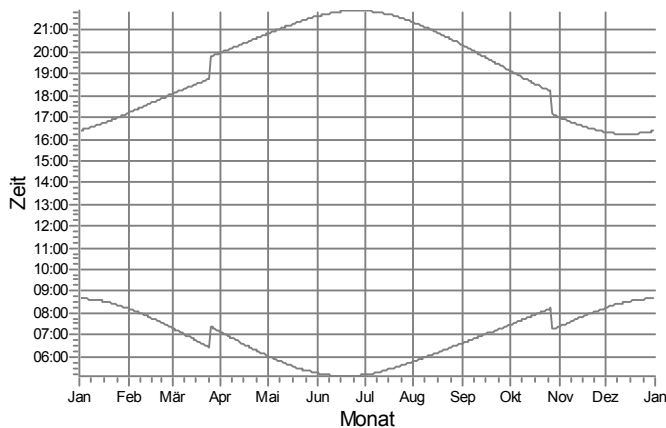
IP 12a: Holle 10/Ost



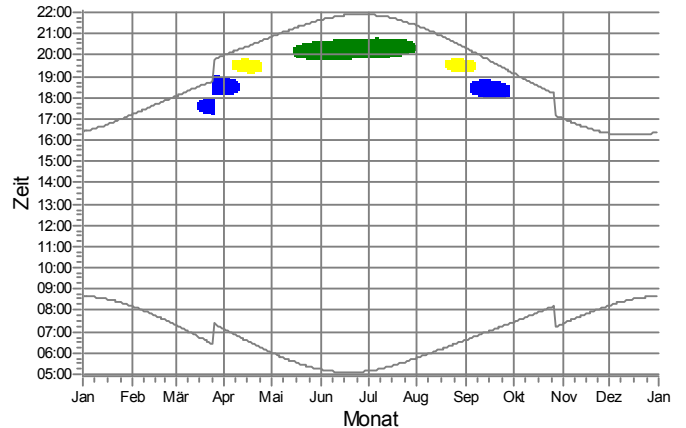
IP 12b: Holle 10/West



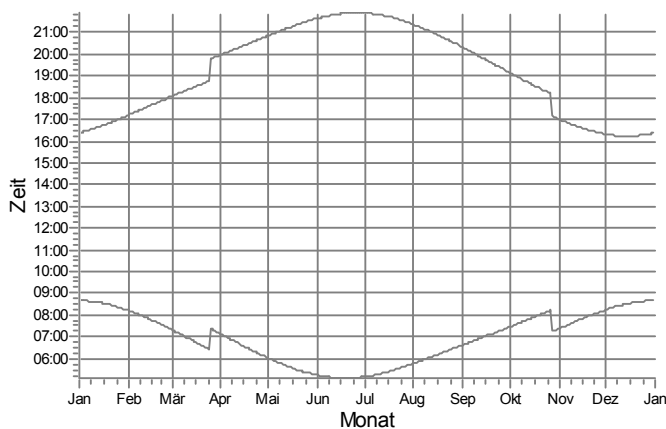
IP 13a: Holle 9/Ost



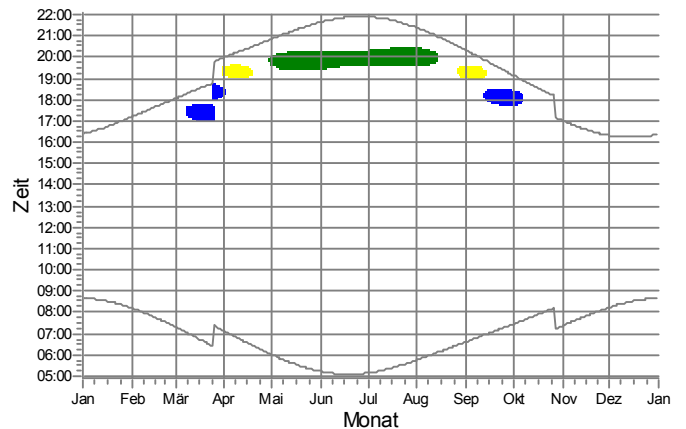
IP 13b: Holle 9/West



IP 14a: Holle 7/Ost



IP 14b: Holle 7/West



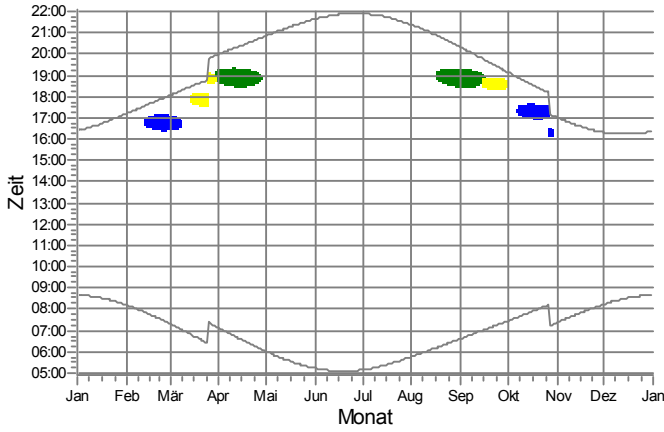
WEA

- WEA 17-1: E-138 EP3 E2 TES
- WEA 17-2: E-138 EP3 E2 TES
- WEA 17-3: E-138 EP3 E2 TES

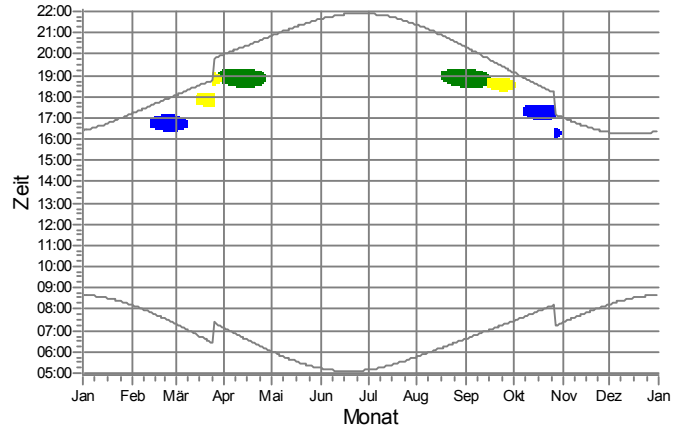
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

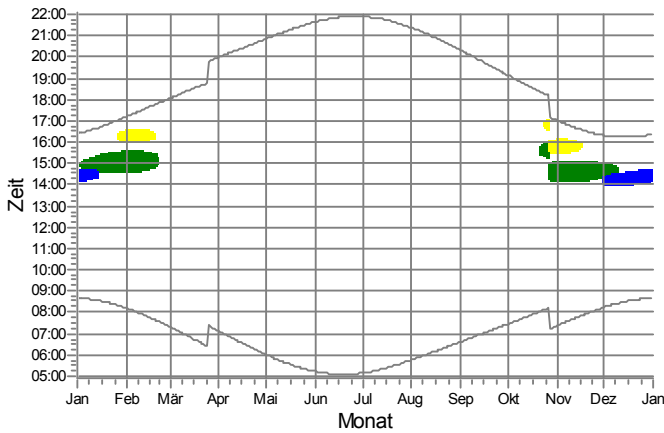
IP 15a: Holle 5/Süd



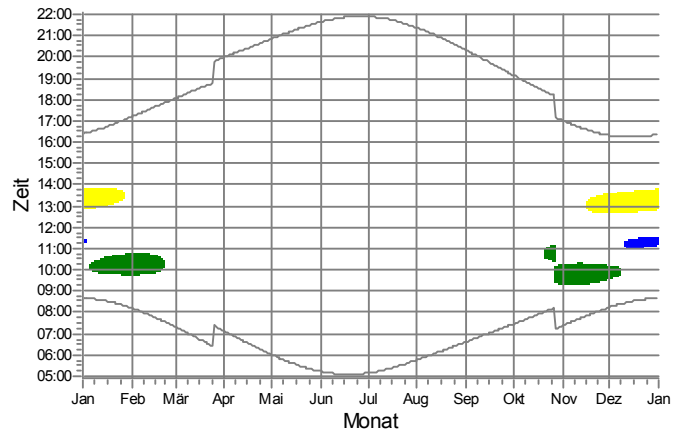
IP 15b: Holle 5/West



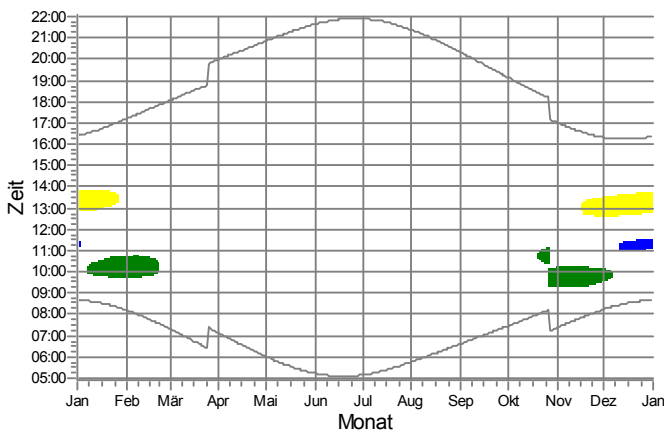
IP 16: Holle 2



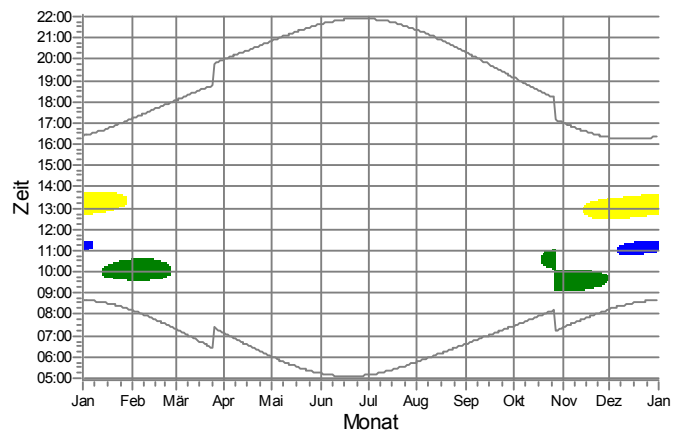
IP 17a: Neuenstadt 25/Südost



IP 17b: Neuenstadt 25/Südwest



IP 18a: Neuenstadt 25A/Südost



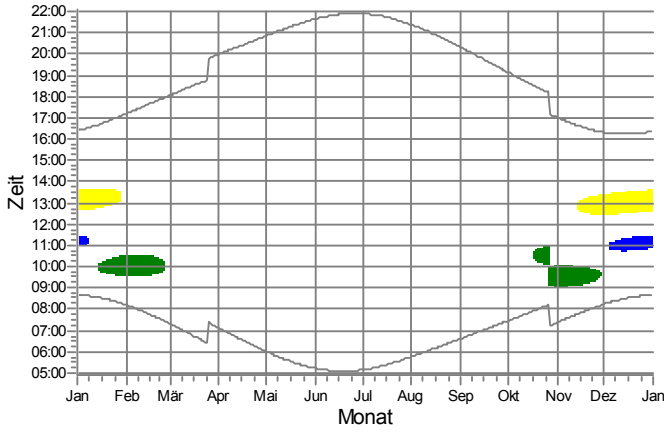
WEA

- WEA 17-1: E-138 EP3 E2 TES
- WEA 17-2: E-138 EP3 E2 TES
- WEA 17-3: E-138 EP3 E2 TES

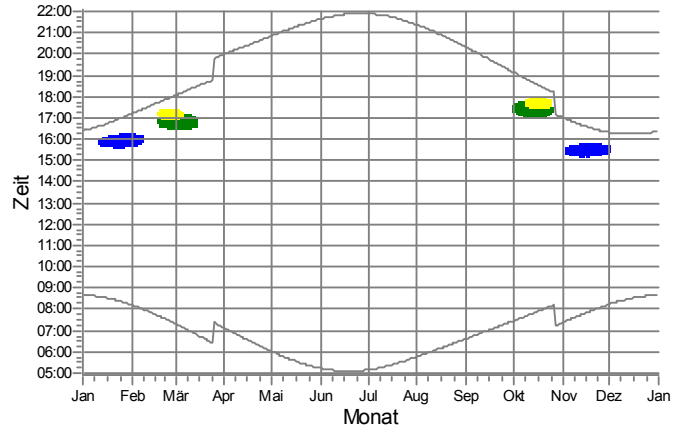
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

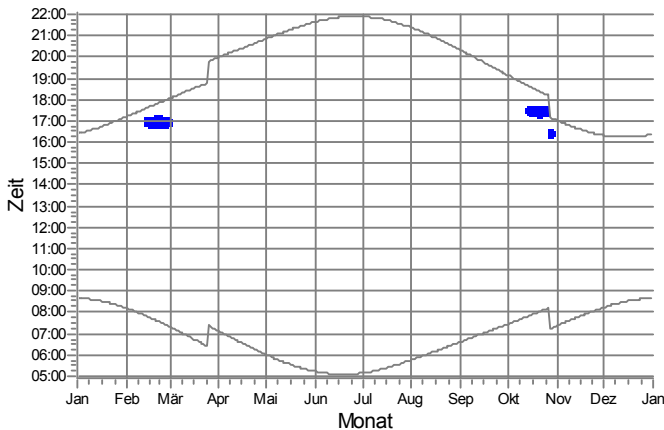
IP 18b: Neuenstadt 25/Südwest



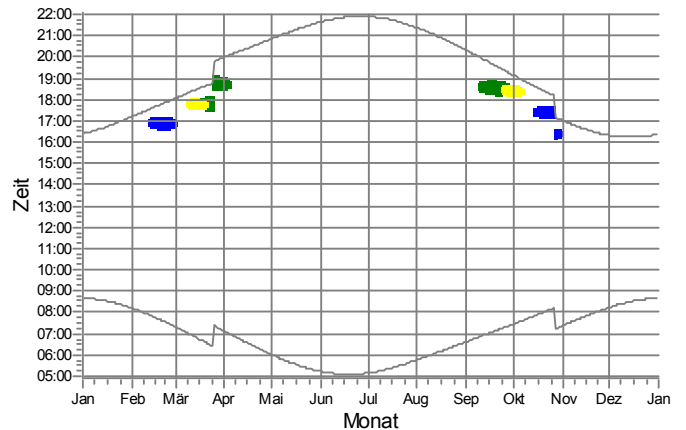
IP 19: Holle 2/Südost



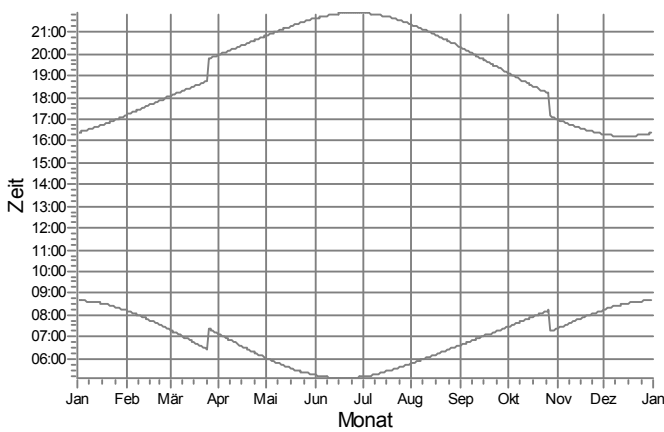
IP 20a: Zur Dasslage 1/Südost



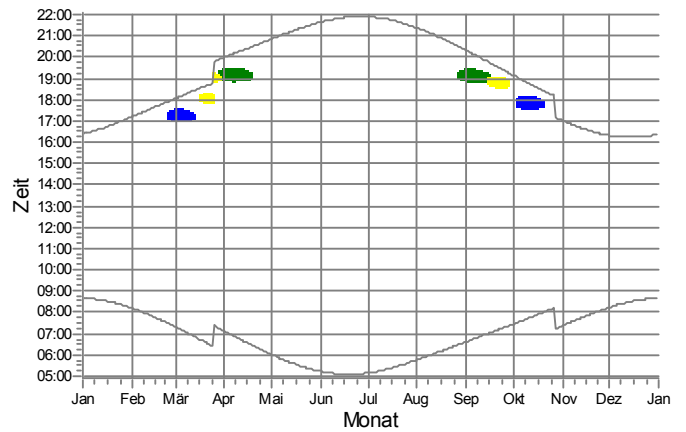
IP 20b: Zur Dasslage 1/Südwest



IP 21a: Zur Dasslage 3/Südost



IP 21b: Zur Dasslage 3/Südwest



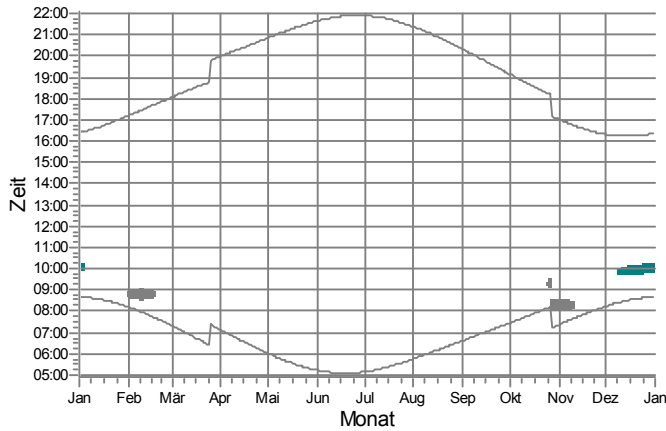
WEA

- WEA 17-1: E-138 EP3 E2 TES
- WEA 17-2: E-138 EP3 E2 TES
- WEA 17-3: E-138 EP3 E2 TES

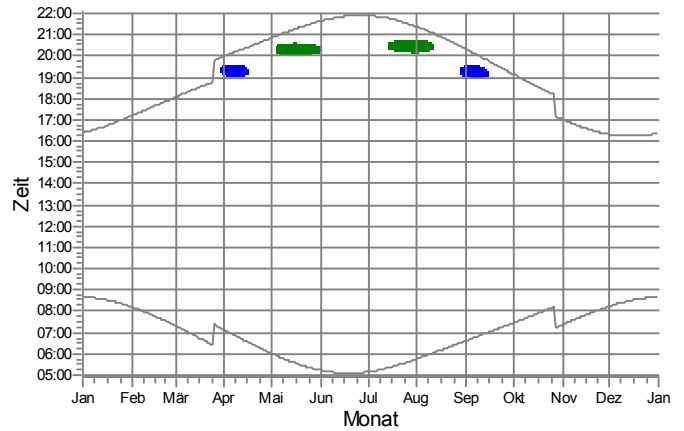
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

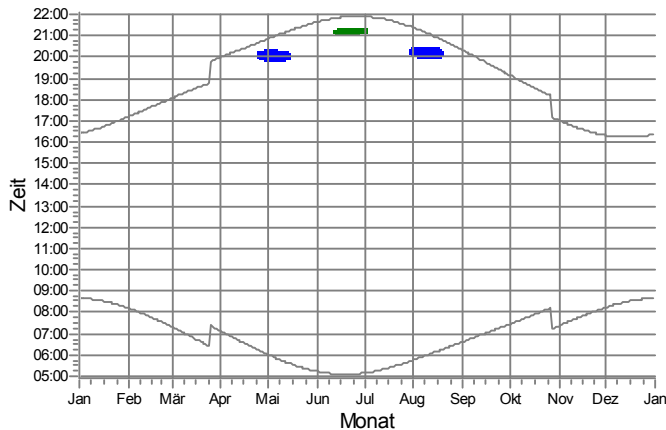
IP 22a: Zur Dasslage 4/Südost



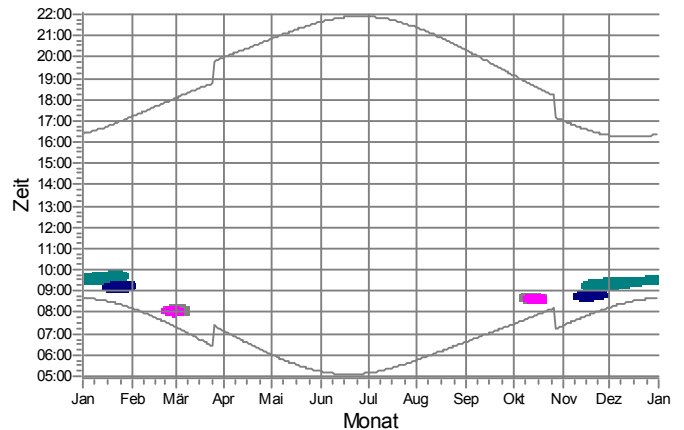
IP 22b: Zur Dasslage 4/Nordwest



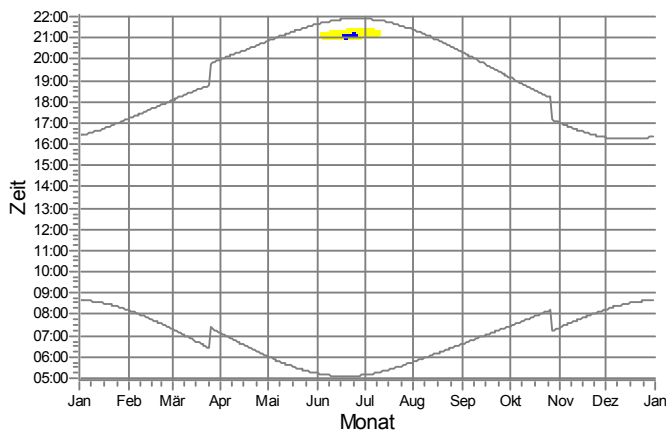
IP 23a: Große Haar 9/Nordwest



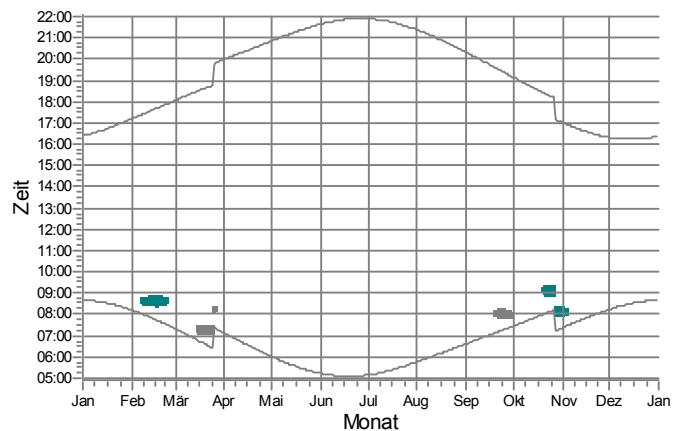
IP 23b: Große Haar 9/Südost



IP 24a: Große Haar 7/Nordwest



IP 24b: Große Haar 7/Südost



WEA

WEA 17-1: E-138 EP3 E2 TES
 WEA 17-2: E-138 EP3 E2 TES
 WEA 17-3: E-138 EP3 E2 TES

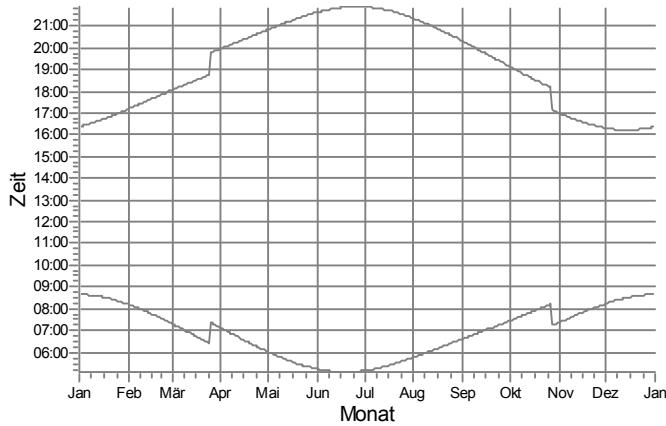
WEA 18-1: E-138 EP3 E2 TES
 WEA 18-2: E-138 EP3 E2 TES
 WEA 18-3: E-138 EP3 E2 TES

WEA 18-4: E-138 EP3 E2 TES

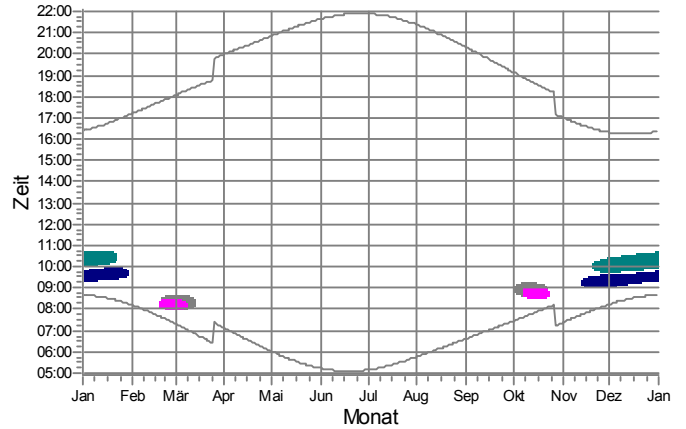
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

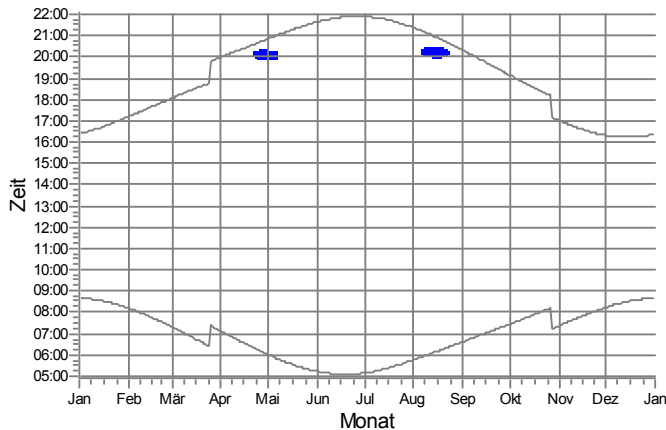
IP 25a: Zur Dasslage 7A/Nordwest



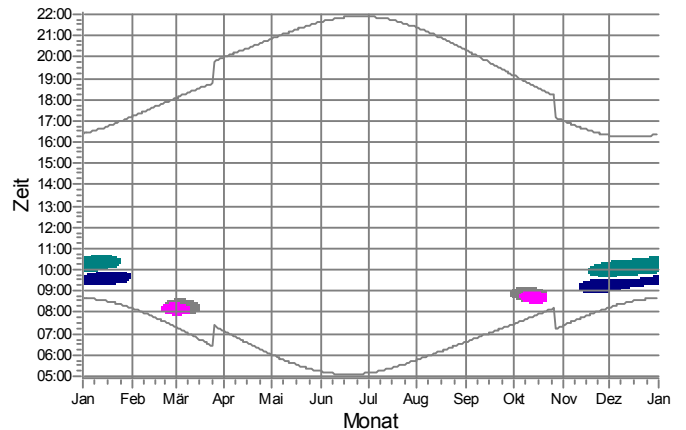
IP 25b: Zur Dasslage 7A/Südost



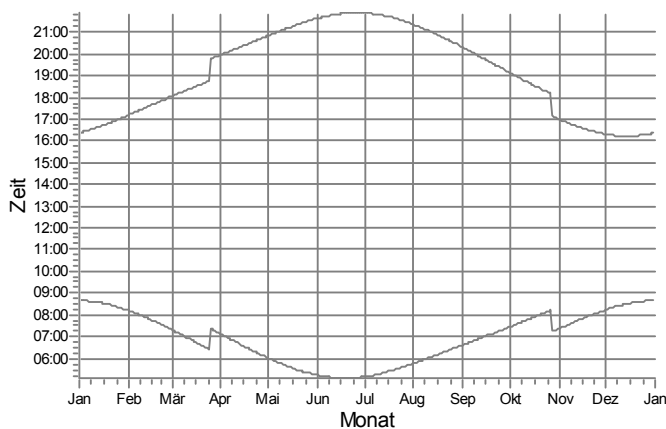
IP 26a: Zur Dasslage 7/Nordwest



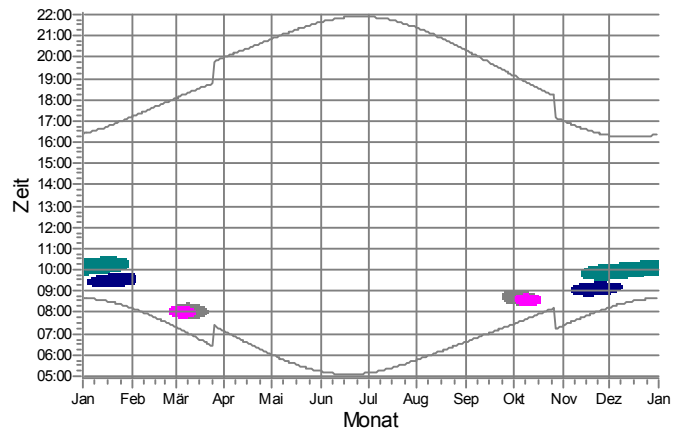
IP 26b: Zur Dasslage 7/Südost



IP 27a: Zur Dasslage 7/Nordwest



IP 27b: Zur Dasslage 8/Südost



WEA

WEA 17-3: E-138 EP3 E2 TES
 WEA 18-1: E-138 EP3 E2 TES

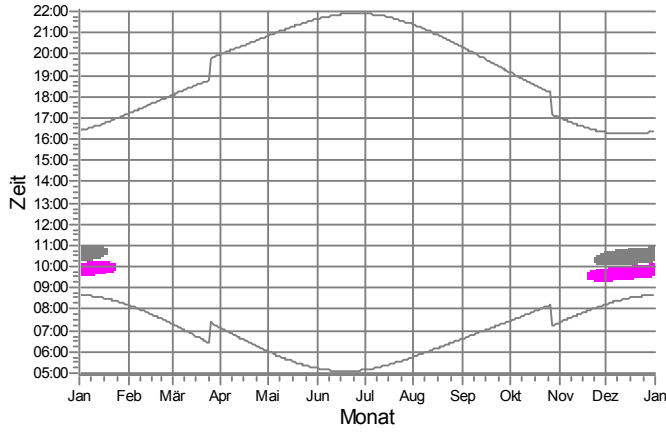
WEA 18-2: E-138 EP3 E2 TES
 WEA 18-3: E-138 EP3 E2 TES

WEA 18-4: E-138 EP3 E2 TES

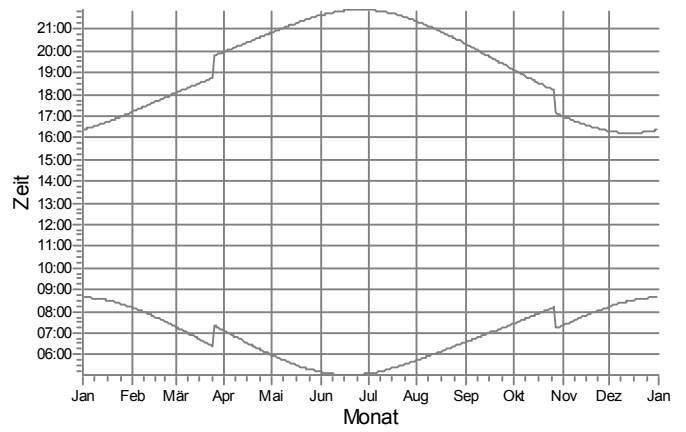
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

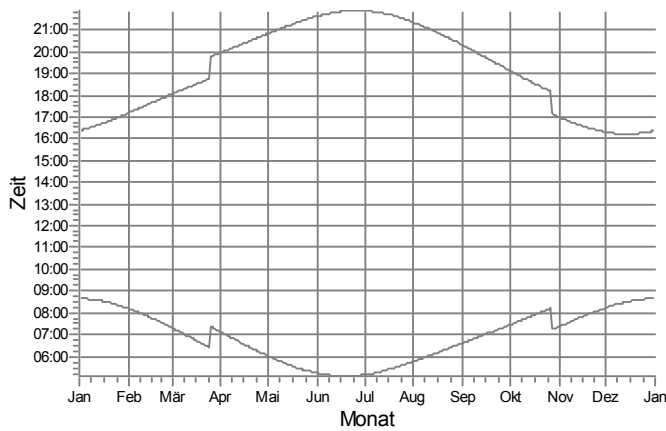
IP 28a: Hörsten 6/Südost



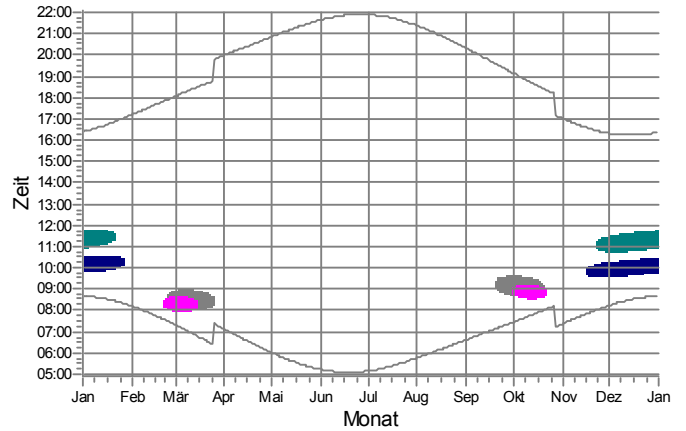
IP 28b: Hörsten 6/West



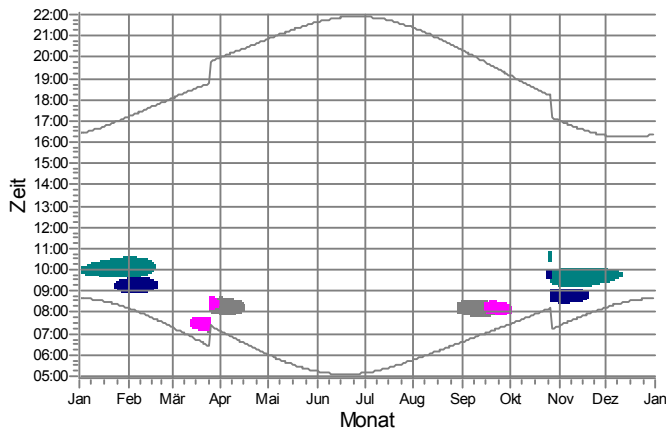
IP 29a: Zur Dasslage 6/Nordost



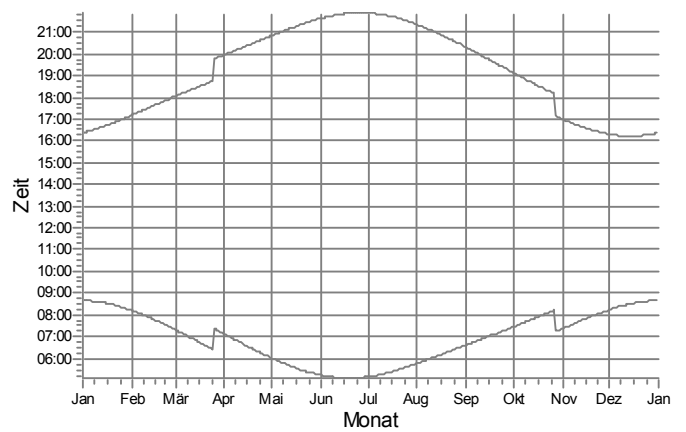
IP 29b: Zur Dasslage 6/Südwest



IP 30a: Zur Dasslage 11/Südost



IP 30b: Zur Dasslage 11/Südwest

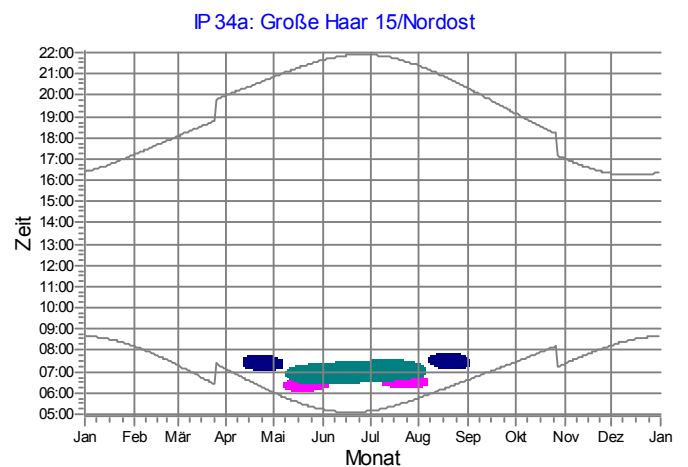
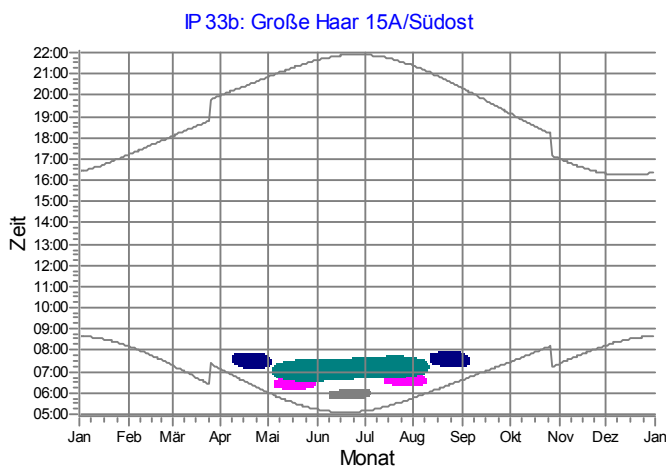
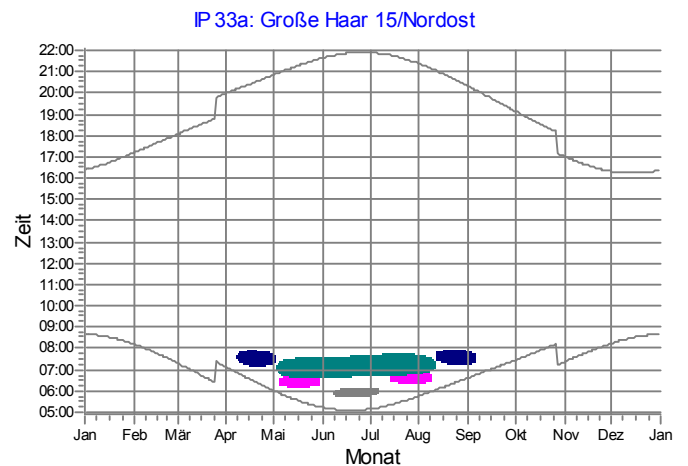
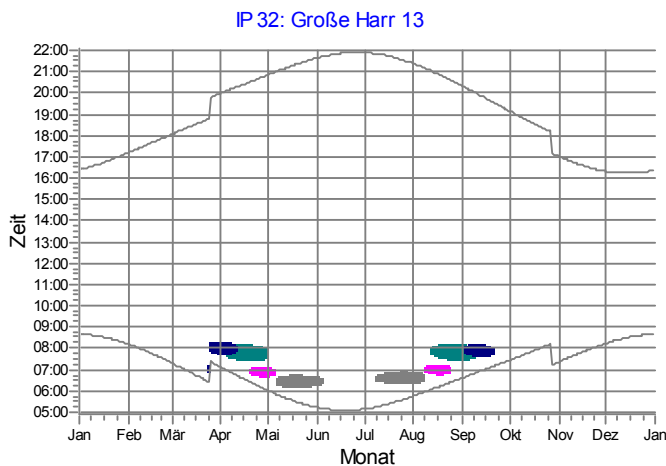
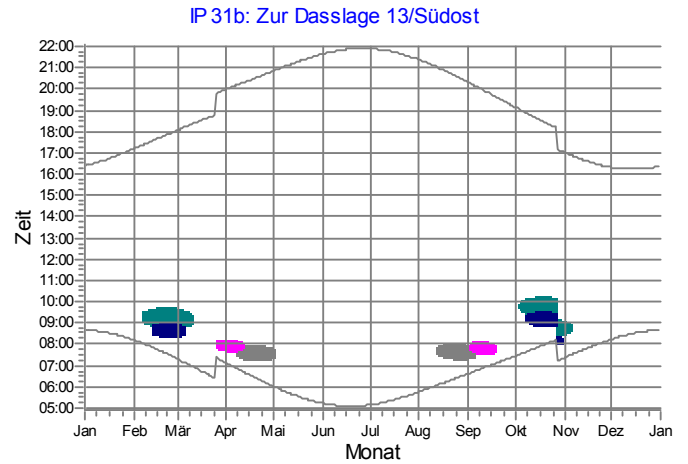
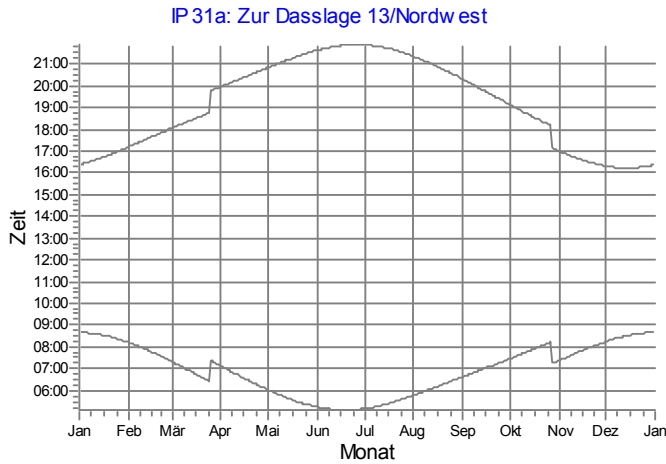


WEA

- | | | | |
|---|----------------------------|---|----------------------------|
|  | WEA 18-1: E-138 EP3 E2 TES |  | WEA 18-3: E-138 EP3 E2 TES |
|  | WEA 18-2: E-138 EP3 E2 TES |  | WEA 18-4: E-138 EP3 E2 TES |

SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12



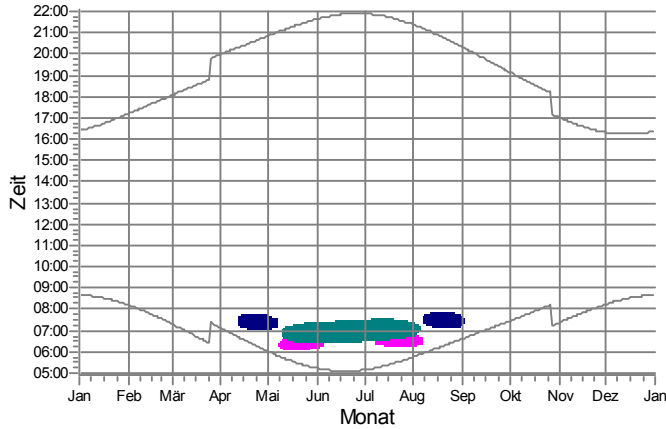
WEA



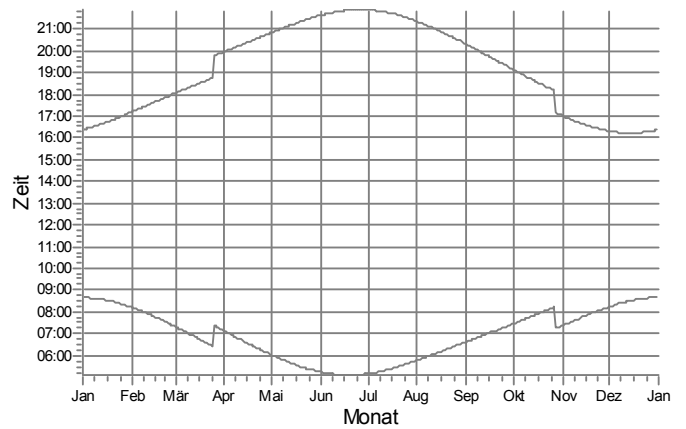
SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

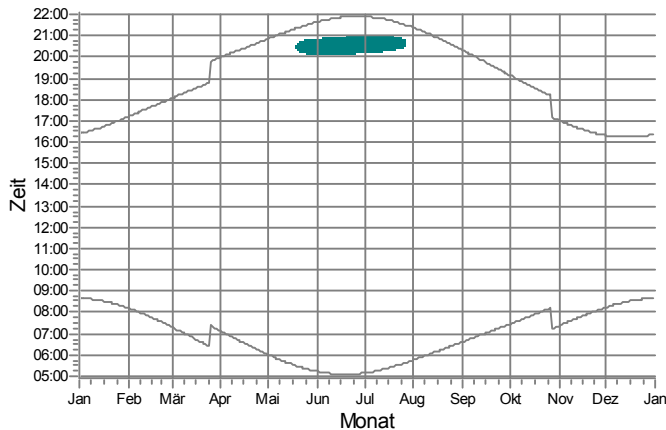
IP 34b: Große Haar 15/Südost



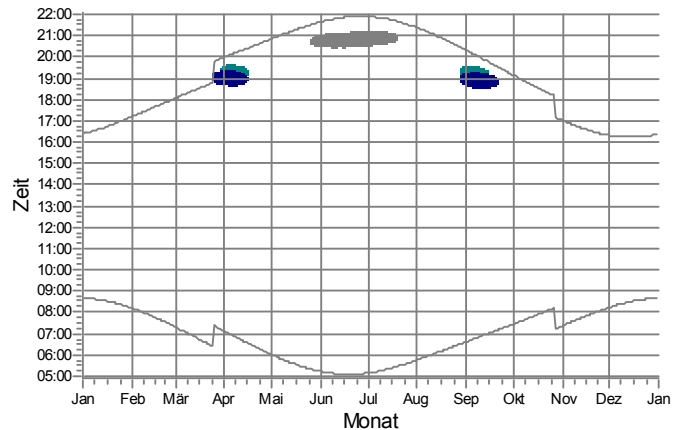
IP 35: Pius 24



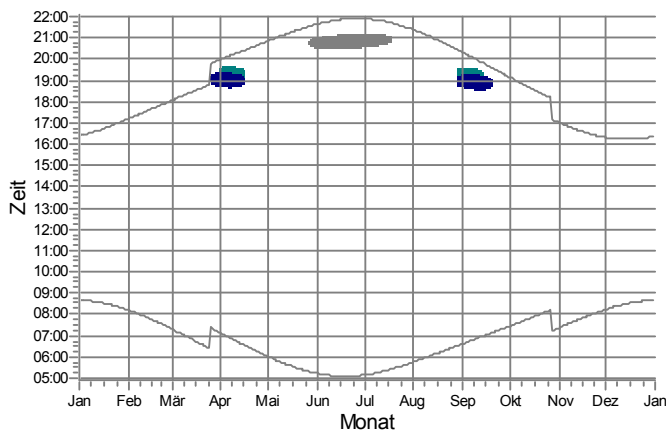
IP 36: Bruchstraße 6



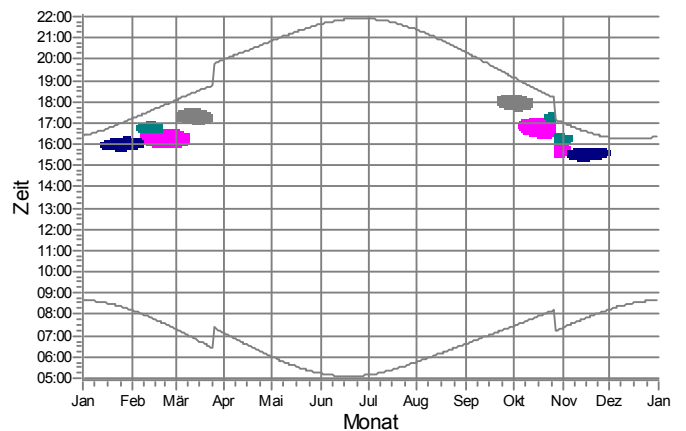
IP 37a: Bruchstraße 4/Nordwest



IP 37b: Bruchstraße 4/Südwest



IP 38: Wielage 5



WEA



Projekt:

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

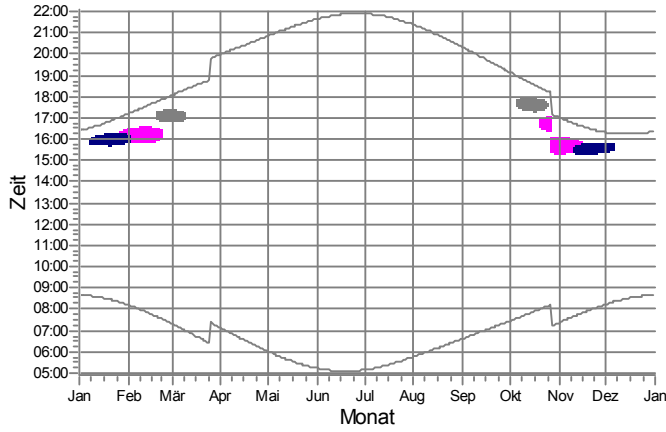
Lizenziertes Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Grafischer Kalender

Berechnung: Windenergie Hollenstede 2018-12

IP 39: Wielage 4



WEA



WEA 18-1: E-138 EP3 E2 TES



WEA 18-2: E-138 EP3 E2 TES



WEA 18-4: E-138 EP3 E2 TES

Anlage 7: Tabellarische Darstellung der Beschattungszeiten an der Immissionspunkten für
die jeweilige Windenergieanlage

Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
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Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 17-1 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2018**

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39	08:12	07:17	07:06	07:06	07:06
2	16:23	17:12	18:04	18:00	18:00	18:00
3	16:24	17:13	18:06	18:01	18:01	18:01
4	16:25	17:15	18:08	18:03	18:03	18:03
5	16:28	17:19	18:12	18:07	18:07	18:07
6	16:32	17:25	18:18	18:13	18:13	18:13
7	16:30	17:23	18:15	18:11	18:11	18:11
8	16:37	17:31	18:24	18:19	18:19	18:19
9	16:36	17:30	18:23	18:18	18:18	18:18
10	16:34	17:29	18:22	18:17	18:17	18:17
11	16:35	17:30	18:23	18:18	18:18	18:18
12	16:37	17:32	18:25	18:20	18:20	18:20
13	16:39	17:34	18:27	18:22	18:22	18:22
14	16:40	17:36	18:28	18:23	18:23	18:23
15	16:42	17:38	18:30	18:25	18:25	18:25
16	16:43	17:40	18:32	18:27	18:27	18:27
17	16:45	17:42	18:34	18:29	18:29	18:29
18	16:47	17:44	18:36	18:31	18:31	18:31
19	16:48	17:46	18:38	18:33	18:33	18:33
20	16:50	17:48	18:40	18:35	18:35	18:35
21	16:52	17:50	18:42	18:37	18:37	18:37
22	16:53	17:51	18:43	18:38	18:38	18:38
23	16:55	17:53	18:45	18:40	18:40	18:40
24	16:57	17:55	18:47	18:42	18:42	18:42
25	16:59	17:57	18:49	18:44	18:44	18:44
26	17:01	17:59	18:51	18:46	18:46	18:46
27	17:02	18:00	18:52	18:47	18:47	18:47
28	17:04	18:02	18:54	18:49	18:49	18:49
29	17:06	18:04	18:56	18:51	18:51	18:51
30	17:08	18:06	18:58	18:53	18:53	18:53
31	17:10	18:08	19:00	18:55	18:55	18:55
Sonnenscheinstunden	256	275	366	416	487	502
Anzahl Minuten mit Schatten	2096	2625	1797	1737	2456	3028

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

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

Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
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Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12 WEA: WEA 17-1 - E-138 EP3 E2 TES Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:08 05:50-06:13/23 19:41-20:42/61	05:45 06:52-07:03/11	06:36 07:43-08:00/17	07:26 08:05-08:31/26	07:21 09:08-10:11/63	08:14 09:39-10:07/28
2	21:54 06:13-06:25/12 21:13-21:17/4	21:22 19:40-20:42/62	20:19 18:32-19:22/50	19:08 17:22-17:32/10	17:01 14:12-15:00/48	16:19 14:27-14:57/30
3	05:09 05:50-06:13/23 19:42-20:42/60	05:47 06:50-07:04/14	06:38 07:40-08:01/21	07:28 08:05-08:30/25	07:23 09:08-10:11/63	08:15 09:40-10:05/25
4	21:54 06:13-06:26/13	21:20 19:40-20:41/61	20:17 18:31-19:22/51	19:06 17:18-17:36/18	16:59 14:12-15:01/49	16:18 14:27-14:55/28
5	05:10 05:50-06:13/23 19:41-20:42/61	05:49 06:49-07:06/17	06:40 07:39-08:02/23	07:30 08:05-08:29/24	07:25 09:08-10:12/64	08:17 09:42-10:05/23
6	21:53 06:13-06:26/13	21:19 19:41-20:41/60	20:14 18:31-19:22/51	19:04 17:14-17:37/23	16:57 14:11-15:01/50	16:17 14:29-14:55/26
7	05:11 05:51-06:13/22 19:41-20:42/61	05:50 06:47-07:07/20 19:41-20:40/59	06:41 07:38-08:03/25	07:32 08:06-08:28/22	07:27 09:08-10:12/64	08:18 09:44-10:03/19
8	21:53 06:13-06:27/14	21:17 07:07-07:12/5	20:12 18:30-19:22/52	19:01 17:13-17:39/26	16:55 14:11-15:02/51	16:17 14:30-14:54/24
9	05:11 05:52-06:13/21 19:41-20:42/61	05:52 06:47-07:09/22 19:42-20:40/58	06:43 07:37-08:03/26	07:33 08:07-08:26/19 17:11-17:40/29	07:29 09:08-10:13/65	08:19 09:46-10:03/17
10	21:53 06:13-06:28/15	21:15 07:09-07:15/6	20:10 18:31-19:22/51	18:59 08:42-08:43/1	16:53 14:11-15:02/51	16:16 14:32-14:53/21
11	05:12 05:52-06:13/21 19:41-20:43/62	05:53 06:46-07:09/23 19:42-20:38/56	06:45 07:36-08:03/27	07:35 08:10-08:25/15 17:10-17:41/31	07:31 09:08-10:13/65	08:21 09:48-10:01/13
12	21:52 06:13-06:29/16	21:13 07:09-07:16/7	20:07 18:31-19:22/51	18:57 08:37-08:48/11	16:52 14:10-15:02/52	16:16 14:34-14:52/18
13	05:13 05:53-06:13/20 19:40-20:42/62	05:55 06:46-07:10/24 19:43-20:17/34	06:46 07:35-08:03/28	07:37 08:12-08:21/9 17:08-17:41/33	07:32 09:08-10:13/65	08:22 09:51-09:59/8
14	21:51 06:13-06:29/16	21:11 07:10-07:18/8 20:19-20:38/19	20:05 18:31-19:21/50	18:54 08:34-08:50/16	16:50 14:10-15:02/52	16:15 14:36-14:51/15
15	05:14 05:53-06:13/20 19:40-20:42/62	05:57 06:45-07:09/24 19:43-20:16/33	06:48 07:35-08:03/28	07:38 08:32-08:51/19	07:34 09:09-10:13/64	08:23 14:38-14:50/12
16	21:51 06:12-06:29/17	21:10 07:09-07:18/9 20:20-20:36/16	20:03 18:32-19:21/49	18:52 17:07-17:42/35	16:48 14:10-15:03/53	16:15
17	05:15 05:53-06:13/20 19:40-20:42/62	05:58 06:45-07:10/25 19:45-20:15/30	06:50 07:35-08:03/28 18:43-19:19/36	07:40 08:31-08:52/21	07:36 09:09-10:13/64	08:24 14:41-14:47/6
18	21:50 06:12-06:30/18	21:08 07:10-07:19/9 20:23-20:34/11	20:00 18:32-18:44/12	18:50 17:06-17:42/36	16:46 14:10-15:03/53	16:14
19	05:16 05:54-06:11/17 19:40-20:42/62	06:00 06:44-07:10/26 19:46-20:13/27	06:51 07:34-08:02/28 18:47-19:19/32	07:42 08:30-08:53/23	07:38 09:09-10:13/64	08:26
20	21:49 06:11-06:30/19	21:06 07:10-07:19/9 20:26-20:29/3	19:58 18:29-18:48/19	18:47 17:06-17:42/36	16:45 14:10-15:03/53	16:14
21	05:17 05:55-06:11/16 19:40-20:42/62	06:01 06:45-07:10/25 19:48-20:11/23	06:53 07:35-08:01/26 18:27-18:50/23	07:44 08:30-08:53/23	07:40 09:10-10:14/64	08:27
22	21:49 06:11-06:31/20	21:04 07:10-07:20/10	19:56 08:07-08:17/10 18:49-19:18/29	18:45 17:04-17:41/37	16:43 14:11-15:03/52	16:14
23	05:18 05:56-06:10/14 19:40-20:42/62	06:03 06:44-07:09/25 19:49-20:09/20	06:55 07:34-08:00/26 18:24-18:50/26	07:45 08:28-08:52/24	07:42 09:10-10:14/64	08:28
24	21:48 06:11-06:31/20	21:02 07:09-07:20/11	19:53 08:04-08:19/15 18:49-19:16/27	18:44 17:04-17:41/37	16:41 14:11-15:03/52	16:14
25	05:19 05:57-06:08/11 19:39-20:42/63	06:05 06:45-07:09/24 19:53-20:06/13	06:56 07:35-07:59/24 18:23-18:51/28	07:47 08:28-08:52/24	07:43 09:11-10:13/62	08:29
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Sonnenscheinstunden	505	456	382	332	265	241
Anzahl Minuten mit Schatten	2751	1756	2045	2126	3059	313

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

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



Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12WEA: WEA 17-2 - E-138 EP3 E2 TES Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 12:43-13:44/61	08:12 09:07-09:39/32	07:17 08:26-09:08/42 16:59-17:20/21	07:06 08:39-09:16/37	07:59 06:48-07:18/30 19:36-20:05/29	05:12 06:03-06:10/7 20:18-20:48/30
	16:23	17:12 16:05-16:29/24	18:04 09:08-09:11/3	20:00 19:16-19:29/13	21:39 06:51-07:14/23	21:39 06:51-07:14/23
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	17:01	17:59 16:58-17:22/24	19:49 18:39-19:09/30	20:43 07:07-07:44/37	21:32 07:18-07:34/16	21:55 20:23-20:52/29
27	08:19 09:08-09:35/27 16:14-16:20/6	07:22 08:27-09:11/44	07:17 08:37-09:22/45	06:08 06:56-07:12/16 19:38-20:05/27	05:18 06:47-07:18/31 20:17-20:47/30	05:06 05:58-06:25/27 21:03-21:21/18
	17:02	18:01 16:59-17:22/23	19:51 18:40-19:08/28	20:45 07:12-07:45/33	21:33 07:18-07:33/15	21:56 20:24-20:53/30
28	08:18 09:07-09:35/28 16:16-16:23/13	07:20 08:26-09:10/44 16:58-17:20/22	07:15 08:38-09:22/44	06:05 06:53-07:14/21 19:37-20:05/28	05:16 06:47-07:17/30 20:17-20:47/30	05:07 05:58-06:25/27 21:03-21:21/18
	17:04	18:03 09:10-09:11/1	19:53 18:42-19:06/24	20:47 07:14-07:31/14	21:34 07:17-07:31/14	21:55 20:23-20:52/29
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30	08:15 09:07-09:37/30		07:10 08:38-09:19/41	06:01 06:49-07:17/28 19:37-20:05/28	05:14 06:49-07:15/26 20:17-20:47/30	05:08 05:56-06:24/26 21:04-21:21/17
	17:08	16:07-16:27/20	19:56	20:50 07:17-07:46/29	21:37 07:18-07:27/9	21:54 20:23-20:53/30
31	08:13 09:06-09:38/32		07:08 08:39-09:18/39		05:13 06:51-07:15/24	
	17:10	16:06-16:28/22	19:58 19:21-19:25/4		21:38 20:17-20:47/30	
Sonnenscheinstunden	256	275	366	416	487	502
Anzahl Minuten mit Schatten	1738	1832	2277	1493	2381	2167

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

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



Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 17-2 - E-138 EP3 E2 TES
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember	
1	05:08 05:59-06:25/26 21:04-21:21/17 21:54 20:24-20:54/30	05:45 06:52-07:33/41 21:22 07:33-07:55/22	06:36 19:07-19:32/25 20:19 19:32-19:43/11	07:26 08:26-09:02/36 18:15-18:36/21 19:08 09:07-09:42/35	07:21 08:13-08:34/21 15:34-16:03/29 17:01 08:39-09/28	08:14 12:32-13:29/57 16:19	
2	05:09 06:00-06:25/25 21:05-21:22/17 21:54 20:24-20:54/30	05:47 06:52-07:33/41 19:58-20:02/4 21:20 07:33-07:55/22	06:38 19:06-19:32/26 20:17 19:32-19:42/10	07:28 08:27-09:01/34 18:15-18:36/21 19:06 09:06-09:44/38	07:23 08:16-08:32/16 15:33-16:03/30 16:59 08:39-09/28	08:15 12:31-13:29/58 16:18	
3	05:10 06:00-06:24/24 21:05-21:21/16 21:53 20:24-20:54/30	05:49 06:52-07:33/41 19:55-20:06/11 21:19 07:33-07:55/22	06:40 19:05-19:32/27 20:14 19:32-19:41/9	07:30 08:28-08:58/30 18:15-18:34/19 19:04 09:04-09:44/40	07:25 08:19-08:28/9 15:33-16:03/30 16:57 08:39-09/28	08:17 12:32-13:30/58 16:17	
4	05:11 06:01-06:24/23 21:06-21:21/15 21:53 20:24-20:54/30	05:50 06:52-07:32/40 19:52-20:08/16 21:17 07:32-07:55/23	06:41 19:04-19:31/27 20:12 19:31-19:39/8	07:32 08:30-08:56/26 18:16-18:33/17 19:01 09:03-09:45/42	07:27 08:37-09/29/32 16:55 15:33-16:03/30	08:18 12:32-13:30/58 16:17	
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7	05:13 06:04-06:24/20 20:24-20:55/31 21:51 07:05-07:15/10 21:07-21:11/2	05:55 06:53-07:32/39 19:49-20:11/22 21:11 07:32-07:56/24	06:46 08:44-08:58/14 20:05 19:04-19:29/25	07:37 09:00-09:45/45 18:54 18:21-18:26/5	07:32 08:37-09/10/33 16:50 15:34-16:03/29	08:22 12:33-13:33/60 16:15	
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31	05:44 06:52-07:33/41 21:24 07:33-07:54/21	06:35 19:08-19:31/23 20:21 19:31-19:43/12	 382	 332	 265	08:39 12:43-13:44/61 16:22 241	
	Sonnenscheinstunden Anzahl Minuten mit Schatten	505 2223	456 2052	382 1878	332 2084	265 1730	1875

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

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

Projekt:

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12WEA: WEA 17-3 - E-138 EP3 E2 TES Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Januar	Februar	März	April	Mai	Juni
1 08:39 11:00-11:24/24 16:23 14:11-14:39/28	08:12 08:56-09:18/22 17:12 15:45-16:09/26	07:17 08:03-08:31/28 16:56-17:01/5 18:04 16:29-16:58/29 17:04-17:29/25	07:06 07:45-08:12/27 18:14-18:52/38 20:00 08:12-08:26/14 19:12-19:30/18	05:59 06:41-07:11/30 18:46-19:08/22 20:52 07:10-07:29/19 19:52-20:16/24	05:12 19:33-20:24/51 21:39 19:33-20:24/51
2 08:39 11:02-11:39/21 16:24 14:12-14:30/27	08:10 08:59-09:18/22 17:13 15:44-16:10/26	07:15 08:03-08:31/28 17:04-17:29/25 18:06 16:30-17:00/30	07:03 07:45-08:12/27 18:15-18:51/36 20:01 08:12-08:25/13 19:00-19:06/6	05:57 06:40-07:11/31 18:49-19:05/16 20:54 07:10-07:28/18 19:52-20:16/24	05:12 19:33-20:24/51 21:40 19:33-20:24/51
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Sonnenscheinstunden 256 Anzahl Minuten mit Schatten 1020	275 1684	366 1997	416 2395	487 1789	502 1619

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

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

Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12WEA: WEA 17-3 - E-138 EP3 E2 TES Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli	August	September	Oktober	November	Dezember
1 05:08 19:38-20:31/53 21:54	05:45 06:53-07:17/24 19:58-20:22/24 21:22 07:17-07:32/15	06:36 18:39-19:27/48 20:32	07:26 17:49-18:21/32 19:08	07:21 08:02-08:28/26 17:01	08:14 14:05-14:19/14 15:30-15:35/55
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Sonnenscheinstunden 505 Anzahl Minuten mit Schatten	456 2313	382 2283	332 2003	265 1109	241 1502

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

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

Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-1 - E-138 EP3 E2 TES
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38 10:20-10:52/32 16:23	08:11 17:11	07:17 07:55-08:34/39 16:51-17:19/28 18:04 08:33-08:50/17	07:05 07:58-08:36/38 20:00	05:59 07:26-07:38/12 20:52	05:12 06:21-06:35/14 21:39 20:34-20:57/23	
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	Sonnenscheinstunden Anzahl Minuten mit Schatten	256 464	275 816	366 2456	416 1123	487 636	502 1274

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

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

Projekt:

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
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Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-1 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember	
1	05:08 05:51-06:03/12 20:36-21:07/31 21:54 06:03-06:04/1	05:45 06:25-06:48/23 21:22	06:36 07:22-07:51/29 20:19 08:01-08:26/25	07:26 08:27-09:02/35 17:40-18:15/35 19:08 09:02-09:32/30	07:21 08:06-08:28/22 17:01	08:13 10:10-10:35/25 16:19	
2	05:09 05:52-06:03/11 20:35-21:06/31 21:54 06:03-06:04/1	05:47 06:25-06:47/22 21:20	06:38 07:22-07:49/27 20:17 07:58-08:27/29	07:28 08:26-09:03/37 17:39-18:14/35 19:06 09:03-09:31/28	07:23 08:06-08:28/22 16:59	08:15 10:09-10:36/27 16:18	
3	05:10 05:53-06:02/9 20:36-21:06/30 21:53 06:02-06:03/1	05:48 06:27-06:47/20 21:18	06:40 07:24-07:47/23 20:14 07:57-08:28/31	07:30 08:25-09:05/40 17:39-18:14/35 19:03 09:05-09:31/26	07:25 08:06-08:28/22 16:57	08:16 10:09-10:37/28 16:17	
4	05:10 05:54-06:00/6 20:37-21:07/30 21:53 06:00-06:02/2	05:50 06:27-06:46/19 21:17	06:41 07:25-07:44/19 20:12 07:55-08:28/33	07:31 08:25-09:07/42 17:39-18:13/34 19:01 09:07-09:31/24	07:27 08:06-08:28/22 16:55	08:18 10:09-10:37/28 16:17	
5	05:11 05:56-06:01/5 21:52 20:37-21:07/30	05:52 06:29-06:45/16 21:15	06:43 07:28-07:42/14 20:10 07:55-08:29/34	07:33 08:25-09:08/43 17:40-18:13/33 18:59 09:07-09:31/24	07:29 08:07-08:28/21 16:53	08:19 10:09-10:39/30 16:16	
6	05:12 20:37-21:06/29 21:52	05:53 06:30-06:43/13 21:13	06:45 07:34-07:36/2 20:07 07:54-08:30/36	07:35 08:24-09:08/44 17:35-18:11/36 18:57 09:07-09:30/23	07:30 08:07-08:27/20 16:51	08:20 10:09-10:39/30 16:16	
7	05:13 20:38-21:06/28 21:51	05:55 06:33-06:40/7 21:11	06:46 07:53-08:29/36 20:05	07:37 08:24-09:08/44 17:32-18:10/38 18:54 09:07-09:30/23	07:32 08:08-08:26/18 16:50	08:22 10:09-10:39/30 16:15	
8	05:14 20:38-21:06/28 21:51	05:56 21:09	06:48 07:52-08:30/38 20:03	07:38 08:25-09:09/44 17:30-18:09/39 18:52 09:08-09:29/21	07:34 08:09-08:25/16 16:48	08:23 10:10-10:41/31 16:15	
9	05:15 06:32-06:36/4 21:50 20:39-21:06/27	05:58 21:08	06:50 07:51-08:29/38 20:00	07:40 08:25-09:09/44 17:29-18:08/39 18:50 09:08-09:29/21	07:36 08:11-08:24/13 16:46	08:24 10:09-10:41/32 16:14	
10	05:16 06:31-06:39/8 21:49 20:40-21:05/25	06:00 21:06	06:51 07:51-08:29/38 19:58	07:42 08:26-09:09/43 17:26-18:06/40 18:47 09:08-09:28/20	07:38 08:13-08:22/9 16:45	08:25 10:09-10:42/33 16:14	
11	05:17 06:29-06:40/11 21:48 20:40-21:05/25	06:01 21:04	06:53 07:51-08:29/38 19:56	07:44 08:26-09:08/42 17:26-18:03/37 18:45 09:07-09:26/19	07:40 16:43	08:27 10:10-10:42/32 16:14	
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13	05:19 06:28-06:43/15 21:47 20:42-21:04/22	06:05 07:34-07:47/13 21:00	06:56 07:51-08:28/37 19:51	07:47 08:28-09:07/39 17:25-17:52/27 18:41 09:06-09:24/18	07:43 16:40	08:29 10:11-10:44/33 16:14	
14	05:20 06:27-06:43/16 21:46 20:43-21:03/20	06:06 07:31-07:49/18 20:58	06:58 07:50-08:27/37 19:48	07:49 08:28-09:06/38 17:24-17:52/28 18:38 09:05-09:23/18	07:45 16:38	08:30 10:11-10:44/33 16:14	
15	05:21 06:26-06:44/18 21:45 20:44-21:02/18	06:08 07:29-07:51/22 20:56	06:59 07:51-08:26/35 19:46	07:51 08:28-09:06/38 17:24-17:52/28 18:36 09:05-09:21/16	07:47 16:37	08:31 10:12-10:45/33 16:14	
16	05:23 06:27-06:46/19 21:44 20:45-21:01/16	06:10 07:27-07:52/25 20:54	07:01 07:52-08:25/33 19:44	07:52 08:29-09:05/36 17:24-17:52/28 18:34 09:04-09:20/16	07:49 16:35	08:32 10:12-10:46/34 16:14	
17	05:24 06:26-06:46/20 21:43 20:47-21:00/13	06:11 07:26-07:53/27 20:52	07:03 07:51-08:24/33 19:41	07:54 08:29-09:02/33 17:23-17:51/28 18:32 09:01-09:16/15	07:50 16:34	08:32 10:12-10:45/33 16:14	
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19	05:26 06:25-06:47/22 21:40	06:15 07:24-07:55/31 20:47	07:06 07:54-08:08/14 19:37 08:08-08:21/13	07:58 08:31-08:58/27 17:25-17:49/24 18:27 08:58-09:08/10	07:54 16:31	08:34 10:13-10:47/34 16:14	
20	05:28 06:24-06:47/23 21:39	06:16 07:24-07:56/32 20:45	07:08 07:54-08:09/15 09:06-09:18/12 19:34 08:09-08:18/9	07:59 08:33-08:55/22 17:25-17:48/23 18:25 08:55-09:02/7	07:56 16:30	08:35 10:13-10:47/34 16:15	
21	05:29 06:25-06:49/24 21:38	06:18 07:22-07:55/33 20:43	07:09 07:53-08:10/17 09:02-09:22/20 19:32 08:10-08:16/6 17:58-18:05/7	08:01 08:44-09:00/16 18:23 17:27-17:47/20	07:57 16:29	08:35 10:14-10:48/34 16:15	
22	05:31 06:24-06:49/25 21:37	06:20 07:22-07:56/34 20:41	07:11 07:52-08:11/19 08:59-09:25/26 19:29 08:11-08:13/2 17:52-18:08/16	08:03 08:47-08:57/10 18:21 17:28-17:45/17	07:59 16:27	08:36 10:15-10:49/34 16:15	
23	05:32 06:24-06:49/25 21:35	06:21 07:21-07:55/34 20:39	07:13 07:50-08:10/20 17:50-18:11/21 19:27 08:56-09:26/30	08:05 17:30-17:43/13 18:19	08:01 16:26	08:36 10:15-10:49/34 16:16	
24	05:33 06:24-06:50/26 21:34	06:23 07:21-07:56/35 20:37	07:15 07:50-08:10/20 17:48-18:12/24 19:25 08:55-09:28/33	08:07 17:35-17:39/4 18:17	08:02 16:25	08:37 10:15-10:49/34 16:16	
25	05:35 06:24-06:49/25 21:33	06:25 07:21-07:56/35 20:35	07:16 07:50-08:10/20 08:53-09:29/36 19:22 08:38-08:51/13 17:46-18:13/27	08:08 09:16-09:18/2 18:15	08:04 10:15-10:24/9 16:24	08:37 10:16-10:50/34 16:17	
26	05:36 06:23-06:49/26 21:31	06:26 07:20-07:55/35 20:32	07:18 07:49-08:08/19 17:44-18:14/30 19:20 08:34-09:29/55	08:10 09:12-09:23/11 18:12	08:06 10:13-10:27/14 16:23	08:38 10:16-10:50/34 16:18	
27	05:38 06:24-06:50/26 21:30	06:28 07:21-07:55/34 20:30	07:20 07:50-08:08/18 17:43-18:14/31 19:18 08:33-09:30/57	08:12 09:10-09:25/15 18:10	08:07 10:12-10:29/17 16:22	08:38 10:17-10:50/33 16:18	
28	05:39 06:24-06:49/25 21:28	06:30 07:20-07:54/34 20:28	07:21 07:50-08:07/17 17:43-18:15/32 19:15 08:31-09:31/60	07:14 08:08-08:26/18 17:08	08:09 10:12-10:31/19 16:21	08:38 10:17-10:51/34 16:19	
29	05:41 06:24-06:49/25 21:27	06:31 07:21-07:54/33 20:26 08:09-08:19/10	07:23 07:51-08:05/14 17:41-18:14/33 19:13 08:29-09:31/62	07:16 08:07-08:27/20 17:06	08:10 10:10-10:32/22 16:20	08:38 10:18-10:51/33 16:20	
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31	05:44 06:24-06:48/24 21:23	06:35 07:21-07:52/31 20:21 08:02-08:24/22	06:35 07:21-07:52/31 20:21 08:02-08:24/22	07:19 08:06-08:28/22 17:03	16:19	08:38 10:19-10:52/33 16:22	
	Sonnenscheinstunden Anzahl Minuten mit Schatten	505 950	456 742	382 1685	332 1977	265 290	241 996

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

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



Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-2 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang

Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung

Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38 09:37-10:04/27 16:23	08:11 15:59-16:24/25 17:11	07:17 07:51-08:24/33 18:04 08:23-08:34/11	07:05 07:43-08:08/25 20:00	05:59 06:43-07:01/18 20:52	05:12 06:16-06:29/13 21:39	
2	08:38 09:38-10:05/27 16:24	08:10 15:59-16:26/27 17:13	07:15 07:50-08:24/34 18:06 08:23-08:34/11	07:03 07:42-08:08/26 20:01	05:57 06:44-07:00/16 20:53	05:11 06:17-06:28/11 21:40	
3	08:38 09:38-10:05/27 16:25	08:08 15:58-16:27/29 17:15	07:13 07:49-08:22/33 18:08 08:21-08:33/12	07:01 07:42-08:08/26 20:03	05:55 06:45-06:58/13 20:55	05:11 06:18-06:27/9 21:41	
4	08:38 09:38-10:06/28 16:26	08:07 15:57-16:27/30 17:17	07:11 07:48-08:22/34 18:10 08:21-08:33/12	06:58 07:41-08:07/26 20:05	05:53 06:48-06:57/9 20:57	05:10 06:20-06:26/6 21:42	
5	08:38 09:39-10:07/28 16:28	08:05 15:56-16:28/32 17:19	07:08 07:48-08:21/33 18:12 08:21-08:33/12	06:56 07:42-08:07/25 20:07	05:52 20:59	05:09 21:43	
6	08:37 09:39-10:07/28 16:29	08:03 15:55-16:28/33 17:21	07:06 07:49-08:20/31 18:13 08:20-08:33/13	06:54 07:42-08:06/24 20:08	05:50 06:21-06:31/10 21:00	05:08 21:44	
7	08:37 09:40-10:08/28 16:30	08:01 15:55-16:29/34 17:23	07:04 07:48-08:16/28 18:15 08:16-08:32/16	06:51 07:42-08:04/22 20:10	05:48 06:19-06:33/14 21:02	05:08 21:45	
8	08:37 09:40-10:08/28 16:31	08:00 15:55-16:29/34 17:25	07:01 07:49-08:14/25 18:17 08:14-08:31/17	06:49 07:43-08:03/20 20:12	05:46 06:18-06:35/17 21:04	05:07 21:46	
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11	08:35 09:42-10:09/27 16:36	07:54 15:55-16:31/36 17:30	06:55 07:52-08:27/35 18:22	06:42 07:50-07:54/4 20:17	05:41 06:13-06:37/24 21:09	05:06 21:49	
12	08:34 09:42-10:09/27 16:37	07:52 15:56-16:31/35 17:32	06:52 07:54-08:04/10 18:24 08:06-08:24/18	06:40 20:19	05:39 06:11-06:37/26 21:10	05:05 21:49	
13	08:34 09:43-10:09/26 16:39	07:50 15:56-16:31/35 17:34	06:50 07:26-07:33/7 18:26 08:09-08:21/12	06:38 20:20	05:37 06:11-06:38/27 21:12	05:05 21:50	
14	08:33 09:43-10:09/26 16:40	07:48 15:56-16:31/35 17:36	06:48 07:22-07:37/15 18:28	06:35 20:22	05:36 06:10-06:37/27 21:13	05:05 21:51	
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16	08:31 09:45-10:09/24 16:43	07:45 15:55-16:29/34 17:40	06:43 07:18-07:39/21 18:31	06:31 20:26	05:32 06:09-06:37/28 21:17	05:04 21:52	
17	08:30 09:46-10:09/23 16:45	07:43 15:55-16:28/33 17:42	06:41 07:17-07:41/24 18:33	06:29 20:27	05:31 06:09-06:38/29 21:18	05:04 21:52	
18	08:29 09:47-10:09/22 16:47	07:41 15:54-16:28/34 17:44	06:38 07:15-07:40/25 18:35	06:27 20:29	05:29 06:09-06:37/28 21:20	05:04 21:53	
19	08:28 09:48-10:08/20 16:48	07:39 15:54-16:26/32 17:46	06:36 07:15-07:41/26 18:37	06:24 20:31	05:28 06:09-06:37/28 21:21	05:04 21:53	
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21	08:26 09:50-10:06/16 16:52	07:34 08:03-08:05/2 17:49	06:31 07:13-07:41/28 18:40	06:20 06:47-07:01/14 20:34	05:25 06:10-06:37/27 21:24	05:04 21:54	
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23	08:24 09:54-10:03/9 16:55	07:30 07:57-08:21/24 17:53	06:27 07:13-07:40/27 18:44	06:16 06:45-07:03/18 20:38	05:22 06:10-06:35/25 21:27	05:05 21:54	
24	08:23 16:57	07:28 07:55-08:22/27 17:55	06:24 07:13-07:39/26 18:46	06:14 06:44-07:04/20 20:40	05:21 06:10-06:35/25 21:29	05:05 21:54	
25	08:21 16:59	07:26 07:55-08:23/28 17:57	07:22 08:14-08:39/25 19:47	06:12 06:44-07:04/20 20:41	05:20 06:10-06:34/24 21:30	05:05 21:55	
26	08:20 17:00	07:24 07:54-08:24/30 17:59	07:20 07:52-08:03/11 19:49	06:09 06:43-07:04/21 20:43	05:19 06:11-06:34/23 21:31	05:06 21:55	
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28	08:17 16:06-16:16/10 17:04	07:19 07:52-08:23/31 18:02	07:15 07:48-08:07/19 19:53	06:05 06:43-07:03/20 20:47	05:16 06:12-06:32/20 21:34	05:07 21:54	
29	08:16 16:03-16:18/15 17:06		07:12 07:45-08:07/22 19:54	06:03 06:43-07:03/20 20:48	05:15 06:13-06:30/17 21:35	05:07 21:54	
30	08:14 16:02-16:21/19 17:08		07:10 07:45-08:08/23 19:56	06:01 06:43-07:02/19 20:50	05:14 06:13-06:30/17 21:37	05:08 21:54	
31	08:13 16:00-16:23/23 17:10		07:08 07:44-08:09/25 19:58		05:13 06:14-06:29/15 21:38		
	Sonnenscheinstunden Anzahl Minuten mit Schatten	256 620	275 1358	366 1278	416 425	487 653	502 39

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

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



SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12WEA: WEA 18-2 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember
1	05:08	05:45 06:22-06:48/26	06:36	07:26 08:04-08:15/11	07:21 15:24-16:00/36	08:13 09:24-09:51/27
	21:54	21:22	20:19	19:08 08:51-08:59/8	17:01	16:19
2	05:09	05:47 06:22-06:47/25	06:38 07:48-07:53/5	07:28 08:34-08:40/6	07:23 15:24-15:59/35	08:15 09:24-09:51/27
	21:54	21:20	20:16	19:06 08:46-09:02/16	16:59	16:18
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	21:23	20:21		17:03 16:00-16:02/2		16:22
Sonnenscheinstunden	505	456	382	332	265	241
Anzahl Minuten mit Schatten	493	413	712	1840	636	840

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

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

Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-3 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2018**

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38 09:23-09:41/18 10:33-10:36/3 16:23 09:50-10:33/43 11:00-11:40/40	08:11 09:44-10:30/46 17:12	07:17 08:50-09:35/45 18:04	07:05 19:13-19:30/17 20:00	05:59 20:52	05:12 06:29-07:31/62 21:39 20:13-20:47/34	
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29	08:16 09:36-09:47/11 17:06 09:47-10:29/42	 	06:13 19:54	06:03 07:35-07:54/19 20:48	05:15 06:29-07:30/61 21:35 20:14-20:45/31	05:07 06:34-07:35/61 21:54 20:17-20:54/37	
30	08:14 09:44-10:30/46 17:08	 	06:11 19:56	06:01 07:37-07:51/14 20:50	05:14 06:29-07:30/61 21:37 20:13-20:45/32	05:08 06:34-07:35/61 21:54 20:17-20:54/37	
31	08:13 09:44-10:30/46 17:10	 	06:08 19:58	05:08 19:15-19:28/13 19:58	05:13 06:28-07:30/62 21:38 20:13-20:46/33	 	
	Sonnenscheinstunden Anzahl Minuten mit Schatten	256 2671	275 2069	366 351	416 1143	487 1692	502 2936

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

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



Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-3 - E-138 EP3 E2 TES
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2018**

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember	
1	05:08 06:34-07:35/61 21:54 20:17-20:54/37	05:45 06:50-07:35/45 21:22 07:35-07:36/1	06:36 07:30-08:06/36 20:19 19:09-19:30/21	07:26 19:08 07:28	07:21 07:58-08:17/19 09:19-09:56/37 17:01 08:28-09:00/32 16:04-16:25/21	08:13 09:06-09:31/25 10:18-10:20/2 16:19 09:29-10:18/49 10:50-11:23/33	
2	05:09 06:35-07:36/61 21:54 20:18-20:55/37	05:47 06:52-07:34/42 21:20 07:34-07:35/1	06:38 07:30-08:05/35 20:17 19:07-19:30/23	07:26 19:06 07:30	07:23 07:59-08:16/17 09:19-09:57/38 16:59 08:30-08:58/28 16:05-16:25/20	08:15 09:06-09:31/25 10:18-10:20/2 16:18 09:30-10:18/48 10:50-11:24/34	
3	05:10 06:34-07:35/61 20:17-20:54/37 21:53 07:35-07:36/1	05:48 06:54-07:33/39 21:18 07:33-07:35/2	06:40 07:31-08:04/33 20:14 19:06-19:30/24	07:30 19:04	07:25 08:01-08:14/13 09:18-09:58/40 16:57 08:32-08:56/24 16:05-16:24/19	08:16 09:07-09:31/24 10:20-10:21/1 16:17 09:32-10:20/48 10:50-11:25/35	
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	Sonnenscheinstunden Anzahl Minuten mit Schatten	505 2585	456 968	382 536	332 1685	265 2133	241 3207

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

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

Projekt:

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-4 - E-138 EP3 E2 TES

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 09:22-09:39/17 09:51-10:24/33	08:11 09:01-09:42/41 16:05-16:13/8	07:17 08:24-08:52/28	07:05 07:47-08:14/27	05:59 07:09-07:35/26	05:12
	16:23 09:39-09:43/4	17:12 15:48-16:05/17	18:04	20:00 18:44-19:17/33	20:52	21:39
2	08:38 09:22-09:41/19 09:52-10:25/33	08:10 09:02-09:22/20 15:50-16:13/23	07:15 08:25-08:51/26	07:03 07:47-08:14/27	05:57 07:10-07:33/23	05:12
	16:24 09:41-09:44/3	17:13 09:22-09:41/19	18:06	20:01 18:44-19:18/34	20:53 07:32-07:34/2	21:40
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	16:25 09:41-09:44/3	17:15 09:19-09:39/20	18:08	20:03 18:44-19:18/34	20:55	21:41
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12	08:34 09:18-09:48/30 09:56-10:29/33	07:52 09:03-09:32/29	06:52	06:40 07:21-07:46/25 18:46-19:11/25	05:39	05:05
	16:37 09:48-09:51/3 15:47-16:03/16	17:32	18:24	20:19 07:46-07:47/1	21:10	21:49
13	08:34 09:17-09:49/32 09:56-10:29/33	07:50 08:34-08:46/12	06:50	06:38 07:18-07:47/29 18:48-19:09/21	05:37	05:05
	16:39 09:49-09:51/2 15:47-16:04/17	17:34 09:04-09:31/27	18:26	20:20 07:47-07:48/1	21:12	21:50
14	08:33 09:08-09:10/2 09:49-09:51/2 15:47-16:05/18	07:48 08:31-08:49/18	06:48	06:36 07:16-07:48/32	05:36	05:05
	16:40 09:17-09:49/32 09:57-10:29/32	17:36 09:05-09:30/25	18:28	20:22 18:50-19:07/17	21:13	21:51
15	08:32 09:05-09:13/8 09:50-09:52/2 15:47-16:05/18	07:47 08:29-08:51/22	06:45	06:33 07:14-07:49/35	05:34	05:05
	16:42 09:17-09:50/33 09:58-10:29/31	17:38 09:06-09:29/23	18:30	20:24 18:51-19:03/12	21:15	21:51
16	08:31 09:04-09:15/11 09:50-09:52/2 15:47-16:06/19	07:45 08:28-08:52/24	06:43	06:31 07:12-07:48/36	05:32	05:04
	16:43 09:17-09:50/33 09:58-10:29/31	17:40 09:07-09:27/20	18:31	20:26	21:17	21:52
17	08:30 09:03-09:17/14 09:51-09:53/2 15:47-16:08/20	07:43 08:26-08:52/26	06:41	06:29 07:11-07:49/38	05:31	05:04
	16:45 09:17-09:51/34 09:59-10:29/30	17:42 09:09-09:24/15	18:33	20:27	21:18	21:52
18	08:29 09:03-09:18/15 09:51-09:53/2 15:47-16:08/21	07:41 08:25-08:53/28	06:38	06:27 07:10-07:49/39	05:29	05:04
	16:47 09:17-09:51/34 10:00-10:29/29	17:44 09:12-09:21/9	18:35	20:29	21:20	21:53
19	08:28 09:03-09:20/17 09:52-09:53/1 15:47-16:09/22	07:39 08:24-08:54/30	06:36	06:24 07:09-07:49/40	05:28	05:04
	16:48 09:17-09:52/35 10:01-10:29/28	17:46	18:37	20:31	21:21	21:53
20	08:27 09:02-09:20/18 09:51-09:53/2 15:46-16:09/23	07:36 08:24-08:55/31	06:34	06:22 07:08-07:48/40	05:27	05:04
	16:50 09:17-09:51/34 10:01-10:28/27	17:48	18:39	20:33	21:23	21:54
21	08:26 09:02-09:21/19 09:51-09:53/2 15:47-16:10/23	07:34 08:24-08:55/31	06:31	06:20 07:08-07:48/40	05:25	05:04
	16:52 09:17-09:51/34 10:03-10:28/25	17:49	18:40	20:34	21:24	21:54
22	08:25 09:02-09:22/20 09:52-09:53/1 15:47-16:11/24	07:32 08:23-08:55/32	06:29	06:18 07:08-07:48/40	05:24	05:05
	16:53 09:18-09:52/34 10:04-10:27/23	17:51	18:42	20:36	21:26	21:54
23	08:24 09:01-09:22/21 09:51-09:52/1 15:46-16:11/25	07:30 08:22-08:55/33	06:27	06:16 07:07-07:47/40	05:22	05:05
	16:55 09:17-09:51/34 10:05-10:26/21	17:53	18:44	20:38	21:27	21:54
24	08:23 09:02-09:23/21 09:51-09:52/1 15:46-16:12/26	07:28 08:22-08:55/33	06:24 06:59-07:07/8	06:14 07:07-07:46/39	05:21	05:05
	16:57 09:18-09:51/33 10:07-10:25/18	17:55	18:46	20:40	21:29	21:54
25	08:21 09:02-09:23/21 09:51-09:52/1 15:46-16:12/26	07:26 08:23-08:55/32	07:22 07:56-08:10/14	06:12 07:07-07:45/38	05:20	05:05
	16:59 09:19-09:51/32 10:09-10:24/15	17:57	19:47 18:57-19:09/12	20:41	21:30	21:55
26	08:20 09:02-09:24/22 09:50-09:51/1 15:46-16:13/27	07:24 08:23-08:54/31	07:20 07:53-08:11/18	06:09 07:07-07:44/37	05:19	05:06
	17:00 09:19-09:50/31 10:12-10:21/9	17:59	19:49 18:53-19:11/18	20:43	21:31	21:55
27	08:19 09:03-09:26/23 15:46-16:13/27	07:22 08:24-08:54/30	07:17 07:51-08:13/22	06:07 07:07-07:43/36	05:18	05:06
	17:02 09:20-09:50/30	18:01	19:51 18:51-19:13/22	20:45	21:33	21:55
28	08:17 09:03-09:27/24 15:47-16:14/27	07:19 08:23-08:52/29	07:15 07:50-08:14/24	06:05 07:07-07:42/35	05:16	05:07
	17:04 09:20-09:48/28	18:02	19:53 18:49-19:15/26	20:47	21:34	21:54
29	08:16 09:03-09:28/25 15:47-16:13/26		07:12 07:49-08:14/25	06:03 07:08-07:40/32	05:15	05:07
	17:06 09:20-09:46/26		19:54 18:47-19:16/29	20:48	21:35	21:54
30	08:14 09:03-09:29/26 15:48-16:14/26		07:10 07:48-08:14/26	06:01 07:08-07:38/30	05:14	05:08
	17:08 09:22-09:44/22		19:56 18:46-19:17/31	20:50	21:37	21:54
31	08:13 09:02-09:43/41 16:08-16:13/5		07:08 07:48-08:15/27		05:13	
	17:10 15:48-16:08/20		19:58 18:45-19:17/32		21:38	
Sonnenscheinstunden	256	275	366	416	487	502
Anzahl Minuten mit Schatten	2456	1092	441	1394	113	0

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

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

SHADOW - Kalender pro WEA

Berechnung: Windenergie Hollenstede 2018-12**WEA:** WEA 18-4 - E-138 EP3 E2 TES
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember	
1	05:08 21:54	05:45 21:22	06:36 07:20-07:46/26 20:19 18:46-19:11/25	07:26 19:08	07:21 08:32-09:02/30 17:01	08:13 09:00-09:30/30 09:38-10:11/33 16:19 09:30-09:33/3 15:29-15:44/15	
2	05:09 21:54	05:47 21:20	06:38 07:21-07:43/22 18:43-19:11/28 20:17 07:43-07:44/1	07:28 19:06	07:23 08:31-09:03/32 16:59	08:15 09:00-09:30/30 09:38-10:11/33 16:18 09:30-09:32/2 15:30-15:44/14	
3	05:10 21:53	05:48 21:18	06:40 07:23-07:41/18 07:52-08:00/8 20:14 07:41-07:42/1 18:42-19:12/30	07:30 19:04	07:25 08:31-09:03/32 16:57	08:16 09:02-09:30/28 09:38-10:12/34 16:17 09:30-09:33/3 15:32-15:44/12	
4	05:11 21:53	05:50 21:17	06:41 07:25-07:37/12 07:48-08:02/14 20:12 07:37-07:39/2 18:40-19:12/32	07:31 19:01	07:27 08:31-09:03/32 16:55	08:17 09:02-09:30/28 09:38-10:11/33 16:17 09:30-09:33/3 15:33-15:42/9	
5	05:11 21:52	05:52 21:15	06:43 07:30-07:34/4 18:40-19:12/32 20:10 07:46-08:04/18	07:33 18:59	07:29 08:31-09:03/32 16:53 15:26-15:36/10	08:19 09:04-09:30/26 09:39-10:12/33 16:16 09:30-09:33/3 15:35-15:42/7	
6	05:12 21:52	05:53 21:13	06:45 07:45-08:06/21 20:07 18:38-19:12/34	07:35 18:57	07:30 08:31-09:03/32 16:51 15:24-15:38/14	08:20 09:05-09:30/25 09:39-10:12/33 16:16 09:30-09:33/3	
7	05:13 21:51	05:55 21:11	06:46 07:43-08:06/23 20:05 18:38-19:12/34	07:37 18:54	07:32 08:31-09:03/32 16:50 15:22-15:40/18	08:22 09:07-09:30/23 09:39-10:13/34 16:15 09:30-09:33/3	
8	05:14 21:51	05:56 07:25-07:36/11 21:09	06:48 07:42-08:07/25 20:03 18:38-19:12/34	07:38 18:52	07:34 08:32-09:05/33 16:48 15:21-15:41/20	08:23 09:09-09:30/21 09:40-10:14/34 16:15 09:30-09:34/4	
9	05:15 21:50	05:58 07:23-07:39/16 21:07	06:50 07:40-08:06/26 20:00 18:37-19:11/34	07:40 09:08-09:17/9 18:50	07:36 08:32-08:51/19 15:20-15:42/22 16:46 08:51-09:10/19	08:24 09:10-09:30/20 09:40-10:14/34 16:14 09:30-09:33/3	
10	05:16 21:49	06:00 07:21-07:40/19 21:06	06:51 07:40-08:07/27 19:58 18:37-19:11/34	07:42 09:04-09:20/16 18:47	07:38 08:32-08:53/21 15:20-15:43/23 16:45 08:53-09:12/19	08:25 09:11-09:30/19 09:41-10:14/33 16:14 09:30-09:33/3	
11	05:17 21:48	06:01 07:20-07:42/22 21:04	06:53 07:40-08:07/27 19:56 18:36-19:10/34	07:44 09:01-09:21/20 18:45	07:40 08:33-09:14/41 15:36-15:44/8 16:43 15:19-15:36/17	08:27 09:11-09:30/19 09:41-10:14/33 16:14 09:30-09:33/3	
12	05:18 21:48	06:03 07:18-07:43/25 21:02 07:42-07:43/1	06:55 07:39-08:06/27 19:53 18:36-19:10/34	07:45 08:59-09:23/24 18:43	07:41 08:34-09:15/41 15:39-15:44/5 16:41 15:19-15:39/20	08:28 09:13-09:31/18 09:42-10:15/33 16:14 09:31-09:34/3	
13	05:19 21:47	06:05 07:17-07:45/28 21:00	06:56 07:39-08:06/27 19:51 18:37-19:09/32	07:47 08:58-09:24/26 18:41	07:43 08:35-09:01/26 15:19-15:45/26 16:40 08:54-09:16/22	08:29 09:14-09:31/17 09:43-10:16/33 16:14 09:31-09:34/3	
14	05:20 21:46	06:06 07:16-07:46/30 20:58	06:58 07:38-08:05/27 19:48 18:36-19:07/31	07:49 08:57-09:25/28 18:38	07:45 08:35-08:59/24 15:19-15:45/26 16:38 08:53-09:19/26	08:30 09:15-09:31/16 09:43-10:16/33 16:14 09:31-09:35/4	
15	05:22 21:45	06:08 07:15-07:48/33 20:56	06:59 07:39-08:04/25 19:46 18:37-19:06/29	07:51 08:56-09:26/30 18:36	07:47 08:36-08:59/23 15:19-15:45/26 16:37 08:52-09:20/28	08:31 09:15-09:31/16 09:44-10:17/33 16:14 09:31-09:35/4	
16	05:23 21:44	06:10 07:14-07:48/34 20:54	07:01 07:40-08:03/23 19:44 18:38-19:05/27	07:52 08:56-09:26/30 18:34	07:49 08:35-08:58/23 15:19-15:46/27 16:35 08:52-09:22/30	08:32 09:16-09:31/15 09:43-10:16/33 16:14 09:31-09:35/4	
17	05:24 21:43	06:11 07:14-07:50/36 20:52	07:03 07:40-08:01/21 19:41 18:39-19:02/23	07:54 08:54-09:26/32 18:32	07:50 08:35-08:56/21 09:23-09:24/1 15:19-15:46/27 16:34 08:52-09:23/31 09:45-09:54/9	08:32 09:16-09:30/14 09:44-10:17/33 16:14 09:30-09:35/5	
18	05:25 21:42	06:13 07:14-07:51/37 20:50	07:04 07:41-08:00/19 19:39 18:41-19:00/19	07:56 08:54-09:26/32 18:29	07:52 08:35-08:56/21 09:24-09:25/1 15:20-15:46/26 16:32 08:52-09:24/32 09:42-09:57/15	08:33 09:17-09:31/14 09:45-10:17/32 16:14 09:31-09:35/4	
19	05:27 21:40	06:15 07:13-07:51/38 20:47	07:06 07:43-07:58/15 19:37 18:42-18:56/14	07:58 08:54-09:26/32 18:27	07:54 08:36-08:57/21 09:25-09:26/1 15:20-15:46/26 16:31 08:52-09:25/33 09:41-09:59/18	08:34 09:18-09:31/13 09:46-10:18/32 16:14 09:31-09:36/5	
20	05:28 21:39	06:16 07:13-07:52/39 20:45	07:08 07:45-07:54/9 19:34 18:48-18:50/2	07:59 08:54-09:26/32 18:25	07:56 08:36-08:57/21 09:26-09:27/1 15:21-15:46/25 16:30 08:52-09:26/34 09:40-10:01/21	08:35 09:18-09:31/13 09:45-10:18/33 16:15 09:31-09:35/4	
21	05:29 21:38	06:18 07:12-07:52/40 20:43	07:10 19:32	08:01 08:54-09:26/32 18:23	07:57 08:37-08:57/20 09:27-09:28/1 15:22-15:46/24 16:29 08:53-09:27/34 09:39-10:02/23	08:35 09:19-09:32/13 09:46-10:19/33 16:15 09:32-09:36/4	
22	05:31 21:37	06:20 07:12-07:52/40 20:41	07:11 19:29	08:03 08:54-09:25/31 18:21	07:59 08:38-08:57/19 09:27-09:29/2 15:23-15:46/23 16:27 08:53-09:27/34 09:39-10:04/25	08:36 09:20-09:32/12 09:47-10:20/33 16:15 09:32-09:37/5	
23	05:32 21:35	06:21 07:12-07:52/40 20:39	07:13 19:27	08:05 08:54-09:25/31 18:19	08:01 08:39-08:57/18 09:28-09:30/2 15:23-15:46/23 16:26 08:54-09:28/34 09:38-10:05/27	08:36 09:20-09:32/12 09:47-10:20/33 16:16 09:32-09:37/5	
24	05:33 21:34	06:23 07:12-07:52/40 20:37	07:15 19:25	08:07 08:55-09:24/29 18:17	08:02 08:40-08:57/17 09:29-09:30/1 15:23-15:45/22 16:25 08:54-09:29/35 09:38-10:06/28	08:37 09:20-09:33/13 09:47-10:20/33 16:17 09:33-09:37/4	
25	05:35 21:33	06:25 07:13-07:52/39 20:35	07:16 19:22	08:08 08:56-09:23/27 18:15	08:04 08:40-08:55/15 09:28-09:30/2 15:24-15:45/21 16:24 08:54-09:28/34 09:37-10:06/29	08:37 09:21-09:34/13 09:48-10:21/33 16:17 09:34-09:39/5	
26	05:36 21:31	06:26 07:13-07:51/38 20:32	07:18 19:20	08:10 08:57-09:22/25 18:13	08:06 08:41-08:55/14 09:29-09:31/2 15:25-15:45/20 16:23 08:55-09:29/34 09:37-10:07/30	08:37 09:21-09:34/13 09:49-10:21/32 16:18 09:34-09:39/5	
27	05:38 21:30	06:28 07:13-07:51/38 20:30	07:20 19:18	08:12 08:58-09:21/23 18:10	08:07 08:43-08:54/11 09:29-09:31/2 15:26-15:45/19 16:22 08:56-09:29/33 09:37-10:08/31	08:38 09:21-09:35/14 09:49-10:22/33 16:18 09:35-09:39/4	
28	05:39 21:28	06:30 07:14-07:50/36 20:28	07:21 19:15	08:14 07:59-08:20/21 17:08	08:09 08:45-08:54/9 09:30-09:32/2 15:27-15:46/19 16:21 08:57-09:30/33 09:38-10:09/31	08:38 09:21-09:36/15 09:49-10:22/33 16:19 09:36-09:40/4	
29	05:41 21:27	06:31 07:15-07:50/35 20:26	07:23 19:13	08:16 08:01-08:18/17 17:06	08:10 08:47-08:51/4 09:29-09:32/3 15:27-15:45/18 16:20 08:57-09:29/32 09:37-10:09/32	08:38 09:22-09:37/15 09:50-10:22/32 16:20 09:36-09:41/5	
30	05:42 21:25	06:33 07:16-07:48/32 20:23	07:25 19:11	08:18 08:04-08:15/11 17:04	08:12 08:58-09:30/32 09:38-10:10/32 16:19 09:30-09:32/2 15:28-15:45/17	08:38 09:22-09:37/15 09:50-10:23/33 16:21 09:37-09:41/4	
31	05:44 21:23	06:35 07:18-07:47/29 20:21	07:19 18:47-19:09/22	08:19 08:32-09:02/30 17:03	08:13 08:32-09:05/33 16:18	08:38 09:22-09:38/16 09:50-10:23/33 16:22 09:38-09:42/4	
	Sonnenscheinstunden Anzahl Minuten mit Schatten	505 0	456 828	382 1030	332 715	265 2180	241 1754

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

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

Anlage 8: Tabellarische Darstellung der Beschattungszeiten durch die Windenergieanlagen
an den einzelnen Immissionspunkten (Auszug)

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 01 - Welperort 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	08:56 (WEA 17-3) 09:39 (WEA 17-2)	07:17 18:04	07:55 (WEA 17-1) 20:00	05:59 20:52
2	08:39 16:24	08:10 17:14	08:56 (WEA 17-3) 09:39 (WEA 17-2)	07:15 18:06	07:55 (WEA 17-1) 20:02	05:57 20:54
3	08:38 16:25	08:08 17:15	08:56 (WEA 17-3) 09:39 (WEA 17-2)	07:13 18:08	07:55 (WEA 17-1) 20:03	05:56 20:55
4	08:38 16:27	08:07 17:17	08:56 (WEA 17-3) 09:39 (WEA 17-2)	07:11 18:10	07:55 (WEA 17-1) 20:05	05:54 20:57
5	08:38 16:28	08:05 17:19	08:57 (WEA 17-3) 09:39 (WEA 17-2)	07:09 18:12	07:56 (WEA 17-1) 20:07	05:52 20:59
6	08:38 16:29	08:03 17:21	08:58 (WEA 17-3) 09:40 (WEA 17-2)	07:06 18:14	07:57 (WEA 17-1) 20:09	05:50 21:01
7	08:37 16:30	08:02 17:23	08:59 (WEA 17-3) 09:40 (WEA 17-2)	07:04 18:15	07:57 (WEA 17-1) 20:10	05:48 21:02
8	08:37 16:32	08:00 17:25	09:01 (WEA 17-3) 09:39 (WEA 17-2)	07:02 18:17	07:59 (WEA 17-1) 20:12	05:46 21:04
9	08:36 16:33	07:58 17:27	09:03 (WEA 17-3) 09:39 (WEA 17-2)	06:59 18:19	08:02 (WEA 17-1) 20:14	05:44 21:06
10	08:36 16:34	07:56 17:29	09:09 (WEA 17-3) 09:38 (WEA 17-2)	06:57 18:21	08:10 (WEA 17-1) 20:15	05:43 21:07
11	08:35 16:36	07:54 17:31	09:09 (WEA 17-2) 09:37 (WEA 17-2)	06:55 18:23	06:42 20:17	05:41 21:09
12	08:35 16:37	07:53 17:33	09:10 (WEA 17-2) 09:36 (WEA 17-2)	06:53 18:24	06:40 20:19	05:39 21:10
13	08:34 16:39	07:51 17:34	09:11 (WEA 17-2) 09:35 (WEA 17-2)	06:50 18:26	06:38 20:21	05:37 21:12
14	08:33 16:40	07:49 17:36	09:13 (WEA 17-2) 09:34 (WEA 17-2)	06:48 18:28	06:36 20:22	05:36 21:14
15	08:32 16:42	07:47 17:38	09:15 (WEA 17-2) 09:32 (WEA 17-2)	06:46 18:30	06:33 20:24	05:34 21:15
16	08:32 16:43	07:45 17:40	09:18 (WEA 17-2) 09:28 (WEA 17-2)	06:43 18:32	06:31 20:26	05:33 21:17
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 18:35	06:29 20:28	05:31 21:18
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 18:37	06:27 20:29	05:30 21:20
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31	06:25 20:31	05:28 21:22
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	06:22 20:33	05:27 21:23
21	08:27 16:52	07:35 17:50	06:32 18:40	06:20 20:35	06:20 20:35	05:25 21:25
22	08:25 16:53	07:33 17:51	08:06 (WEA 17-1) 08:11 (WEA 17-1)	06:29 18:42	06:18 20:36	05:24 21:26
23	08:24 16:55	07:30 17:53	08:02 (WEA 17-1) 08:15 (WEA 17-1)	06:27 18:44	06:16 20:38	05:23 21:27
24	08:23 16:57	07:28 17:55	08:00 (WEA 17-1) 08:16 (WEA 17-1)	06:24 18:46	06:14 20:40	05:21 21:29
25	08:22 16:59	07:26 17:57	07:58 (WEA 17-1) 08:17 (WEA 17-1)	07:22 19:48	06:12 20:42	05:20 21:30
26	08:20 17:01	07:24 17:59	07:57 (WEA 17-1) 08:18 (WEA 17-1)	07:20 19:49	06:10 20:43	05:19 21:32
27	08:19 17:02	07:22 18:01	07:57 (WEA 17-1) 08:19 (WEA 17-1)	07:17 19:51	06:08 20:45	05:18 21:33
28	08:18 17:04	07:20 18:03	07:56 (WEA 17-1) 08:20 (WEA 17-1)	07:15 19:53	06:05 20:47	05:17 21:34
29	08:16 17:06	07:18 18:05	07:13 19:55	07:13 19:55	06:03 20:49	05:15 21:36
30	08:15 17:08	07:16 18:07	07:10 19:56	07:10 19:56	06:01 20:50	05:14 21:37
31	08:13 17:10	07:14 18:09	07:08 19:58	07:08 19:58	05:13 21:38	05:13 21:38
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung	376	646	174			

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

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



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 01 - Welperort 1

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober		November		Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:27 19:08		07:21 17:01	28	08:39 (WEA 17-2) 08:14 09:07 (WEA 17-2) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06		07:23 16:59	30	08:38 (WEA 17-2) 08:15 09:08 (WEA 17-2) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:30 19:04		07:25 16:57	36	08:32 (WEA 17-3) 08:17 09:08 (WEA 17-2) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01		07:27 16:55	39	08:30 (WEA 17-3) 08:18 09:09 (WEA 17-2) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	1	08:42 (WEA 17-1) 07:29 08:43 (WEA 17-1) 16:53	40	08:29 (WEA 17-3) 08:19 09:09 (WEA 17-2) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:08	07:35 18:57	11	08:37 (WEA 17-1) 07:31 08:48 (WEA 17-1) 16:52	42	08:28 (WEA 17-3) 08:21 09:10 (WEA 17-2) 16:16
7	05:13 21:52	05:55 21:12	06:46 20:05	07:37 18:54	16	08:34 (WEA 17-1) 07:33 08:50 (WEA 17-1) 16:50	43	08:27 (WEA 17-3) 08:22 09:10 (WEA 17-2) 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:39 18:52	19	08:32 (WEA 17-1) 07:34 08:51 (WEA 17-1) 16:48	43	08:27 (WEA 17-3) 08:23 09:10 (WEA 17-2) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:01	07:40 18:50	21	08:31 (WEA 17-1) 07:36 08:52 (WEA 17-1) 16:46	44	08:26 (WEA 17-3) 08:25 09:10 (WEA 17-2) 16:15
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:48	23	08:30 (WEA 17-1) 07:38 08:53 (WEA 17-1) 16:45	44	08:26 (WEA 17-3) 08:26 09:10 (WEA 17-2) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	23	08:30 (WEA 17-1) 07:40 08:53 (WEA 17-1) 16:43	44	08:26 (WEA 17-3) 08:27 09:10 (WEA 17-2) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:46 18:43	24	08:28 (WEA 17-1) 07:42 08:52 (WEA 17-1) 16:41	43	08:26 (WEA 17-3) 08:28 09:09 (WEA 17-2) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	24	08:28 (WEA 17-1) 07:43 08:52 (WEA 17-1) 16:40	42	08:27 (WEA 17-3) 08:29 09:09 (WEA 17-2) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	24	08:28 (WEA 17-1) 07:45 08:52 (WEA 17-1) 16:38	42	08:27 (WEA 17-3) 08:30 09:09 (WEA 17-2) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	23	08:29 (WEA 17-1) 07:47 08:52 (WEA 17-1) 16:37	40	08:28 (WEA 17-3) 08:31 09:08 (WEA 17-2) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:53 18:34	22	08:29 (WEA 17-1) 07:49 08:51 (WEA 17-1) 16:35	39	08:29 (WEA 17-3) 08:32 09:08 (WEA 17-2) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	20	08:30 (WEA 17-1) 07:51 08:50 (WEA 17-1) 16:34	38	08:29 (WEA 17-3) 08:33 09:07 (WEA 17-2) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	18	08:31 (WEA 17-1) 07:52 08:49 (WEA 17-1) 16:33	36	08:31 (WEA 17-3) 08:33 09:07 (WEA 17-2) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	15	08:31 (WEA 17-1) 07:54 08:46 (WEA 17-1) 16:31	34	08:31 (WEA 17-3) 08:34 09:05 (WEA 17-2) 16:14
20	05:28 21:40	06:16 20:46	07:08 19:34	08:00 18:25	10	08:34 (WEA 17-1) 07:56 08:44 (WEA 17-1) 16:30	31	08:32 (WEA 17-3) 08:35 09:04 (WEA 17-2) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:02 18:23		07:58 16:29	22	08:35 (WEA 17-3) 08:36 09:02 (WEA 17-2) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21		07:59 16:28	9	08:51 (WEA 17-2) 08:36 09:00 (WEA 17-2) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19		08:01 16:26		08:37 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17		08:03 16:25		08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:09 18:15		08:04 16:24		08:37 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:11 18:13		08:06 16:23		08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	12	09:47 (WEA 17-2) 08:08 09:59 (WEA 17-2) 16:22		08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	18	08:44 (WEA 17-2) 08:09 09:02 (WEA 17-2) 16:21		08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	22	08:42 (WEA 17-2) 08:11 09:04 (WEA 17-2) 16:20		08:38 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	24	08:41 (WEA 17-2) 08:12 09:05 (WEA 17-2) 16:20		08:39 16:21
31	05:44 21:24	06:35 20:21	07:20 19:03	07:20 17:03	26	08:40 (WEA 17-2) 08:12 09:06 (WEA 17-2) 16:20		08:39 16:22
Sonnenscheinstunden	505	456	382	332		265	809	241
astr.max.mögl.Beschattung				396				

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 02 - Welperort 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	08:31 (WEA 17-2) 09:02 (WEA 17-2)	07:06 20:00	05:59 20:52
2	08:39 16:24	08:10 17:14	07:15 18:06	08:32 (WEA 17-2) 09:01 (WEA 17-2)	07:03 20:02	05:57 20:54
3	08:38 16:25	08:08 17:15	07:13 18:08	08:34 (WEA 17-2) 09:00 (WEA 17-2)	07:01 20:03	05:56 20:55
4	08:38 16:27	08:07 17:17	07:11 18:10	08:34 (WEA 17-2) 08:57 (WEA 17-2)	06:59 20:05	05:54 20:57
5	08:38 16:28	08:05 17:19	07:09 18:12	08:36 (WEA 17-2) 08:55 (WEA 17-2)	06:56 20:07	05:52 20:59
6	08:38 16:29	08:03 17:21	07:06 18:14	08:40 (WEA 17-2) 08:49 (WEA 17-3)	06:54 20:09	05:50 21:01
7	08:37 16:30	08:02 17:23	07:04 18:15	08:36 (WEA 17-3) 08:51 (WEA 17-3)	07:04 20:10	05:48 21:02
8	08:37 16:32	08:00 17:25	07:02 18:17	08:34 (WEA 17-3) 08:52 (WEA 17-3)	07:02 20:12	05:46 21:04
9	08:36 16:33	07:58 17:27	06:59 18:19	08:33 (WEA 17-3) 08:53 (WEA 17-3)	06:47 20:14	05:44 21:06
10	08:36 16:34	07:56 17:29	06:57 18:21	08:33 (WEA 17-3) 08:54 (WEA 17-3)	06:45 20:15	05:43 21:07
11	08:35 16:36	07:54 17:31	06:55 18:23	08:32 (WEA 17-3) 08:55 (WEA 17-3)	06:42 20:17	05:41 21:09
12	08:35 16:37	07:53 17:33	06:53 18:24	08:32 (WEA 17-3) 08:57 (WEA 17-2)	06:40 20:19	05:39 21:10
13	08:34 16:39	07:51 17:34	06:50 18:26	08:32 (WEA 17-3) 08:59 (WEA 17-2)	06:38 20:21	05:37 21:12
14	08:33 16:40	07:49 17:36	06:48 18:28	08:32 (WEA 17-3) 09:01 (WEA 17-2)	06:36 20:22	05:36 21:14
15	08:32 16:42	07:47 17:38	06:46 18:30	08:32 (WEA 17-3) 09:02 (WEA 17-2)	06:33 20:24	05:34 21:15
16	08:32 16:43	07:45 17:40	06:43 18:32	08:32 (WEA 17-3) 09:04 (WEA 17-2)	06:31 20:26	05:33 21:17
17	08:31 16:45	07:43 17:42	06:41 18:33	08:33 (WEA 17-2) 09:05 (WEA 17-2)	06:29 20:28	05:31 21:18
18	08:30 16:47	07:41 17:44	06:39 18:35	08:33 (WEA 17-2) 09:05 (WEA 17-2)	06:27 20:29	05:30 21:20
19	08:29 16:48	07:39 17:46	06:36 18:37	08:31 (WEA 17-2) 09:05 (WEA 17-2)	06:25 20:31	05:28 21:22
20	08:28 16:50	07:37 17:48	06:34 18:39	08:31 (WEA 17-2) 09:06 (WEA 17-2)	06:22 20:33	05:27 21:23
21	08:27 16:52	07:35 17:50	06:32 18:40	08:30 (WEA 17-2) 09:06 (WEA 17-2)	06:20 20:35	05:25 21:25
22	08:25 16:54	07:33 17:51	06:29 18:42	08:30 (WEA 17-2) 09:06 (WEA 17-2)	06:18 20:36	05:24 21:26
23	08:24 16:55	07:30 17:53	06:27 18:44	08:30 (WEA 17-2) 09:06 (WEA 17-2)	06:16 20:38	05:23 21:27
24	08:23 16:57	07:28 17:55	06:24 18:46	08:29 (WEA 17-2) 09:05 (WEA 17-2)	06:14 20:40	05:21 21:29
25	08:22 16:59	07:26 17:57	06:22 19:48	08:30 (WEA 17-2) 09:05 (WEA 17-2)	06:12 20:42	05:20 21:30
26	08:20 17:01	07:24 17:59	07:20 19:49	08:30 (WEA 17-2) 09:05 (WEA 17-2)	06:10 20:43	05:19 21:32
27	08:19 17:02	07:22 18:01	07:17 19:51	08:31 (WEA 17-2) 09:05 (WEA 17-2)	06:08 20:45	05:18 21:33
28	08:18 17:04	07:20 18:03	07:15 19:53	08:31 (WEA 17-2) 09:04 (WEA 17-2)	06:05 20:47	05:17 21:34
29	08:16 17:06		07:13 19:55		06:03 20:49	05:15 21:36
30	08:15 17:08		07:10 19:56		06:01 20:50	05:14 21:37
31	08:13 17:10		07:08 19:58			05:13 21:38
Sonnenscheinstunden	256	275	366		416	487
astr.max.mögl.Beschattung		670		441		502

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 02 - Welperort 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September		Oktober		November		Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19		07:27 19:08		08:05 (WEA 17-1) 17:01		08:02 (WEA 17-3) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17		07:28 19:06	23	08:05 (WEA 17-1) 16:59	22	08:02 (WEA 17-3) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14		07:30 19:04	23	08:05 (WEA 17-1) 16:57	22	08:03 (WEA 17-3) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12		07:32 19:01	21	08:06 (WEA 17-1) 16:55	20	08:04 (WEA 17-3) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10		07:33 18:59	19	08:07 (WEA 17-1) 16:53	18	08:22 (WEA 17-3) 16:17
6	05:12 21:52	05:53 21:13	06:45 20:08		07:35 18:57	16	08:10 (WEA 17-1) 16:52	15	08:21 (WEA 17-3) 16:16
7	05:13 21:51	05:55 21:12	06:46 20:05		07:37 18:54	11	08:21 (WEA 17-1) 16:50	11	08:19 (WEA 17-3) 16:16
8	05:14 21:51	05:57 21:10	06:48 20:03		07:39 18:52		09:17 (WEA 17-2) 16:48	4	08:15 (WEA 17-3) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:01		07:40 18:50	8	09:25 (WEA 17-2) 16:46		08:23 (WEA 17-3) 16:15
10	05:16 21:49	06:00 21:06	06:51 19:58		07:42 18:48	16	09:29 (WEA 17-2) 16:45		08:25 (WEA 17-3) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56		07:44 18:45	21	09:31 (WEA 17-2) 16:43		08:26 (WEA 17-3) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53		07:46 18:43	24	09:33 (WEA 17-2) 16:41		08:27 (WEA 17-3) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51		07:47 18:41	28	09:06 (WEA 17-2) 16:40		08:28 (WEA 17-3) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49		07:49 18:38	30	09:35 (WEA 17-2) 16:38		08:29 (WEA 17-3) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46		07:51 18:36	32	09:36 (WEA 17-2) 16:37		08:30 (WEA 17-3) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44		07:53 18:34	33	09:03 (WEA 17-2) 16:35		08:31 (WEA 17-3) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42		07:54 18:32	34	09:37 (WEA 17-2) 16:34		08:32 (WEA 17-3) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39		07:56 18:30	35	09:02 (WEA 17-2) 16:33		08:33 (WEA 17-3) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37		07:58 18:27	36	09:38 (WEA 17-2) 16:31		08:34 (WEA 17-3) 16:14
20	05:28 21:40	06:16 20:46	07:08 19:34		08:00 18:25	36	09:01 (WEA 17-2) 16:30		08:35 (WEA 17-3) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32		08:01 18:23	36	09:37 (WEA 17-2) 16:29		08:36 (WEA 17-3) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30		08:03 18:21	35	09:36 (WEA 17-2) 16:28		08:37 (WEA 17-3) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	11	08:14 (WEA 17-1) 08:11 (WEA 17-1)	35	09:01 (WEA 17-2) 16:26		08:37 (WEA 17-3) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	16	08:27 (WEA 17-1) 08:09 (WEA 17-1)	35	09:36 (WEA 17-2) 16:25		08:37 (WEA 17-3) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	19	08:28 (WEA 17-1) 08:08 (WEA 17-1)	33	09:02 (WEA 17-2) 16:24		08:37 (WEA 17-3) 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	21	08:06 (WEA 17-1) 08:29 (WEA 17-1)	33	09:35 (WEA 17-2) 16:23		08:38 (WEA 17-3) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	23	08:06 (WEA 17-1) 08:29 (WEA 17-1)	32	09:02 (WEA 17-2) 16:22		08:38 (WEA 17-3) 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	25	08:05 (WEA 17-1) 08:30 (WEA 17-1)	31	09:33 (WEA 17-2) 16:21		08:38 (WEA 17-3) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	25	08:04 (WEA 17-1) 08:29 (WEA 17-1)	31	08:01 (WEA 17-3) 16:20		08:38 (WEA 17-3) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	25	08:04 (WEA 17-1) 08:29 (WEA 17-1)	29	08:30 (WEA 17-2) 16:20		08:39 (WEA 17-3) 16:21
31	05:44 21:24	06:35 20:21			07:20 17:03	28	08:01 (WEA 17-3) 08:26 (WEA 17-2)		08:39 (WEA 17-3) 16:22
Sonnenscheinstunden	505	456	382		332		265		241
astr.max.mögl.Beschattung			188		829		112		

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 03 - Welperort 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:39 16:24	08:10 17:14	07:15 18:06	07:03 20:02	05:57 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:56 20:55	05:11 21:42
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	05:54 20:57	05:10 21:43
5	08:38 16:28	08:05 17:19	07:09 18:12	06:56 20:07	05:52 20:59	05:09 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:09	05:50 21:01	05:09 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:46
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:47
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:06	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:43 21:07	05:06 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:35 16:37	07:53 17:33	06:53 18:24	06:40 20:19	05:39 21:10	05:06 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	06:46 18:30	06:33 20:24	05:34 21:15	05:05 21:52
16	08:32 16:43	07:45 17:40	06:43 18:32	06:31 20:26	05:33 21:17	05:05 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 20:29	05:30 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31	05:28 21:22	05:04 21:54
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23	05:04 21:54
21	08:27 16:52	07:35 17:50	06:32 18:40	06:20 20:35	05:25 21:25	05:05 21:54
22	08:25 16:54	07:33 17:51	06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:23 21:27	05:05 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:48	06:12 20:42	05:20 21:30	05:06 21:55
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	05:19 21:32	05:06 21:55
27	08:19 17:02	07:22 18:01	06:17 19:51	06:08 20:45	05:18 21:33	05:06 21:55
28	08:18 17:04	07:20 18:03	06:15 19:53	06:05 20:47	05:17 21:34	05:07 21:55
29	08:16 17:06		06:13 19:55	06:03 20:49	05:15 21:36	05:07 21:55
30	08:15 17:08		06:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10		06:08 19:58		05:13 21:38	
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung		758	423			

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 03 - Welperort 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September		Oktober		November		Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19		07:27 19:08	08:06 (WEA 17-1) 25	07:21 17:01	08:05 (WEA 17-3) 29	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17		07:28 19:06	08:07 (WEA 17-1) 23	07:23 16:59	08:05 (WEA 17-3) 27	08:15 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14		07:30 19:04	08:06 (WEA 17-1) 23	07:25 16:57	08:05 (WEA 17-3) 23	08:17 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12		07:32 19:01	08:07 (WEA 17-1) 21	07:27 16:55	08:06 (WEA 17-3) 21	08:18 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10		07:33 18:59	08:08 (WEA 17-1) 18	07:29 16:53	08:07 (WEA 17-3) 19	08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:08		07:35 18:57	08:10 (WEA 17-1) 15	07:31 16:52	08:08 (WEA 17-3) 17	08:21 16:16
7	05:13 21:51	05:55 21:12	06:46 20:05		07:37 18:54	08:12 (WEA 17-1) 9	07:33 16:50	08:10 (WEA 17-3) 13	08:22 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03		07:39 18:52	08:21 (WEA 17-1) 7	07:34 16:48	08:12 (WEA 17-3) 9	08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00		07:40 18:50	09:23 (WEA 17-2) 7	07:36 16:46	08:21 (WEA 17-3) 7	08:25 16:15
10	05:16 21:49	06:00 21:06	06:51 19:58		07:42 18:48	09:30 (WEA 17-2) 16	07:38 16:45	09:18 (WEA 17-2) 16	08:26 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56		07:44 18:45	09:34 (WEA 17-2) 21	07:40 16:43	09:16 (WEA 17-2) 21	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53		07:46 18:43	09:37 (WEA 17-2) 25	07:42 16:41	09:13 (WEA 17-2) 25	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51		07:47 18:41	09:38 (WEA 17-2) 28	07:43 16:40	09:11 (WEA 17-2) 28	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49		07:49 18:38	09:39 (WEA 17-2) 30	07:45 16:38	09:10 (WEA 17-2) 30	08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46		07:51 18:36	09:40 (WEA 17-2) 32	07:47 16:37	09:09 (WEA 17-2) 32	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44		07:53 18:34	09:41 (WEA 17-2) 34	07:49 16:35	09:08 (WEA 17-2) 34	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42		07:54 18:32	09:42 (WEA 17-2) 35	07:51 16:34	09:08 (WEA 17-2) 35	08:33 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39		07:56 18:30	09:43 (WEA 17-2) 36	07:52 16:33	09:07 (WEA 17-2) 36	08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37		07:58 18:27	09:43 (WEA 17-2) 36	07:54 16:31	09:06 (WEA 17-2) 36	08:34 16:14
20	05:28 21:40	06:16 20:46	07:08 19:34		08:00 18:25	09:06 (WEA 17-2) 37	07:56 16:30	09:06 (WEA 17-2) 37	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32		08:01 18:23	09:43 (WEA 17-2) 38	07:58 16:29	09:05 (WEA 17-2) 38	08:36 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:17 (WEA 17-1) 9	08:03 18:21	09:43 (WEA 17-2) 37	07:59 16:28	09:05 (WEA 17-2) 37	08:36 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:13 (WEA 17-1) 15	08:05 18:19	09:42 (WEA 17-2) 36	08:01 16:26	09:06 (WEA 17-2) 36	08:37 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:12 (WEA 17-1) 18	08:07 18:17	09:42 (WEA 17-2) 36	08:03 16:25	09:06 (WEA 17-2) 36	08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:10 (WEA 17-1) 21	08:09 18:15	09:42 (WEA 17-2) 35	08:04 16:24	09:06 (WEA 17-2) 35	08:37 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:08 (WEA 17-1) 23	08:11 18:13	09:06 (WEA 17-3) 35	08:06 16:23	09:41 (WEA 17-2) 35	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:08 (WEA 17-1) 24	08:12 18:11	09:05 (WEA 17-3) 35	08:08 16:22	09:05 (WEA 17-3) 35	08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	08:07 (WEA 17-1) 25	07:14 17:09	08:05 (WEA 17-3) 34	08:09 16:21	08:05 (WEA 17-3) 34	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:06 (WEA 17-1) 25	07:16 17:07	08:04 (WEA 17-3) 34	08:11 16:20	08:04 (WEA 17-3) 34	08:38 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	08:06 (WEA 17-1) 25	07:18 17:05	08:38 (WEA 17-2) 33	08:12 16:20	08:04 (WEA 17-3) 33	08:39 16:21
31	05:44 21:24	06:35 20:21		08:31 (WEA 17-1) 25	07:20 17:03	08:37 (WEA 17-2) 32	08:12 16:22	08:04 (WEA 17-3) 32	08:39 16:22
Sonnenscheinstunden	505	456	382		332	856	265	158	241
astr.max.mögl.Beschattung			185						

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 04 - Welperort 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	08:26 (WEA 17-2) 09:11 (WEA 17-2)	07:06 20:00	08:11 (WEA 17-1) 05:59
2	08:39 16:24	08:10 17:14	07:15 18:06	08:25 (WEA 17-2) 09:12 (WEA 17-2)	07:03 20:02	08:14 (WEA 17-1) 05:57
3	08:38 16:25	08:08 17:15	07:13 18:08	08:25 (WEA 17-2) 09:12 (WEA 17-2)	07:01 20:03	08:24 (WEA 17-1) 05:56
4	08:38 16:27	08:07 17:17	07:11 18:10	08:24 (WEA 17-2) 09:11 (WEA 17-2)	06:59 20:05	05:54 20:57
5	08:38 16:28	08:05 17:19	07:09 18:12	08:25 (WEA 17-2) 09:11 (WEA 17-2)	06:56 20:07	05:52 20:59
6	08:38 16:29	08:03 17:21	07:06 18:14	08:25 (WEA 17-2) 09:11 (WEA 17-2)	06:54 20:08	05:50 21:00
7	08:37 16:30	08:02 17:23	07:04 18:15	08:24 (WEA 17-2) 09:10 (WEA 17-2)	06:52 20:10	05:48 21:02
8	08:37 16:32	08:00 17:25	07:02 18:17	08:25 (WEA 17-2) 09:09 (WEA 17-2)	06:49 20:12	05:46 21:04
9	08:36 16:33	07:58 17:27	06:59 18:19	08:25 (WEA 17-2) 09:09 (WEA 17-2)	06:47 20:14	05:44 21:06
10	08:36 16:34	07:56 17:29	06:57 18:21	08:25 (WEA 17-2) 09:07 (WEA 17-2)	06:45 20:15	05:43 21:07
11	08:35 16:36	07:54 17:31	06:55 18:23	08:26 (WEA 17-2) 09:06 (WEA 17-2)	06:42 20:17	05:41 21:09
12	08:35 16:37	07:53 17:33	06:53 18:24	08:27 (WEA 17-2) 09:05 (WEA 17-2)	06:40 20:19	05:39 21:10
13	08:34 16:39	07:51 17:34	06:50 18:26	08:27 (WEA 17-2) 09:03 (WEA 17-2)	06:38 20:21	05:37 21:12
14	08:33 16:40	07:49 17:36	06:48 18:28	08:28 (WEA 17-2) 09:02 (WEA 17-2)	06:36 20:22	05:36 21:14
15	08:32 16:42	07:47 17:38	06:46 18:30	08:30 (WEA 17-2) 09:00 (WEA 17-2)	06:33 20:24	05:34 21:15
16	08:32 16:43	07:45 17:40	06:43 18:32	08:30 (WEA 17-2) 09:00 (WEA 17-2)	06:31 20:26	05:33 21:17
17	08:31 16:45	07:43 17:42	06:41 18:33	08:30 (WEA 17-2) 09:00 (WEA 17-2)	06:29 20:28	05:31 21:18
18	08:30 16:47	07:41 17:44	06:39 18:35	08:30 (WEA 17-2) 09:01 (WEA 17-2)	06:27 20:29	05:30 21:20
19	08:29 16:48	07:39 17:46	06:36 18:37	08:29 (WEA 17-2) 09:02 (WEA 17-2)	06:25 20:31	05:28 21:22
20	08:28 16:50	07:37 17:48	06:34 18:39	08:29 (WEA 17-2) 09:04 (WEA 17-2)	06:22 20:33	05:27 21:23
21	08:27 16:52	07:35 17:50	06:32 18:40	08:30 (WEA 17-2) 09:06 (WEA 17-2)	06:20 20:35	05:25 21:25
22	08:25 16:53	07:33 17:51	06:29 18:42	08:31 (WEA 17-2) 09:08 (WEA 17-2)	06:18 20:36	05:24 21:26
23	08:24 16:55	07:30 17:53	06:27 18:44	08:31 (WEA 17-2) 09:09 (WEA 17-2)	06:16 20:38	05:23 21:27
24	08:23 16:57	07:28 17:55	06:24 18:46	08:29 (WEA 17-2) 09:09 (WEA 17-2)	06:14 20:40	05:21 21:29
25	08:22 16:59	07:26 17:57	06:22 19:48	08:28 (WEA 17-2) 09:10 (WEA 17-2)	06:12 20:42	05:20 21:30
26	08:20 17:01	07:24 17:59	06:20 19:49	08:28 (WEA 17-2) 09:11 (WEA 17-2)	06:10 20:43	05:19 21:32
27	08:19 17:02	07:22 18:01	06:17 19:51	08:27 (WEA 17-2) 09:11 (WEA 17-2)	06:08 20:45	05:18 21:33
28	08:18 17:04	07:20 18:03	06:15 19:53	08:26 (WEA 17-2) 09:11 (WEA 17-2)	06:05 20:47	05:17 21:34
29	08:16 17:06		06:13 19:55	08:08 (WEA 17-1) 08:33 (WEA 17-1)	06:03 20:49	05:15 21:36
30	08:15 17:08		06:10 19:56	08:09 (WEA 17-1) 08:32 (WEA 17-1)	06:01 20:50	05:14 21:37
31	08:13 17:10		06:08 19:58	08:10 (WEA 17-1) 08:30 (WEA 17-1)	06:00 20:50	05:13 21:38
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung		640	1074	26		

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 04 - Welperort 7

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September		Oktober		November		Dezember	
1	05:08 21:54	05:45 21:22	06:36 20:19		07:27 19:08		09:07 (WEA 17-2) 09:42 (WEA 17-2)	07:21 17:01	08:03 (WEA 17-3) 08:23 (WEA 17-3)	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17		07:28 19:06	35	09:06 (WEA 17-2) 09:44 (WEA 17-2)	07:23 16:59	08:04 (WEA 17-3) 08:22 (WEA 17-3)	08:15 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14		07:30 19:04	38	09:04 (WEA 17-2) 09:44 (WEA 17-2)	07:25 16:57	08:06 (WEA 17-3) 08:20 (WEA 17-3)	08:17 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12		07:32 19:01	40	09:03 (WEA 17-2) 09:45 (WEA 17-2)	07:27 16:55	08:10 (WEA 17-3) 08:16 (WEA 17-3)	08:18 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10		07:33 18:59	42	09:02 (WEA 17-2) 09:45 (WEA 17-2)	07:29 16:53		08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07		07:35 18:57	43	09:02 (WEA 17-2) 09:46 (WEA 17-2)	07:31 16:52		08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05		07:37 18:54	44	09:00 (WEA 17-2) 09:45 (WEA 17-2)	07:33 16:50		08:22 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03		07:39 18:52	45	09:00 (WEA 17-2) 09:46 (WEA 17-2)	07:34 16:48		08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00		07:40 18:50	46	09:00 (WEA 17-2) 09:46 (WEA 17-2)	07:36 16:46		08:25 16:15
10	05:16 21:49	06:00 21:06	06:51 19:58		07:42 18:48	46	08:59 (WEA 17-2) 09:46 (WEA 17-2)	07:38 16:45		08:26 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	10	08:07 (WEA 17-1) 08:17 (WEA 17-1)	47	08:59 (WEA 17-2) 09:46 (WEA 17-2)	07:40 16:43		08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	15	08:04 (WEA 17-1) 08:19 (WEA 17-1)	47	08:58 (WEA 17-2) 09:45 (WEA 17-2)	07:42 16:41		08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	19	08:02 (WEA 17-1) 08:21 (WEA 17-1)	47	08:59 (WEA 17-2) 09:45 (WEA 17-2)	07:43 16:40		08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	23	08:00 (WEA 17-1) 08:23 (WEA 17-1)	46	08:59 (WEA 17-2) 09:44 (WEA 17-2)	07:45 16:38		08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	25	07:58 (WEA 17-1) 08:23 (WEA 17-1)	45	08:59 (WEA 17-2) 09:44 (WEA 17-2)	07:47 16:37		08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	27	07:57 (WEA 17-1) 08:24 (WEA 17-1)	45	09:00 (WEA 17-2) 09:43 (WEA 17-2)	07:49 16:35		08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	27	07:56 (WEA 17-1) 08:23 (WEA 17-1)	43	09:00 (WEA 17-2) 09:43 (WEA 17-2)	07:51 16:34		08:33 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	27	07:55 (WEA 17-1) 08:24 (WEA 17-1)	43	09:01 (WEA 17-2) 09:42 (WEA 17-2)	07:52 16:33		08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	29	07:55 (WEA 17-1) 08:24 (WEA 17-1)	41	09:01 (WEA 17-2) 09:40 (WEA 17-2)	07:54 16:31		08:34 16:14
20	05:28 21:40	06:16 20:46	07:08 19:34	29	07:54 (WEA 17-1) 08:23 (WEA 17-1)	39	09:01 (WEA 17-3) 09:39 (WEA 17-2)	07:56 16:30		08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	29	07:54 (WEA 17-1) 08:23 (WEA 17-1)	38	09:01 (WEA 17-3) 09:37 (WEA 17-2)	07:58 16:29		08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	29	07:55 (WEA 17-1) 08:22 (WEA 17-1)	36	09:00 (WEA 17-3) 09:36 (WEA 17-2)	07:59 16:28		08:36 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	27	07:54 (WEA 17-1) 08:21 (WEA 17-1)	36	09:00 (WEA 17-3) 09:34 (WEA 17-2)	08:01 16:26		08:37 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	27	07:55 (WEA 17-1) 08:20 (WEA 17-1)	34	08:59 (WEA 17-3) 09:32 (WEA 17-2)	08:03 16:25		08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	23	07:56 (WEA 17-1) 08:19 (WEA 17-1)	30	08:59 (WEA 17-3) 09:29 (WEA 17-2)	08:04 16:24		08:37 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	23	07:56 (WEA 17-1) 09:29 (WEA 17-2)	30	08:59 (WEA 17-3) 09:27 (WEA 17-3)	08:06 16:23		08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	29	07:57 (WEA 17-1) 09:35 (WEA 17-2)	28	08:59 (WEA 17-3) 09:27 (WEA 17-3)	08:08 16:22		08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	38	08:00 (WEA 17-1) 09:38 (WEA 17-2)	26	08:00 (WEA 17-3) 08:26 (WEA 17-3)	08:09 16:21		08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	29	09:10 (WEA 17-2) 09:39 (WEA 17-2)	26	08:00 (WEA 17-3) 08:26 (WEA 17-3)	08:11 16:20		08:38 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	29	09:09 (WEA 17-2) 09:41 (WEA 17-2)	26	08:01 (WEA 17-3) 08:25 (WEA 17-3)	08:12 16:20		08:39 16:21
31	05:44 21:24	06:35 20:21		32	07:20 17:03	24	08:02 (WEA 17-3) 08:24 (WEA 17-3)			08:39 16:22
	Sonnenscheinstunden	505	456	382	332	1183	265	58	241	
	astr.max.mögl.Beschattung			529						

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 05 - Welperort 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	08:03 (WEA 17-3) 07:06 08:31 (WEA 17-3) 20:00	07:42 (WEA 17-1) 05:59 09:16 (WEA 17-2) 20:52	05:13 21:39
2	08:39 16:24	08:10 17:14	07:15 18:06	08:03 (WEA 17-3) 07:03 08:31 (WEA 17-3) 20:02	07:42 (WEA 17-1) 05:57 09:14 (WEA 17-2) 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	08:03 (WEA 17-3) 07:01 08:31 (WEA 17-3) 20:03	07:41 (WEA 17-1) 05:56 09:12 (WEA 17-2) 20:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	08:03 (WEA 17-3) 06:59 08:30 (WEA 17-3) 20:05	07:40 (WEA 17-1) 05:54 09:09 (WEA 17-2) 20:57	05:10 21:43
5	08:38 16:28	08:05 17:19	07:09 18:12	08:03 (WEA 17-3) 06:56 08:29 (WEA 17-3) 20:07	07:40 (WEA 17-1) 05:52 09:07 (WEA 17-2) 20:59	05:09 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14	08:04 (WEA 17-3) 06:54 08:28 (WEA 17-3) 20:08	07:40 (WEA 17-1) 05:50 09:03 (WEA 17-2) 21:00	05:09 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	08:05 (WEA 17-3) 06:52 08:26 (WEA 17-3) 20:10	07:40 (WEA 17-1) 05:48 08:07 (WEA 17-1) 21:02	05:08 21:46
8	08:37 16:32	08:00 17:25	07:02 18:17	08:03 (WEA 17-2) 06:49 08:25 (WEA 17-3) 20:12	07:40 (WEA 17-1) 05:46 08:06 (WEA 17-1) 21:04	05:07 21:47
9	08:36 16:33	07:58 17:27	06:59 18:19	07:57 (WEA 17-2) 06:47 08:23 (WEA 17-3) 20:14	07:40 (WEA 17-1) 05:44 08:05 (WEA 17-1) 21:06	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	07:53 (WEA 17-2) 06:45 08:18 (WEA 17-3) 20:15	07:41 (WEA 17-1) 05:43 08:04 (WEA 17-1) 21:07	05:06 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23	07:51 (WEA 17-2) 06:42 08:19 (WEA 17-2) 20:17	07:42 (WEA 17-1) 05:41 08:03 (WEA 17-1) 21:09	05:06 21:49
12	08:35 16:37	07:53 17:33	06:53 18:24	07:49 (WEA 17-2) 06:40 08:21 (WEA 17-2) 20:19	07:43 (WEA 17-1) 05:39 08:00 (WEA 17-1) 21:10	05:06 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	07:46 (WEA 17-2) 06:38 08:22 (WEA 17-2) 20:21	07:45 (WEA 17-1) 05:37 07:58 (WEA 17-1) 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	07:45 (WEA 17-2) 06:36 08:23 (WEA 17-2) 20:22	07:49 (WEA 17-1) 05:36 07:53 (WEA 17-1) 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	06:46 18:30	07:44 (WEA 17-2) 06:33 08:24 (WEA 17-2) 20:24	05:34 21:15	05:05 21:52
16	08:32 16:43	07:45 17:40	06:43 18:32	07:42 (WEA 17-2) 06:31 08:24 (WEA 17-2) 20:26	05:33 21:17	05:05 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33	07:42 (WEA 17-2) 06:29 08:25 (WEA 17-2) 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	06:39 18:35	07:40 (WEA 17-2) 06:27 08:25 (WEA 17-2) 20:29	05:30 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	07:40 (WEA 17-2) 06:25 08:25 (WEA 17-2) 20:31	05:28 21:22	05:04 21:54
20	08:28 16:50	07:37 17:48	06:34 18:39	07:39 (WEA 17-2) 06:22 08:21 (WEA 17-3) 20:33	05:27 21:23	05:04 21:54
21	08:27 16:52	07:35 17:50	06:32 18:40	07:38 (WEA 17-2) 06:20 08:25 (WEA 17-2) 20:35	05:25 21:25	05:05 21:54
22	08:25 16:54	07:33 17:51	06:29 18:42	07:38 (WEA 17-2) 06:18 08:25 (WEA 17-2) 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	07:38 (WEA 17-2) 06:16 08:25 (WEA 17-2) 20:38	05:23 21:27	05:05 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	07:37 (WEA 17-2) 06:14 08:24 (WEA 17-2) 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:48	08:37 (WEA 17-2) 06:12 09:24 (WEA 17-2) 20:42	05:20 21:30	05:06 21:55
26	08:20 17:01	07:24 17:59	07:20 19:49	08:38 (WEA 17-2) 06:10 09:24 (WEA 17-2) 20:43	05:19 21:32	05:06 21:55
27	08:19 17:02	07:22 18:01	07:17 19:51	07:53 (WEA 17-1) 06:08 09:22 (WEA 17-2) 20:45	05:18 21:33	05:06 21:55
28	08:18 17:04	07:20 18:03	07:15 19:53	07:50 (WEA 17-1) 06:05 09:22 (WEA 17-2) 20:47	05:17 21:34	05:07 21:55
29	08:16 17:06		07:13 19:55	07:47 (WEA 17-1) 06:03 09:20 (WEA 17-2) 20:49	05:15 21:36	05:07 21:55
30	08:15 17:08		07:10 19:56	07:45 (WEA 17-1) 06:01 09:19 (WEA 17-2) 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10		07:08 19:58	07:44 (WEA 17-1) 06:00 09:18 (WEA 17-2) 20:52	05:13 21:38	
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 275	188 366	1229 366	416 483	502 487

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 05 - Welperort 10

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember	
1	05:08 21:54	05:45 21:22	06:36 20:19	07:43 (WEA 17-1) 08:00 (WEA 17-1)	07:27 19:08	08:26 (WEA 17-2) 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:40 (WEA 17-1) 08:01 (WEA 17-1)	19:08 19:06	08:27 (WEA 17-2) 09:01 (WEA 17-2)	08:15 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:39 (WEA 17-1) 08:02 (WEA 17-1)	07:30 19:04	08:28 (WEA 17-2) 08:58 (WEA 17-2)	08:17 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:38 (WEA 17-1) 08:03 (WEA 17-1)	07:32 19:01	08:30 (WEA 17-2) 08:56 (WEA 17-2)	08:18 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:37 (WEA 17-1) 08:03 (WEA 17-1)	07:33 18:59	08:32 (WEA 17-2) 08:58 (WEA 17-3)	08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:36 (WEA 17-1) 08:03 (WEA 17-1)	07:35 18:57	08:36 (WEA 17-2) 09:01 (WEA 17-3)	08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:35 (WEA 17-1) 08:58 (WEA 17-2)	07:37 18:54	08:41 (WEA 17-3) 09:02 (WEA 17-3)	08:22 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:35 (WEA 17-1) 09:02 (WEA 17-2)	07:39 18:52	08:40 (WEA 17-3) 09:03 (WEA 17-3)	08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:35 (WEA 17-1) 09:04 (WEA 17-2)	07:40 18:50	08:39 (WEA 17-3) 09:04 (WEA 17-3)	08:25 16:15
10	05:16 21:49	06:00 21:06	06:51 19:58	07:34 (WEA 17-1) 09:05 (WEA 17-2)	07:42 18:48	08:38 (WEA 17-3) 09:04 (WEA 17-3)	08:26 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:35 (WEA 17-1) 09:07 (WEA 17-2)	07:44 18:45	08:38 (WEA 17-3) 09:05 (WEA 17-3)	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:34 (WEA 17-1) 09:08 (WEA 17-2)	07:46 18:43	08:36 (WEA 17-3) 09:04 (WEA 17-3)	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:35 (WEA 17-1) 09:09 (WEA 17-2)	07:47 18:41	08:36 (WEA 17-3) 09:04 (WEA 17-3)	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:36 (WEA 17-1) 09:10 (WEA 17-2)	07:49 18:38	08:36 (WEA 17-3) 09:04 (WEA 17-3)	08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:37 (WEA 17-1) 09:10 (WEA 17-2)	07:51 18:36	08:36 (WEA 17-3) 09:04 (WEA 17-3)	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:39 (WEA 17-1) 09:11 (WEA 17-2)	07:53 18:34	08:36 (WEA 17-3) 09:03 (WEA 17-3)	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:41 (WEA 17-1) 09:10 (WEA 17-2)	07:54 18:32	08:37 (WEA 17-3) 09:03 (WEA 17-3)	08:33 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	08:25 (WEA 17-2) 09:11 (WEA 17-2)	07:56 18:30	08:38 (WEA 17-3) 09:02 (WEA 17-3)	08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	08:25 (WEA 17-2) 09:11 (WEA 17-2)	07:58 18:27	08:37 (WEA 17-3) 09:00 (WEA 17-3)	08:34 16:14
20	05:28 21:40	06:16 20:46	07:08 19:34	08:24 (WEA 17-2) 09:11 (WEA 17-2)	08:00 18:25	08:39 (WEA 17-3) 08:59 (WEA 17-3)	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:24 (WEA 17-2) 09:11 (WEA 17-2)	08:01 18:23	08:40 (WEA 17-3) 08:57 (WEA 17-3)	08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:24 (WEA 17-2) 09:11 (WEA 17-2)	08:03 18:21	08:43 (WEA 17-3) 08:54 (WEA 17-3)	08:36 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:23 (WEA 17-2) 09:10 (WEA 17-2)	08:05 18:19	08:01 16:26	08:37 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:23 (WEA 17-2) 09:09 (WEA 17-2)	08:07 18:17	08:03 16:25	08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:23 (WEA 17-2) 09:09 (WEA 17-2)	08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:23 (WEA 17-2) 09:08 (WEA 17-2)	08:11 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:23 (WEA 17-2) 09:07 (WEA 17-2)	08:12 18:11	08:08 16:22	08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	08:24 (WEA 17-2) 09:06 (WEA 17-2)	07:14 17:09	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:24 (WEA 17-2) 09:05 (WEA 17-2)	07:16 17:07	08:11 16:20	08:38 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	08:24 (WEA 17-2) 09:03 (WEA 17-2)	07:18 17:05	08:12 16:20	08:39 16:21
31	05:44 21:24	06:35 20:21	07:25 19:09	07:58 (WEA 17-1) 07:58 (WEA 17-1)	07:20 17:03	08:39 16:22	08:39 16:22
Sonnenscheinstunden	505	456	382	332	559	265	241
astr.max.mögl.Beschattung		19	1346				

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 06 - Welperort 14

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April		Mai		Juni		
1	08:39 16:23	08:12 17:12	07:17 18:04		07:06 20:00	22	08:04 (WEA 17-3) 08:26 (WEA 17-3)	05:59 20:52	61	06:45 (WEA 17-1) 07:46 (WEA 17-2)	05:13 21:39
2	08:39 16:24	08:10 17:14	07:15 18:06		07:03 20:02	19	08:06 (WEA 17-3) 08:25 (WEA 17-3)	05:57 20:54	61	06:45 (WEA 17-1) 07:46 (WEA 17-2)	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08		07:01 20:03	15	08:08 (WEA 17-3) 08:23 (WEA 17-3)	05:56 20:55	60	06:46 (WEA 17-1) 07:46 (WEA 17-2)	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10		06:59 20:05	8	08:10 (WEA 17-3) 08:18 (WEA 17-3)	05:54 20:57	60	06:47 (WEA 17-1) 07:47 (WEA 17-2)	05:10 21:43
5	08:38 16:28	08:05 17:19	07:09 18:12		06:56 20:07			05:52 20:59	59	06:47 (WEA 17-1) 07:46 (WEA 17-2)	05:09 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14		06:54 20:08			05:50 21:00	58	06:48 (WEA 17-1) 07:46 (WEA 17-2)	05:09 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15		06:52 20:10			05:48 21:02	58	06:48 (WEA 17-1) 07:46 (WEA 17-2)	05:08 21:46
8	08:37 16:32	08:00 17:25	07:02 18:17		06:49 20:12			05:46 21:04	56	06:50 (WEA 17-1) 07:46 (WEA 17-2)	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19		06:47 20:14			05:44 21:05	53	06:52 (WEA 17-1) 07:45 (WEA 17-2)	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21		06:45 20:15			05:43 21:07	51	06:54 (WEA 17-1) 07:45 (WEA 17-2)	05:06 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23		06:42 20:17			05:41 21:09	45	07:00 (WEA 17-2) 07:45 (WEA 17-2)	05:06 21:49
12	08:35 16:37	07:53 17:33	06:53 18:24		06:40 20:19			05:39 21:10	44	07:00 (WEA 17-2) 07:44 (WEA 17-2)	05:06 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26		06:38 20:21			05:37 21:12	43	07:01 (WEA 17-2) 07:44 (WEA 17-2)	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28		06:36 20:22			05:36 21:14	42	07:01 (WEA 17-2) 07:43 (WEA 17-2)	05:05 21:51
15	08:32 16:42	07:47 17:38	06:46 18:30		06:33 20:24			05:34 21:15	41	07:02 (WEA 17-2) 07:43 (WEA 17-2)	05:05 21:52
16	08:32 16:43	07:45 17:40	06:43 18:32		06:31 20:26			05:33 21:17	40	07:02 (WEA 17-2) 07:42 (WEA 17-2)	05:05 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33		06:29 20:28			05:31 21:18	39	07:03 (WEA 17-2) 07:42 (WEA 17-2)	05:04 21:53
18	08:30 16:47	07:41 17:44	06:39 18:35	12	07:14 (WEA 17-3) 07:26 (WEA 17-3)			05:30 21:20	38	07:04 (WEA 17-2) 07:42 (WEA 17-2)	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	18	07:11 (WEA 17-3) 07:29 (WEA 17-3)		12	05:28 21:21	36	07:04 (WEA 17-2) 07:40 (WEA 17-2)	05:04 21:54
20	08:28 16:50	07:37 17:48	06:34 18:39	20	07:10 (WEA 17-3) 07:30 (WEA 17-3)		29	05:27 21:23	35	07:05 (WEA 17-2) 07:40 (WEA 17-2)	05:04 21:54
21	08:27 16:52	07:35 17:50	06:32 18:40	24	07:07 (WEA 17-3) 07:31 (WEA 17-3)		40	05:25 21:25	33	07:06 (WEA 17-2) 07:39 (WEA 17-2)	05:05 21:54
22	08:25 16:54	07:33 17:51	06:29 18:42	26	07:06 (WEA 17-3) 07:32 (WEA 17-3)		47	05:24 21:26	32	07:07 (WEA 17-2) 07:39 (WEA 17-2)	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	27	07:06 (WEA 17-3) 07:33 (WEA 17-3)		51	05:23 21:27	30	07:07 (WEA 17-2) 07:37 (WEA 17-2)	05:05 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	28	07:04 (WEA 17-3) 07:32 (WEA 17-3)		54	05:21 21:29	28	07:08 (WEA 17-2) 07:36 (WEA 17-2)	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:48	28	08:04 (WEA 17-3) 08:32 (WEA 17-3)		55	05:20 21:30	26	07:09 (WEA 17-2) 07:35 (WEA 17-2)	05:06 21:55
26	08:20 17:01	07:24 17:59	06:20 19:49	29	08:04 (WEA 17-3) 08:33 (WEA 17-3)		57	05:19 21:32	23	07:11 (WEA 17-2) 07:34 (WEA 17-2)	05:06 21:55
27	08:19 17:02	07:22 18:01	06:17 19:51	29	08:03 (WEA 17-3) 08:32 (WEA 17-3)		58	05:18 21:33	21	07:12 (WEA 17-2) 07:33 (WEA 17-2)	05:06 21:55
28	08:18 17:04	07:20 18:03	06:15 19:53	28	08:03 (WEA 17-3) 08:31 (WEA 17-3)		59	05:17 21:34	17	07:14 (WEA 17-2) 07:31 (WEA 17-2)	05:07 21:55
29	08:16 17:06		06:13 19:55	27	08:03 (WEA 17-3) 08:30 (WEA 17-3)		60	05:15 21:36	14	07:15 (WEA 17-2) 07:29 (WEA 17-2)	05:07 21:55
30	08:15 17:08		06:10 19:56	26	08:03 (WEA 17-3) 08:29 (WEA 17-3)		60	05:14 21:37	9	07:18 (WEA 17-2) 07:27 (WEA 17-2)	05:08 21:54
31	08:13 17:10		06:08 19:58	24	08:04 (WEA 17-3) 08:28 (WEA 17-3)			05:13 21:38			
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 275	366 346		416 646			487 1213		502	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 06 - Welperort 14

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	05:09	05:45	07:11 (WEA 17-2)	06:36			07:27	07:21	08:14		
	21:54	21:22	07:55 (WEA 17-2)	20:19			19:08	17:01	16:19		
2	05:09	05:47	07:10 (WEA 17-2)	06:38			07:28	07:23	08:15		
	21:54	21:20	07:55 (WEA 17-2)	20:17			19:06	16:59	16:18		
3	05:10	05:49	07:11 (WEA 17-2)	06:40			07:30	07:25	08:17		
	21:53	21:19	07:55 (WEA 17-2)	20:14			19:04	16:57	16:17		
4	05:11	05:50	07:03 (WEA 17-1)	06:41			07:32	07:27	08:18		
	21:53	21:17	07:55 (WEA 17-2)	20:12			19:01	16:55	16:17		
5	05:11	05:52	07:01 (WEA 17-1)	06:43			07:33	07:29	08:19		
	21:53	21:15	07:56 (WEA 17-2)	20:10			18:59	16:53	16:16		
6	05:12	05:53	06:59 (WEA 17-1)	06:45			07:35	07:31	08:21		
	21:52	21:13	07:55 (WEA 17-2)	20:07			18:57	16:52	16:16		
7	05:13	05:55	06:58 (WEA 17-1)	06:46			07:37	07:32	08:22		
	21:51	21:11	07:56 (WEA 17-2)	20:05			18:54	16:50	16:15		
8	05:14	05:57	06:57 (WEA 17-1)	06:48			07:39	07:34	08:23		
	21:51	21:10	07:55 (WEA 17-2)	20:03			18:52	16:48	16:15		
9	05:15	05:58	06:56 (WEA 17-1)	06:50		08:06 (WEA 17-3)	07:40	07:36	08:25		
	21:50	21:08	07:56 (WEA 17-2)	20:00	7	08:13 (WEA 17-3)	18:50	16:46	16:15		
10	05:16	06:00	06:55 (WEA 17-1)	06:51		08:01 (WEA 17-3)	07:42	07:38	08:26		
	21:49	21:06	07:55 (WEA 17-2)	19:58	15	08:16 (WEA 17-3)	18:48	16:45	16:14		
11	05:17	06:02	06:55 (WEA 17-1)	06:53		07:59 (WEA 17-3)	07:44	07:40	08:27		
	21:49	21:04	07:55 (WEA 17-2)	19:56	19	08:18 (WEA 17-3)	18:45	16:43	16:14		
12	05:18	06:03	06:54 (WEA 17-1)	06:55		07:57 (WEA 17-3)	07:46	07:42	08:28		
	21:48	21:02	07:54 (WEA 17-2)	19:53	21	08:18 (WEA 17-3)	18:43	16:41	16:14		
13	05:19	06:05	06:54 (WEA 17-1)	06:56		07:56 (WEA 17-3)	07:47	07:43	08:29		
	21:47	21:00	07:54 (WEA 17-2)	19:51	24	08:20 (WEA 17-3)	18:41	16:40	16:14		
14	05:20	06:06	06:53 (WEA 17-1)	06:58		07:55 (WEA 17-3)	07:49	07:45	08:30		
	21:46	6 07:34 (WEA 17-2)	20:58	60 07:53 (WEA 17-2)	19:49	25 08:20 (WEA 17-3)	18:38	16:38	16:14		
15	05:22	07:26 (WEA 17-2)	06:08	60 06:53 (WEA 17-1)	07:00	27 07:53 (WEA 17-3)	07:51	07:47	08:31		
	21:45	12 07:38 (WEA 17-2)	20:56	60 07:53 (WEA 17-2)	19:46	27 08:20 (WEA 17-3)	18:36	16:37	16:14		
16	05:23	07:24 (WEA 17-2)	06:10	60 06:54 (WEA 17-1)	07:01	28 07:53 (WEA 17-3)	07:53	07:49	08:32		
	21:44	16 07:40 (WEA 17-2)	20:54	59 07:53 (WEA 17-2)	19:44	28 08:21 (WEA 17-3)	18:34	16:35	16:14		
17	05:24	07:22 (WEA 17-2)	06:11	60 06:53 (WEA 17-1)	07:03	29 07:51 (WEA 17-3)	07:54	07:51	08:33		
	21:43	19 07:41 (WEA 17-2)	20:52	58 07:51 (WEA 17-2)	19:42	29 08:20 (WEA 17-3)	18:32	16:34	16:14		
18	05:25	07:21 (WEA 17-2)	06:13	60 06:54 (WEA 17-1)	07:05	30 07:51 (WEA 17-3)	07:56	07:52	08:33		
	21:42	22 07:43 (WEA 17-2)	20:50	57 07:51 (WEA 17-2)	19:39	29 08:20 (WEA 17-3)	18:30	16:33	16:14		
19	05:27	07:19 (WEA 17-2)	06:15	60 06:54 (WEA 17-1)	07:06	30 07:51 (WEA 17-3)	07:58	07:54	08:34		
	21:41	25 07:44 (WEA 17-2)	20:48	55 07:49 (WEA 17-2)	19:37	29 08:20 (WEA 17-3)	18:27	16:31	16:14		
20	05:28	07:18 (WEA 17-2)	06:16	60 06:55 (WEA 17-1)	07:08	31 07:51 (WEA 17-3)	08:00	07:56	08:35		
	21:39	27 07:45 (WEA 17-2)	20:46	53 07:48 (WEA 17-2)	19:34	28 08:19 (WEA 17-3)	18:25	16:30	16:15		
21	05:29	07:18 (WEA 17-2)	06:18	60 06:55 (WEA 17-1)	07:10	29 07:51 (WEA 17-3)	08:01	07:58	08:35		
	21:38	29 07:47 (WEA 17-2)	20:43	51 07:46 (WEA 17-2)	19:32	27 08:18 (WEA 17-3)	18:23	16:29	16:15		
22	05:31	07:17 (WEA 17-2)	06:20	60 06:56 (WEA 17-1)	07:11	28 07:52 (WEA 17-3)	08:03	07:59	08:36		
	21:37	31 07:48 (WEA 17-2)	20:41	46 07:44 (WEA 17-2)	19:30	25 08:17 (WEA 17-3)	18:21	16:28	16:16		
23	05:32	07:16 (WEA 17-2)	06:21	60 06:59 (WEA 17-1)	07:13	26 07:52 (WEA 17-3)	08:05	08:01	08:37		
	21:36	32 07:48 (WEA 17-2)	20:39	37 07:42 (WEA 17-2)	19:27	24 08:16 (WEA 17-3)	18:19	16:26	16:16		
24	05:34	07:16 (WEA 17-2)	06:23	60 07:01 (WEA 17-1)	07:15	25 07:53 (WEA 17-3)	08:07	08:03	08:37		
	21:34	34 07:50 (WEA 17-2)	20:37	26 07:39 (WEA 17-2)	19:25	21 08:14 (WEA 17-3)	18:17	16:25	16:17		
25	05:35	07:15 (WEA 17-2)	06:25	60 07:25 (WEA 17-2)	07:16	22 07:54 (WEA 17-3)	08:09	08:04	08:37		
	21:33	35 07:50 (WEA 17-2)	20:35	10 07:35 (WEA 17-2)	19:23	19 08:13 (WEA 17-3)	18:15	16:24	16:17		
26	05:36	07:14 (WEA 17-2)	06:26		07:18	20 07:56 (WEA 17-3)	08:11	08:06	08:38		
	21:31	37 07:51 (WEA 17-2)	20:33		19:20	13 08:09 (WEA 17-3)	18:13	16:23	16:18		
27	05:38	07:14 (WEA 17-2)	06:28		07:20	14 08:00 (WEA 17-3)	08:12	08:08	08:38		
	21:30	38 07:52 (WEA 17-2)	20:30		19:18	5 08:05 (WEA 17-3)	18:11	16:22	16:19		
28	05:39	07:13 (WEA 17-2)	06:30		07:21		07:14	08:09	08:38		
	21:28	39 07:52 (WEA 17-2)	20:28		19:15		17:09	16:21	16:19		
29	05:41	07:13 (WEA 17-2)	06:31		07:23		07:16	08:11	08:38		
	21:27	41 07:54 (WEA 17-2)	20:26		19:13		17:07	16:20	16:20		
30	05:42	07:12 (WEA 17-2)	06:33		07:25		07:18	08:12	08:39		
	21:25	42 07:54 (WEA 17-2)	20:24		19:11		17:05	16:20	16:21		
31	05:44	07:11 (WEA 17-2)	06:35				07:20		08:39		
	21:24	43 07:54 (WEA 17-2)	20:21				17:03		16:22		
Sonnenscheinstunden 505		456		382		415		332		265	
astr.max.mögl.Beschattung 528		1284								241	

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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
	Sonnenuntergang (SS:MM)			



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 07 - Welperort 16

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00		
2	08:39 16:24	08:10 17:14	07:15 18:06	07:03 20:02	26 07:45 (WEA 17-3) 05:59 08:11 (WEA 17-3) 20:52	41 06:36 (WEA 17-1) 05:13 07:17 (WEA 17-2) 21:39
3	08:38 16:26	08:08 17:15	07:13 18:08	07:01 20:03	26 07:45 (WEA 17-3) 05:56 08:11 (WEA 17-3) 20:55	44 06:35 (WEA 17-1) 05:11 07:19 (WEA 17-2) 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	26 07:44 (WEA 17-3) 05:54 08:10 (WEA 17-3) 20:57	44 06:36 (WEA 17-1) 05:10 07:20 (WEA 17-2) 21:43
5	08:38 16:28	08:05 17:19	07:09 18:12	06:56 20:07	24 07:45 (WEA 17-3) 05:52 08:09 (WEA 17-3) 20:59	44 06:36 (WEA 17-1) 05:09 07:20 (WEA 17-2) 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:09	23 07:45 (WEA 17-3) 05:50 08:08 (WEA 17-3) 21:00	45 06:36 (WEA 17-1) 05:09 07:21 (WEA 17-2) 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	21 07:46 (WEA 17-3) 05:48 08:07 (WEA 17-3) 21:02	45 06:36 (WEA 17-1) 05:08 07:21 (WEA 17-2) 21:46
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	18 07:47 (WEA 17-3) 05:46 08:05 (WEA 17-3) 21:04	45 06:37 (WEA 17-1) 05:07 07:22 (WEA 17-2) 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	15 07:48 (WEA 17-3) 05:44 08:03 (WEA 17-3) 21:06	44 06:37 (WEA 17-1) 05:07 07:21 (WEA 17-2) 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	9 07:51 (WEA 17-3) 05:43 08:00 (WEA 17-3) 21:07	44 06:37 (WEA 17-1) 05:06 07:21 (WEA 17-2) 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23	06:43 20:17		43 06:39 (WEA 17-1) 05:06 07:22 (WEA 17-2) 21:49
12	08:35 16:37	07:53 17:33	06:53 18:24	06:40 20:19		41 06:40 (WEA 17-1) 05:06 07:21 (WEA 17-2) 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21		40 06:42 (WEA 17-1) 05:05 07:22 (WEA 17-2) 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22		40 06:41 (WEA 17-2) 05:05 07:21 (WEA 17-2) 21:51
15	08:32 16:42	07:47 17:38	06:46 18:30	06:33 20:24		40 06:42 (WEA 17-2) 05:05 07:22 (WEA 17-2) 21:52
16	08:32 16:43	07:45 17:40	06:43 18:32	06:31 20:26		40 06:41 (WEA 17-2) 05:05 07:21 (WEA 17-2) 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28		39 06:42 (WEA 17-2) 05:04 07:21 (WEA 17-2) 21:53
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 20:29		38 06:43 (WEA 17-2) 05:04 07:21 (WEA 17-2) 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31		38 06:42 (WEA 17-2) 05:04 07:20 (WEA 17-2) 21:54
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33		37 06:43 (WEA 17-2) 05:04 07:20 (WEA 17-2) 21:54
21	08:27 16:52	07:35 17:50	06:32 18:40	06:20 20:35		36 06:44 (WEA 17-2) 05:05 07:20 (WEA 17-2) 21:54
22	08:25 16:54	07:33 17:51	06:29 18:42	06:18 20:36		36 06:44 (WEA 17-2) 05:05 07:20 (WEA 17-2) 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38		34 06:44 (WEA 17-2) 05:05 07:18 (WEA 17-2) 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40		33 06:45 (WEA 17-2) 05:05 07:18 (WEA 17-2) 21:55
25	08:22 16:59	07:26 17:57	06:22 19:48	06:12 20:42	5 06:47 (WEA 17-1) 05:21 06:52 (WEA 17-1) 21:29	33 06:45 (WEA 17-2) 05:05 07:18 (WEA 17-2) 21:55
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	12 06:53 (WEA 17-1) 05:20 06:43 (WEA 17-1) 21:29	33 06:46 (WEA 17-2) 05:06 07:18 (WEA 17-2) 21:55
27	08:19 17:02	07:22 18:01	06:17 19:51	06:08 20:45	20 06:41 (WEA 17-1) 05:19 07:06 (WEA 17-2) 21:32	31 06:47 (WEA 17-2) 05:06 07:17 (WEA 17-2) 21:55
28	08:18 17:04	07:20 18:03	06:15 19:53	06:06 20:47	31 06:40 (WEA 17-1) 05:18 07:11 (WEA 17-2) 21:33	30 06:47 (WEA 17-2) 05:06 07:17 (WEA 17-2) 21:55
29	08:16 17:06		06:13 19:55	06:03 20:49	35 06:38 (WEA 17-1) 05:17 07:13 (WEA 17-2) 21:34	29 06:47 (WEA 17-2) 05:07 07:16 (WEA 17-2) 21:55
30	08:15 17:08		06:10 19:57	06:01 20:50	38 06:37 (WEA 17-1) 05:15 07:15 (WEA 17-2) 21:36	27 06:48 (WEA 17-2) 05:07 07:15 (WEA 17-2) 21:55
31	08:13 17:10		06:08 19:58	06:00 20:50	39 06:37 (WEA 17-1) 05:14 07:16 (WEA 17-2) 21:37	26 06:49 (WEA 17-2) 05:08 07:15 (WEA 17-2) 21:54
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 275	366 366	416 416	487 487	502 502
			143	394	1174	112

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 07 - Welperort 16

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:09 21:54	05:45 21:22	06:52 (WEA 17-1) 06:36	07:27	07:21	08:14
2	05:09 21:54	05:47 21:20	06:50 (WEA 17-1) 06:38 07:32 (WEA 17-2) 20:17	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:49 21:19	06:49 (WEA 17-1) 06:40 07:32 (WEA 17-2) 20:14	07:49 (WEA 17-3) 07:30 07:58 (WEA 17-3) 19:04	07:25 16:57	08:17 16:17
4	05:11 21:53	05:50 21:17	06:47 (WEA 17-1) 06:41 07:31 (WEA 17-2) 20:12	07:46 (WEA 17-3) 07:32 08:01 (WEA 17-3) 19:01	07:27 16:55	08:18 16:17
5	05:11 21:53	05:52 21:15	06:47 (WEA 17-1) 06:43 07:32 (WEA 17-2) 20:10	07:44 (WEA 17-3) 07:33 08:02 (WEA 17-3) 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	07:06 (WEA 17-2) 05:53 07:12 (WEA 17-2) 21:13	06:46 (WEA 17-1) 06:45 07:31 (WEA 17-2) 20:08	07:42 (WEA 17-3) 07:35 08:03 (WEA 17-3) 18:57	07:31 16:52	08:21 16:16
7	05:13 21:51	07:05 (WEA 17-2) 05:55 07:15 (WEA 17-2) 21:11	06:46 (WEA 17-1) 06:46 07:31 (WEA 17-2) 20:05	07:40 (WEA 17-3) 07:37 08:03 (WEA 17-3) 18:54	07:33 16:50	08:22 16:15
8	05:14 21:51	07:03 (WEA 17-2) 05:57 07:16 (WEA 17-2) 21:10	06:45 (WEA 17-1) 06:48 07:30 (WEA 17-2) 20:03	07:40 (WEA 17-3) 07:39 08:04 (WEA 17-3) 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	07:02 (WEA 17-2) 05:58 07:17 (WEA 17-2) 21:08	06:45 (WEA 17-1) 06:50 07:30 (WEA 17-2) 20:00	07:39 (WEA 17-3) 07:40 08:05 (WEA 17-3) 18:50	07:36 16:46	08:25 16:15
10	05:16 21:49	07:01 (WEA 17-2) 06:00 07:18 (WEA 17-2) 21:06	06:44 (WEA 17-1) 06:51 07:28 (WEA 17-2) 19:58	07:38 (WEA 17-3) 07:42 08:04 (WEA 17-3) 18:48	07:38 16:45	08:26 16:14
11	05:17 21:49	07:00 (WEA 17-2) 06:02 07:20 (WEA 17-2) 21:04	06:45 (WEA 17-1) 06:53 07:28 (WEA 17-2) 19:56	07:38 (WEA 17-3) 07:44 08:04 (WEA 17-3) 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:59 (WEA 17-2) 06:03 07:21 (WEA 17-2) 21:02	06:44 (WEA 17-1) 06:55 07:26 (WEA 17-2) 19:53	07:37 (WEA 17-3) 07:46 08:03 (WEA 17-3) 18:43	07:42 16:42	08:28 16:14
13	05:19 21:47	06:58 (WEA 17-2) 06:05 07:22 (WEA 17-2) 21:00	06:45 (WEA 17-1) 06:56 07:25 (WEA 17-2) 19:51	07:37 (WEA 17-3) 07:47 08:03 (WEA 17-3) 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:58 (WEA 17-2) 06:06 07:23 (WEA 17-2) 20:58	06:44 (WEA 17-1) 06:58 07:23 (WEA 17-2) 19:49	07:38 (WEA 17-3) 07:49 08:03 (WEA 17-3) 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	06:58 (WEA 17-2) 06:08 07:24 (WEA 17-2) 20:56	06:45 (WEA 17-1) 07:00 07:22 (WEA 17-2) 19:46	07:37 (WEA 17-3) 07:51 08:01 (WEA 17-3) 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:57 (WEA 17-2) 06:10 07:25 (WEA 17-2) 20:54	06:46 (WEA 17-1) 07:01 07:20 (WEA 17-2) 19:44	07:38 (WEA 17-3) 07:53 08:00 (WEA 17-3) 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:57 (WEA 17-2) 06:11 07:26 (WEA 17-2) 20:52	06:46 (WEA 17-1) 07:03 07:17 (WEA 17-2) 19:42	07:38 (WEA 17-3) 07:54 07:58 (WEA 17-3) 18:32	07:51 16:34	08:33 16:14
18	05:25 21:42	06:56 (WEA 17-2) 06:13 07:26 (WEA 17-2) 20:50	06:48 (WEA 17-1) 07:05 07:03 (WEA 17-1) 19:39	07:40 (WEA 17-3) 07:56 07:56 (WEA 17-3) 18:30	07:52 16:33	08:33 16:14
19	05:27 21:41	06:55 (WEA 17-2) 06:15 07:27 (WEA 17-2) 20:48	06:49 (WEA 17-1) 07:06 07:00 (WEA 17-1) 19:37	07:42 (WEA 17-3) 07:58 07:54 (WEA 17-3) 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:54 (WEA 17-2) 06:16 07:27 (WEA 17-2) 20:46	07:08	08:00	07:56	08:35
21	05:29 21:38	06:55 (WEA 17-2) 06:18 07:29 (WEA 17-2) 20:43	19:34 07:10	18:25 08:01	16:30 07:58	16:15 08:35
22	05:31 21:37	06:54 (WEA 17-2) 06:20 07:29 (WEA 17-2) 20:41	19:32 07:11	18:23 08:03	16:29 07:59	16:15 08:36
23	05:32 21:36	06:53 (WEA 17-2) 06:21 07:29 (WEA 17-2) 20:39	19:30 07:13	18:21 08:05	16:28 08:01	16:16 08:37
24	05:34 21:34	06:54 (WEA 17-2) 06:23 07:30 (WEA 17-2) 20:37	19:27 07:15	18:19 08:07	16:26 08:03	16:16 08:37
25	05:35 21:33	06:53 (WEA 17-2) 06:25 07:31 (WEA 17-2) 20:35	19:25 07:16	18:17 08:09	16:25 08:04	16:17 08:37
26	05:36 21:31	06:52 (WEA 17-2) 06:26 07:31 (WEA 17-2) 20:33	19:23 07:18	18:15 08:11	16:24 08:06	16:17 08:38
27	05:38 21:30	06:53 (WEA 17-2) 06:28 07:32 (WEA 17-2) 20:30	19:20 07:20	18:13 08:12	16:23 08:08	16:18 08:38
28	05:39 21:28	06:52 (WEA 17-2) 06:30 07:31 (WEA 17-2) 20:28	19:18 07:21	18:11 07:14	16:22 08:09	16:19 08:38
29	05:41 21:27	06:53 (WEA 17-2) 06:31 07:32 (WEA 17-2) 20:26	19:15 07:23	18:09 07:16	16:21 08:11	16:19 08:38
30	05:42 21:25	06:52 (WEA 17-2) 06:33 07:32 (WEA 17-2) 20:24	19:13 07:25	18:07 07:18	16:20 08:12	16:20 08:39
31	05:44 21:24	06:52 (WEA 17-2) 06:35 07:32 (WEA 17-2) 20:21	19:11	18:05 07:20	16:20 08:39	16:21 08:39
	Sonnenscheinstunden 505	456	382	332	265	241
	astr.max.mögl.Beschattung 745	730	359			

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 08 - Welperort 24

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni		
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00		05:59 20:52	14	07:01 (WEA 17-3) 07:15 (WEA 17-3) 21:39	05:13 06:01 (WEA 17-2)	06:03 (WEA 17-1) 06:24 (WEA 17-1)
2	08:39 16:24	08:10 17:14	07:15 18:06	07:03 20:02		05:58 20:54	8	07:04 (WEA 17-3) 07:12 (WEA 17-3) 21:40	05:12 21:40	06:23 (WEA 17-1) 06:24 (WEA 17-1)
3	08:38 16:26	08:08 17:15	07:13 18:08	07:01 20:03		05:56 20:55			05:11 21:41	05:59 (WEA 17-2) 05:58 (WEA 17-1)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57			05:10 21:43	05:59 (WEA 17-2) 06:24 (WEA 17-1)
5	08:38 16:28	08:05 17:19	07:09 18:12	06:56 20:07		05:52 20:59			05:09 21:44	05:58 (WEA 17-2) 06:23 (WEA 17-1)
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:09		05:50 21:00			05:09 21:45	05:57 (WEA 17-2) 06:22 (WEA 17-1)
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10		05:48 21:02			05:08 21:46	05:57 (WEA 17-2) 06:23 (WEA 17-1)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04			05:07 21:46	05:57 (WEA 17-2) 06:23 (WEA 17-1)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05			05:07 21:47	05:56 (WEA 17-2) 06:22 (WEA 17-1)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:43 21:07			05:06 21:48	05:56 (WEA 17-2) 06:22 (WEA 17-1)
11	08:35 16:36	07:54 17:31	06:55 18:23	06:43 20:17		05:41 21:09			05:06 21:49	05:55 (WEA 17-2) 06:21 (WEA 17-1)
12	08:35 16:37	07:53 17:33	06:53 18:24	06:40 20:19		05:39 21:10			05:06 21:50	05:55 (WEA 17-2) 06:21 (WEA 17-1)
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21		05:37 21:12			05:05 21:50	05:55 (WEA 17-2) 06:21 (WEA 17-1)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	3	07:11 (WEA 17-3) 07:14 (WEA 17-3) 21:14	10	06:07 (WEA 17-1) 06:17 (WEA 17-1) 21:51	05:05 21:51	05:56 (WEA 17-2) 06:22 (WEA 17-2)
15	08:32 16:42	07:47 17:38	06:46 18:30	06:33 20:24	12	07:06 (WEA 17-3) 07:18 (WEA 17-3) 21:15	13	06:06 (WEA 17-1) 06:19 (WEA 17-1) 21:52	05:05 21:52	05:56 (WEA 17-2) 06:22 (WEA 17-2)
16	08:32 16:43	07:45 17:40	06:43 18:32	06:31 20:26	16	07:04 (WEA 17-3) 07:20 (WEA 17-3) 21:17	15	06:04 (WEA 17-1) 06:19 (WEA 17-1) 21:52	05:05 21:52	05:56 (WEA 17-2) 06:23 (WEA 17-2)
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28	20	07:01 (WEA 17-3) 07:21 (WEA 17-3) 21:18	17	06:04 (WEA 17-1) 06:21 (WEA 17-1) 21:53	05:05 21:53	05:56 (WEA 17-2) 06:23 (WEA 17-2)
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 20:29	22	07:00 (WEA 17-3) 07:22 (WEA 17-3) 21:20	19	06:03 (WEA 17-1) 06:22 (WEA 17-1) 21:53	05:04 21:53	05:56 (WEA 17-2) 06:24 (WEA 17-2)
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31	23	06:59 (WEA 17-3) 07:22 (WEA 17-3) 21:21	20	06:02 (WEA 17-1) 06:22 (WEA 17-1) 21:54	05:04 21:54	05:56 (WEA 17-2) 06:24 (WEA 17-2)
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	24	06:59 (WEA 17-3) 07:23 (WEA 17-3) 21:23	21	06:02 (WEA 17-1) 06:23 (WEA 17-1) 21:54	05:05 21:54	05:56 (WEA 17-2) 06:24 (WEA 17-2)
21	08:27 16:52	07:35 17:50	06:32 18:40	06:20 20:35	25	06:58 (WEA 17-3) 07:23 (WEA 17-3) 21:24	21	06:02 (WEA 17-1) 06:23 (WEA 17-1) 21:54	05:05 21:54	05:56 (WEA 17-2) 06:24 (WEA 17-2)
22	08:25 16:54	07:33 17:51	06:29 18:42	06:18 20:36	25	06:58 (WEA 17-3) 07:23 (WEA 17-3) 21:26	22	06:02 (WEA 17-1) 06:24 (WEA 17-1) 21:54	05:05 21:54	05:56 (WEA 17-2) 06:24 (WEA 17-2)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	26	06:57 (WEA 17-3) 07:23 (WEA 17-3) 21:27	22	06:01 (WEA 17-1) 06:23 (WEA 17-1) 21:55	05:05 21:55	05:56 (WEA 17-2) 06:24 (WEA 17-2)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	26	06:57 (WEA 17-3) 07:23 (WEA 17-3) 21:29	23	06:01 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:05 21:55	05:57 (WEA 17-2) 06:25 (WEA 17-2)
25	08:22 16:59	07:26 17:57	06:22 19:48	06:12 20:42	25	06:57 (WEA 17-3) 07:22 (WEA 17-3) 21:30	23	06:01 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:06 21:55	05:57 (WEA 17-2) 06:25 (WEA 17-2)
26	08:20 17:01	07:24 17:59	07:20 19:49	06:10 20:43	24	06:58 (WEA 17-3) 07:22 (WEA 17-3) 21:32	23	06:01 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:06 21:55	05:57 (WEA 17-2) 06:24 (WEA 17-2)
27	08:19 17:02	07:22 18:01	07:17 19:51	06:08 20:45	23	06:58 (WEA 17-3) 07:21 (WEA 17-3) 21:33	22	06:02 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:06 21:55	05:58 (WEA 17-2) 06:25 (WEA 17-2)
28	08:18 17:04	07:20 18:03	07:15 19:53	06:06 20:47	22	06:58 (WEA 17-3) 07:20 (WEA 17-3) 21:34	22	06:02 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:07 21:55	05:58 (WEA 17-2) 06:25 (WEA 17-2)
29	08:16 17:06		07:13 19:55	06:03 20:49	20	06:59 (WEA 17-3) 07:19 (WEA 17-3) 21:36	22	06:02 (WEA 17-1) 06:24 (WEA 17-1) 21:55	05:07 21:55	05:59 (WEA 17-2) 06:25 (WEA 17-2)
30	08:15 17:08		07:10 19:56	06:01 20:50	17	07:00 (WEA 17-3) 07:17 (WEA 17-3) 21:37	22	06:02 (WEA 17-1) 06:24 (WEA 17-1) 21:54	05:08 21:54	05:58 (WEA 17-2) 06:24 (WEA 17-1)
31	08:13 17:10		07:08 19:58			05:13 21:38	21	06:03 (WEA 17-1) 06:24 (WEA 17-1)		
Sonnenscheinstunden	256	275	366	416		487		502		
astr.max.mögl.Beschattung				353		380		788		

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 08 - Welperort 24

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	05:09	05:59 (WEA 17-2)	05:45		06:36	07:27	07:21	08:14				
	21:54	26 06:25 (WEA 17-1)	21:22		20:19	19:08	17:01	16:19				
2	05:09	06:00 (WEA 17-2)	05:47		06:38	07:28	07:23	08:15				
	21:54	26 06:26 (WEA 17-1)	21:20		20:17	19:06	16:59	16:18				
3	05:10	06:00 (WEA 17-2)	05:49		06:40	07:30	07:25	08:17				
	21:53	26 06:26 (WEA 17-1)	21:19		20:14	19:04	16:57	16:17				
4	05:11	06:01 (WEA 17-2)	05:50		06:41	07:32	07:27	08:18				
	21:53	26 06:27 (WEA 17-1)	21:17		20:12	19:01	16:55	16:17				
5	05:11	06:02 (WEA 17-2)	05:52		06:43	07:33	07:29	08:19				
	21:53	26 06:28 (WEA 17-1)	21:15		20:10	18:59	16:53	16:16				
6	05:12	06:03 (WEA 17-2)	05:53		06:45	07:35	07:31	08:21				
	21:52	26 06:29 (WEA 17-1)	21:13		20:08	18:57	16:52	16:16				
7	05:13	06:04 (WEA 17-2)	05:55		06:46	07:37	07:32	08:22				
	21:51	25 06:29 (WEA 17-1)	21:11		20:05	18:54	16:50	16:15				
8	05:14	06:04 (WEA 17-2)	05:57		06:48	07:39	07:34	08:23				
	21:51	25 06:29 (WEA 17-1)	21:10		20:03	18:52	16:48	16:15				
9	05:15	06:05 (WEA 17-2)	05:58		06:50	07:40	07:36	08:25				
	21:50	25 06:30 (WEA 17-1)	21:08		20:00	18:50	16:46	16:15				
10	05:16	06:06 (WEA 17-2)	06:00		06:51	07:42	07:38	08:26				
	21:49	24 06:30 (WEA 17-1)	21:06		19:58	18:48	16:45	16:14				
11	05:17	06:07 (WEA 17-2)	06:02		06:53	07:44	07:40	08:27				
	21:49	24 06:31 (WEA 17-1)	21:04		19:56	18:45	16:43	16:14				
12	05:18	06:09 (WEA 17-2)	06:03		07:11 (WEA 17-3)	06:55	07:46	08:28				
	21:48	22 06:31 (WEA 17-1)	21:02	11	07:22 (WEA 17-3)	19:53	18:43	16:42	16:14			
13	05:19	06:11 (WEA 17-2)	06:05		07:09 (WEA 17-3)	06:56	07:47	08:29				
	21:47	21 06:32 (WEA 17-1)	21:00	15	07:24 (WEA 17-3)	19:51	18:41	16:40	16:14			
14	05:20	06:11 (WEA 17-2)	06:06		07:07 (WEA 17-3)	06:58	07:49	08:30				
	21:46	21 06:32 (WEA 17-1)	20:58	18	07:25 (WEA 17-3)	19:49	18:38	16:38	16:14			
15	05:22	06:11 (WEA 17-2)	06:08		07:06 (WEA 17-3)	07:00	07:51	08:31				
	21:45	22 06:33 (WEA 17-1)	20:56	20	07:26 (WEA 17-3)	19:46	18:36	16:37	16:14			
16	05:23	06:11 (WEA 17-2)	06:10		07:06 (WEA 17-3)	07:01	07:53	08:32				
	21:44	22 06:33 (WEA 17-1)	20:54	22	07:28 (WEA 17-3)	19:44	18:34	16:35	16:14			
17	05:24	06:11 (WEA 17-2)	06:11		07:04 (WEA 17-3)	07:03	07:54	08:33				
	21:43	22 06:33 (WEA 17-1)	20:52	24	07:28 (WEA 17-3)	19:42	18:32	16:34	16:14			
18	05:25	06:11 (WEA 17-2)	06:13		07:04 (WEA 17-3)	07:05	07:56	08:33				
	21:42	22 06:33 (WEA 17-1)	20:50	24	07:28 (WEA 17-3)	19:39	18:30	16:33	16:14			
19	05:27	06:11 (WEA 17-2)	06:15		07:03 (WEA 17-3)	07:06	07:58	08:34				
	21:41	22 06:33 (WEA 17-1)	20:48	25	07:28 (WEA 17-3)	19:37	18:27	16:31	16:14			
20	05:28	06:11 (WEA 17-2)	06:16		07:03 (WEA 17-3)	07:08	08:00	08:35				
	21:39	22 06:33 (WEA 17-1)	20:46	25	07:28 (WEA 17-3)	19:34	18:25	16:30	16:15			
21	05:29	06:11 (WEA 17-2)	06:18		07:02 (WEA 17-3)	07:10	08:01	08:35				
	21:38	23 06:34 (WEA 17-1)	20:43	26	07:28 (WEA 17-3)	19:32	18:23	16:29	16:15			
22	05:31	06:11 (WEA 17-2)	06:20		07:02 (WEA 17-3)	07:11	08:03	08:36				
	21:37	22 06:33 (WEA 17-1)	20:41	26	07:28 (WEA 17-3)	19:30	18:21	16:28	16:16			
23	05:32	06:11 (WEA 17-2)	06:21		07:03 (WEA 17-3)	07:13	08:05	08:01	08:37			
	21:36	22 06:33 (WEA 17-1)	20:39	25	07:28 (WEA 17-3)	19:27	18:19	16:26	16:16			
24	05:34	06:12 (WEA 17-2)	06:23		07:02 (WEA 17-3)	07:15	08:07	08:03	08:37			
	21:34	21 06:33 (WEA 17-1)	20:37	24	07:26 (WEA 17-3)	19:25	18:17	16:25	16:17			
25	05:35	06:12 (WEA 17-2)	06:25		07:03 (WEA 17-3)	07:16	08:09	08:04	08:37			
	21:33	21 06:33 (WEA 17-1)	20:35	23	07:26 (WEA 17-3)	19:23	18:15	16:24	16:17			
26	05:36	06:13 (WEA 17-2)	06:26		07:03 (WEA 17-3)	07:18	08:11	08:06	08:38			
	21:31	19 06:32 (WEA 17-1)	20:33	21	07:24 (WEA 17-3)	19:20	18:13	16:23	16:18			
27	05:38	06:14 (WEA 17-2)	06:28		07:04 (WEA 17-3)	07:20	08:12	08:08	08:38			
	21:30	18 06:32 (WEA 17-1)	20:30	19	07:23 (WEA 17-3)	19:18	18:11	16:22	16:19			
28	05:39	06:14 (WEA 17-2)	06:30		07:05 (WEA 17-3)	07:21	07:14	08:09	08:38			
	21:28	17 06:31 (WEA 17-1)	20:28	16	07:21 (WEA 17-3)	19:15	17:09	16:21	16:19			
29	05:41	06:16 (WEA 17-2)	06:31		07:07 (WEA 17-3)	07:23	07:16	08:11	08:38			
	21:27	14 06:30 (WEA 17-1)	20:26	12	07:19 (WEA 17-3)	19:13	17:07	16:20	16:20			
30	05:42	06:17 (WEA 17-2)	06:33			07:25	07:18	08:12	08:39			
	21:25	11 06:28 (WEA 17-1)	20:24			19:11	17:05	16:20	16:21			
31	05:44	06:19 (WEA 17-2)	06:35				07:20		08:39			
	21:24	7 06:26 (WEA 17-1)	20:21				17:03		16:22			
Sonnenscheinstunden	505		456		382	332	265	241				
astr.max.mögl.Beschattung	670		376									

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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 09 - Welperort 20

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni	
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00		05:59 20:52	06:41 (WEA 17-3) 28 07:09 (WEA 17-3)	05:13 21:39	05:49 (WEA 17-1) 12 06:01 (WEA 17-1)
2	08:39 16:24	08:10 17:14	07:15 18:06	07:03 20:02		05:58 20:54	06:40 (WEA 17-3) 29 07:09 (WEA 17-3)	05:12 21:40	05:48 (WEA 17-1) 14 06:02 (WEA 17-1)
3	08:38 16:26	08:08 17:15	07:13 18:08	07:01 20:03		05:56 20:55	06:40 (WEA 17-3) 29 07:09 (WEA 17-3)	05:11 21:41	05:47 (WEA 17-1) 16 06:03 (WEA 17-1)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	06:40 (WEA 17-3) 30 07:10 (WEA 17-3)	05:10 21:43	05:47 (WEA 17-1) 17 06:04 (WEA 17-1)
5	08:38 16:28	08:05 17:19	07:09 18:12	06:56 20:07		05:52 20:59	06:40 (WEA 17-3) 29 07:09 (WEA 17-3)	05:09 21:44	05:46 (WEA 17-1) 18 06:04 (WEA 17-1)
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08		05:50 21:00	06:40 (WEA 17-3) 29 07:09 (WEA 17-3)	05:09 21:45	05:46 (WEA 17-1) 19 06:05 (WEA 17-1)
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10		05:48 21:02	06:39 (WEA 17-3) 29 07:08 (WEA 17-3)	05:08 21:46	05:46 (WEA 17-1) 20 06:06 (WEA 17-1)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	06:40 (WEA 17-3) 29 07:09 (WEA 17-3)	05:07 21:46	05:46 (WEA 17-1) 21 06:07 (WEA 17-1)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05	06:40 (WEA 17-3) 28 07:08 (WEA 17-3)	05:07 21:47	05:46 (WEA 17-1) 21 06:07 (WEA 17-1)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:43 21:07	06:40 (WEA 17-3) 27 07:07 (WEA 17-3)	05:06 21:48	05:46 (WEA 17-1) 21 06:07 (WEA 17-1)
11	08:35 16:36	07:54 17:31	06:55 18:23	06:43 20:17		05:41 21:09	06:41 (WEA 17-3) 26 07:07 (WEA 17-3)	05:06 21:49	05:45 (WEA 17-1) 22 06:07 (WEA 17-1)
12	08:35 16:37	07:53 17:33	06:53 18:24	06:40 20:19		05:39 21:10	06:42 (WEA 17-3) 24 07:06 (WEA 17-3)	05:06 21:50	05:46 (WEA 17-1) 22 06:08 (WEA 17-1)
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21		05:37 21:12	06:43 (WEA 17-3) 22 07:05 (WEA 17-3)	05:05 21:50	05:46 (WEA 17-1) 22 06:08 (WEA 17-1)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22		05:36 21:14	06:43 (WEA 17-3) 21 07:04 (WEA 17-3)	05:05 21:51	05:46 (WEA 17-1) 23 06:09 (WEA 17-1)
15	08:32 16:42	07:47 17:38	06:46 18:30	06:33 20:24		05:34 21:15	06:45 (WEA 17-3) 18 07:03 (WEA 17-3)	05:05 21:52	05:46 (WEA 17-1) 23 06:09 (WEA 17-1)
16	08:32 16:43	07:45 17:40	06:43 18:32	06:31 20:26		05:33 21:17	06:46 (WEA 17-3) 15 07:01 (WEA 17-3)	05:05 21:52	05:47 (WEA 17-1) 23 06:10 (WEA 17-1)
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28		05:31 21:18	06:48 (WEA 17-3) 12 07:00 (WEA 17-3)	05:04 21:53	05:47 (WEA 17-1) 23 06:10 (WEA 17-1)
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 20:29		05:30 21:20	06:51 (WEA 17-3) 6 06:57 (WEA 17-3)	05:04 21:53	05:47 (WEA 17-1) 23 06:10 (WEA 17-1)
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31		05:28 21:21	06:51 (WEA 17-3) 05:04	05:04 21:54	05:47 (WEA 17-1) 23 06:10 (WEA 17-1)
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33		05:27 21:23	06:51 (WEA 17-3) 05:04	05:05 21:54	05:47 (WEA 17-1) 23 06:10 (WEA 17-1)
21	08:26 16:52	07:35 17:50	06:32 18:40	06:20 20:35		05:25 21:24	06:51 (WEA 17-3) 05:05	05:05 21:54	05:47 (WEA 17-1) 24 06:11 (WEA 17-1)
22	08:25 16:54	07:33 17:51	06:29 18:42	06:18 20:36		05:24 21:26	06:51 (WEA 17-3) 05:05	05:05 21:54	05:47 (WEA 17-1) 24 06:11 (WEA 17-1)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38		05:23 21:27	06:51 (WEA 17-3) 05:05	05:05 21:55	05:47 (WEA 17-1) 24 06:11 (WEA 17-1)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	11	05:21 21:29	06:51 (WEA 17-3) 07:02 (WEA 17-3)	05:05 21:55	05:48 (WEA 17-1) 23 06:11 (WEA 17-1)
25	08:22 16:59	07:26 17:57	06:22 19:48	06:12 20:42	16	05:20 21:30	06:48 (WEA 17-3) 07:04 (WEA 17-3)	05:06 21:55	05:48 (WEA 17-1) 23 06:11 (WEA 17-1)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	20	05:19 21:32	06:46 (WEA 17-3) 07:06 (WEA 17-3)	05:06 21:55	05:48 (WEA 17-1) 23 06:11 (WEA 17-1)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:08 20:45	22	05:18 21:33	06:45 (WEA 17-3) 07:07 (WEA 17-3)	05:06 21:55	05:49 (WEA 17-1) 23 06:12 (WEA 17-1)
28	08:18 17:04	07:20 18:03	06:15 19:53	06:06 20:47	24	05:17 21:34	06:44 (WEA 17-3) 07:08 (WEA 17-3)	05:07 21:55	05:48 (WEA 17-1) 23 06:11 (WEA 17-1)
29	08:16 17:06	07:18 18:03	06:13 19:55	06:03 20:49	25	05:15 21:36	06:43 (WEA 17-3) 07:08 (WEA 17-3)	05:07 21:55	05:49 (WEA 17-1) 23 06:12 (WEA 17-1)
30	08:15 17:08	07:16 18:05	06:10 19:56	06:01 20:50	27	05:14 21:37	06:42 (WEA 17-3) 07:09 (WEA 17-3)	05:08 21:54	05:49 (WEA 17-1) 22 06:11 (WEA 17-1)
31	08:13 17:10	07:14 18:06	06:08 19:58	05:59 20:51		05:13 21:38	06:42 (WEA 17-3) 07:09 (WEA 17-3)	05:08 21:54	05:49 (WEA 17-1) 22 06:11 (WEA 17-1)
Sonnenscheinstunden	256	275	366	416		487		502	
astr.max.mögl.Beschattung				145		447		638	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 09 - Welperort 20

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	05:09	05:50 (WEA 17-1)	05:45	06:53 (WEA 17-3)	06:36	07:27	07:21	08:14			
	21:54	22 06:12 (WEA 17-1)	21:22	23 07:16 (WEA 17-3)	20:19	19:08	17:01	16:19			
2	05:09	05:50 (WEA 17-1)	05:47	06:52 (WEA 17-3)	06:38	07:28	07:23	08:15			
	21:54	22 06:12 (WEA 17-1)	21:20	24 07:16 (WEA 17-3)	20:17	19:06	16:59	16:18			
3	05:10	05:50 (WEA 17-1)	05:49	06:51 (WEA 17-3)	06:40	07:30	07:25	08:17			
	21:53	22 06:12 (WEA 17-1)	21:19	27 07:18 (WEA 17-3)	20:14	19:04	16:57	16:17			
4	05:11	05:51 (WEA 17-1)	05:50	06:50 (WEA 17-3)	06:41	07:32	07:27	08:18			
	21:53	21 06:12 (WEA 17-1)	21:17	28 07:18 (WEA 17-3)	20:12	19:01	16:55	16:17			
5	05:11	05:52 (WEA 17-1)	05:52	06:50 (WEA 17-3)	06:43	07:33	07:29	08:19			
	21:53	20 06:12 (WEA 17-1)	21:15	28 07:18 (WEA 17-3)	20:10	18:59	16:53	16:16			
6	05:12	05:52 (WEA 17-1)	05:53	06:50 (WEA 17-3)	06:45	07:35	07:31	08:21			
	21:52	20 06:12 (WEA 17-1)	21:13	28 07:18 (WEA 17-3)	20:07	18:57	16:52	16:16			
7	05:13	05:53 (WEA 17-1)	05:55	06:50 (WEA 17-3)	06:46	07:37	07:32	08:22			
	21:51	19 06:12 (WEA 17-1)	21:11	29 07:19 (WEA 17-3)	20:05	18:54	16:50	16:15			
8	05:14	05:53 (WEA 17-1)	05:57	06:49 (WEA 17-3)	06:48	07:39	07:34	08:23			
	21:51	18 06:11 (WEA 17-1)	21:10	29 07:18 (WEA 17-3)	20:03	18:52	16:48	16:15			
9	05:15	05:53 (WEA 17-1)	05:58	06:49 (WEA 17-3)	06:50	07:40	07:36	08:24			
	21:50	18 06:11 (WEA 17-1)	21:08	30 07:19 (WEA 17-3)	20:00	18:50	16:46	16:15			
10	05:16	05:54 (WEA 17-1)	06:00	06:49 (WEA 17-3)	06:51	07:42	07:38	08:26			
	21:49	16 06:10 (WEA 17-1)	21:06	29 07:18 (WEA 17-3)	19:58	18:48	16:45	16:14			
11	05:17	05:55 (WEA 17-1)	06:02	06:49 (WEA 17-3)	06:53	07:44	07:40	08:27			
	21:49	15 06:10 (WEA 17-1)	21:04	29 07:18 (WEA 17-3)	19:56	18:45	16:43	16:14			
12	05:18	05:56 (WEA 17-1)	06:03	06:49 (WEA 17-3)	06:55	07:46	07:42	08:28			
	21:48	13 06:09 (WEA 17-1)	21:02	28 07:17 (WEA 17-3)	19:53	18:43	16:42	16:14			
13	05:19	05:57 (WEA 17-1)	06:05	06:49 (WEA 17-3)	06:56	07:47	07:43	08:29			
	21:47	11 06:08 (WEA 17-1)	21:00	28 07:17 (WEA 17-3)	19:51	18:41	16:40	16:14			
14	05:20	05:59 (WEA 17-1)	06:06	06:49 (WEA 17-3)	06:58	07:49	07:45	08:30			
	21:46	8 06:07 (WEA 17-1)	20:58	27 07:16 (WEA 17-3)	19:49	18:38	16:38	16:14			
15	05:22	06:03 (WEA 17-1)	06:08	06:50 (WEA 17-3)	07:00	07:51	07:47	08:31			
	21:45	1 06:04 (WEA 17-1)	20:56	26 07:16 (WEA 17-3)	19:46	18:36	16:37	16:14			
16	05:23		06:10	06:51 (WEA 17-3)	07:01	07:53	07:49	08:32			
	21:44		20:54	24 07:15 (WEA 17-3)	19:44	18:34	16:35	16:14			
17	05:24		06:11	06:52 (WEA 17-3)	07:03	07:54	07:51	08:33			
	21:43		20:52	21 07:13 (WEA 17-3)	19:42	18:32	16:34	16:14			
18	05:25		06:13	06:53 (WEA 17-3)	07:05	07:56	07:52	08:33			
	21:42		20:50	19 07:12 (WEA 17-3)	19:39	18:30	16:33	16:14			
19	05:27		06:15	06:55 (WEA 17-3)	07:06	07:58	07:54	08:34			
	21:41		20:48	14 07:09 (WEA 17-3)	19:37	18:27	16:31	16:14			
20	05:28		06:16	06:58 (WEA 17-3)	07:08	08:00	07:56	08:35			
	21:39		20:46	8 07:06 (WEA 17-3)	19:34	18:25	16:30	16:15			
21	05:29		06:18	07:10	08:01	08:58	08:58	08:35			
	21:38		20:43	19:32	18:23	16:29	16:15				
22	05:31		06:20	07:11	08:03	07:59	08:36				
	21:37		20:41	19:30	18:21	16:28	16:16				
23	05:32		06:21	07:13	08:05	08:01	08:37				
	21:36		20:39	19:27	18:19	16:26	16:16				
24	05:34		06:23	07:15	08:07	08:03	08:37				
	21:34		20:37	19:25	18:17	16:25	16:17				
25	05:35		06:25	07:16	08:09	08:04	08:37				
	21:33		20:35	19:23	18:15	16:24	16:17				
26	05:36		06:26	07:18	08:11	08:06	08:38				
	21:31		20:33	19:20	18:13	16:23	16:18				
27	05:38	07:00 (WEA 17-3)	06:28	07:20	08:12	08:08	08:38				
	21:30	9 07:09 (WEA 17-3)	20:30	19:18	18:11	16:22	16:19				
28	05:39	06:57 (WEA 17-3)	06:30	07:21	07:14	08:09	08:38				
	21:28	14 07:11 (WEA 17-3)	20:28	19:15	17:09	16:21	16:19				
29	05:41	06:56 (WEA 17-3)	06:31	07:23	07:16	08:11	08:38				
	21:27	17 07:13 (WEA 17-3)	20:26	19:13	17:07	16:20	16:20				
30	05:42	06:55 (WEA 17-3)	06:33	07:25	07:18	08:12	08:39				
	21:25	19 07:14 (WEA 17-3)	20:24	19:11	17:05	16:20	16:21				
31	05:44	06:53 (WEA 17-3)	06:35		07:20		08:39				
	21:24	22 07:15 (WEA 17-3)	20:21		17:03		16:22				
Sonnenscheinstunden	505		456		382	332	265	241			
astr.max.mögl.Beschattung		327		499							

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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 10 - Welperort 19

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

	Januar	Februar	März	April		Mai		Juni	
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00		05:59 20:52	06:54 (WEA 17-3) 07:29 (WEA 17-3)	05:13 21:39	05:55 (WEA 17-1) 06:02 (WEA 17-1)
2	08:39 16:24	08:10 17:14	07:15 18:06	07:03 20:02		05:57 20:54	06:53 (WEA 17-3) 07:28 (WEA 17-3)	05:12 21:40	05:53 (WEA 17-1) 06:04 (WEA 17-1)
3	08:38 16:26	08:08 17:15	07:13 18:08	07:01 20:03		05:56 20:55	06:53 (WEA 17-3) 07:28 (WEA 17-3)	05:11 21:41	05:52 (WEA 17-1) 06:05 (WEA 17-1)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	06:54 (WEA 17-3) 07:28 (WEA 17-3)	05:10 21:43	05:52 (WEA 17-1) 06:07 (WEA 17-1)
5	08:38 16:28	08:05 17:19	07:09 18:12	06:56 20:07		05:52 20:59	06:54 (WEA 17-3) 07:28 (WEA 17-3)	05:09 21:44	05:51 (WEA 17-1) 06:07 (WEA 17-1)
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08		05:50 21:00	06:54 (WEA 17-3) 07:27 (WEA 17-3)	05:09 21:45	05:50 (WEA 17-1) 06:08 (WEA 17-1)
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10		05:48 21:02	06:54 (WEA 17-3) 07:26 (WEA 17-3)	05:08 21:46	05:50 (WEA 17-1) 06:09 (WEA 17-1)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	06:55 (WEA 17-3) 07:26 (WEA 17-3)	05:07 21:46	05:49 (WEA 17-1) 06:09 (WEA 17-1)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05	06:56 (WEA 17-3) 07:25 (WEA 17-3)	05:07 21:47	05:49 (WEA 17-1) 06:10 (WEA 17-1)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:43 21:07	06:56 (WEA 17-3) 07:24 (WEA 17-3)	05:06 21:48	05:49 (WEA 17-1) 06:11 (WEA 17-1)
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17		05:41 21:09	06:57 (WEA 17-3) 07:23 (WEA 17-3)	05:06 21:49	05:49 (WEA 17-1) 06:11 (WEA 17-1)
12	08:35 16:37	07:53 17:33	06:53 18:24	06:40 20:19		05:39 21:10	06:58 (WEA 17-3) 07:22 (WEA 17-3)	05:06 21:50	05:49 (WEA 17-1) 06:12 (WEA 17-1)
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21		05:37 21:12	07:00 (WEA 17-3) 07:21 (WEA 17-3)	05:05 21:50	05:49 (WEA 17-1) 06:12 (WEA 17-1)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22		05:36 21:14	07:00 (WEA 17-3) 07:19 (WEA 17-3)	05:05 21:51	05:49 (WEA 17-1) 06:13 (WEA 17-1)
15	08:32 16:42	07:47 17:38	06:46 18:30	06:33 20:24		05:34 21:15	07:03 (WEA 17-3) 07:18 (WEA 17-3)	05:05 21:52	05:49 (WEA 17-1) 06:13 (WEA 17-1)
16	08:31 16:43	07:45 17:40	06:43 18:32	06:31 20:26		05:33 21:17	07:05 (WEA 17-3) 07:15 (WEA 17-3)	05:05 21:52	05:50 (WEA 17-1) 06:14 (WEA 17-1)
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28		05:31 21:18		05:04 21:53	05:50 (WEA 17-1) 06:14 (WEA 17-1)
18	08:30 16:47	07:41 17:44	06:39 18:35	06:27 20:29		05:30 21:20		05:04 21:53	05:50 (WEA 17-1) 06:14 (WEA 17-1)
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31	12	07:08 (WEA 17-3) 07:20 (WEA 17-3)	05:28 21:21	05:04 21:54	05:50 (WEA 17-1) 06:15 (WEA 17-1)
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	18	07:05 (WEA 17-3) 07:23 (WEA 17-3)	05:27 21:23	05:04 21:54	05:50 (WEA 17-1) 06:15 (WEA 17-1)
21	08:26 16:52	07:35 17:50	06:32 18:40	06:20 20:35	22	07:02 (WEA 17-3) 07:24 (WEA 17-3)	05:25 21:24	05:05 21:54	05:50 (WEA 17-1) 06:15 (WEA 17-1)
22	08:25 16:54	07:33 17:51	06:29 18:42	06:18 20:36	25	07:01 (WEA 17-3) 07:26 (WEA 17-3)	05:24 21:26	05:05 21:54	05:50 (WEA 17-1) 06:15 (WEA 17-1)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	28	06:59 (WEA 17-3) 07:27 (WEA 17-3)	05:23 21:27	05:05 21:55	05:50 (WEA 17-1) 06:15 (WEA 17-1)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	30	06:58 (WEA 17-3) 07:28 (WEA 17-3)	05:21 21:29	05:05 21:55	05:51 (WEA 17-1) 06:16 (WEA 17-1)
25	08:22 16:59	07:26 17:57	06:22 19:48	06:12 20:42	31	06:57 (WEA 17-3) 07:28 (WEA 17-3)	05:20 21:30	05:06 21:55	05:51 (WEA 17-1) 06:15 (WEA 17-1)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	33	06:56 (WEA 17-3) 07:29 (WEA 17-3)	05:19 21:32	05:06 21:55	05:51 (WEA 17-1) 06:15 (WEA 17-1)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:08 20:45	33	06:56 (WEA 17-3) 07:29 (WEA 17-3)	05:18 21:33	05:06 21:55	05:52 (WEA 17-1) 06:16 (WEA 17-1)
28	08:18 17:04	07:20 18:03	06:15 19:53	06:06 20:47	34	06:55 (WEA 17-3) 07:29 (WEA 17-3)	05:17 21:34	05:07 21:55	05:52 (WEA 17-1) 06:15 (WEA 17-1)
29	08:16 17:06		06:13 19:55	06:03 20:49	34	06:55 (WEA 17-3) 07:29 (WEA 17-3)	05:15 21:36	05:07 21:55	05:52 (WEA 17-1) 06:16 (WEA 17-1)
30	08:15 17:08		06:11 19:56	06:01 20:50	35	06:54 (WEA 17-3) 07:29 (WEA 17-3)	05:14 21:37	05:08 21:54	05:52 (WEA 17-1) 06:15 (WEA 17-1)
31	08:13 17:10		07:08 19:58				05:13 21:38		
Sonnenscheinstunden	256	275	366	416		487		502	
astr.max.mögl.Beschattung				335		441		642	

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 10 - Welperort 19

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	05:09	05:53 (WEA 17-1)	05:45	07:09 (WEA 17-3)	06:36	07:27	07:21	08:14			
	21:54	23 06:16 (WEA 17-1)	21:22	23 07:32 (WEA 17-3)	20:19	19:08	17:01	16:19			
2	05:09	05:54 (WEA 17-1)	05:47	07:08 (WEA 17-3)	06:38	07:28	07:23	08:15			
	21:54	22 06:16 (WEA 17-1)	21:20	25 07:33 (WEA 17-3)	20:17	19:06	16:59	16:18			
3	05:10	05:54 (WEA 17-1)	05:49	07:07 (WEA 17-3)	06:40	07:30	07:25	08:17			
	21:53	21 06:15 (WEA 17-1)	21:19	27 07:34 (WEA 17-3)	20:14	19:04	16:57	16:17			
4	05:11	05:54 (WEA 17-1)	05:50	07:06 (WEA 17-3)	06:41	07:32	07:27	08:18			
	21:53	21 06:15 (WEA 17-1)	21:17	29 07:35 (WEA 17-3)	20:12	19:01	16:55	16:17			
5	05:11	05:55 (WEA 17-1)	05:52	07:06 (WEA 17-3)	06:43	07:33	07:29	08:19			
	21:53	21 06:16 (WEA 17-1)	21:15	30 07:36 (WEA 17-3)	20:10	18:59	16:53	16:16			
6	05:12	05:56 (WEA 17-1)	05:53	07:05 (WEA 17-3)	06:45	07:35	07:31	08:21			
	21:52	19 06:15 (WEA 17-1)	21:13	31 07:36 (WEA 17-3)	20:07	18:57	16:52	16:16			
7	05:13	05:57 (WEA 17-1)	05:55	07:04 (WEA 17-3)	06:46	07:37	07:32	08:22			
	21:51	18 06:15 (WEA 17-1)	21:11	33 07:37 (WEA 17-3)	20:05	18:54	16:50	16:15			
8	05:14	05:57 (WEA 17-1)	05:57	07:03 (WEA 17-3)	06:48	07:39	07:34	08:23			
	21:51	17 06:14 (WEA 17-1)	21:10	34 07:37 (WEA 17-3)	20:03	18:52	16:48	16:15			
9	05:15	05:58 (WEA 17-1)	05:58	07:03 (WEA 17-3)	06:50	07:40	07:36	08:24			
	21:50	15 06:13 (WEA 17-1)	21:08	34 07:37 (WEA 17-3)	20:00	18:50	16:46	16:15			
10	05:16	05:59 (WEA 17-1)	06:00	07:03 (WEA 17-3)	06:51	07:42	07:38	08:26			
	21:49	14 06:13 (WEA 17-1)	21:06	34 07:37 (WEA 17-3)	19:58	18:48	16:45	16:14			
11	05:17	06:00 (WEA 17-1)	06:02	07:03 (WEA 17-3)	06:53	07:44	07:40	08:27			
	21:49	12 06:12 (WEA 17-1)	21:04	35 07:38 (WEA 17-3)	19:56	18:45	16:43	16:14			
12	05:18	06:02 (WEA 17-1)	06:03	07:02 (WEA 17-3)	06:55	07:46	07:42	08:28			
	21:48	8 06:10 (WEA 17-1)	21:02	35 07:37 (WEA 17-3)	19:53	18:43	16:41	16:14			
13	05:19	06:05 (WEA 17-1)	06:05	07:02 (WEA 17-3)	06:56	07:47	07:43	08:29			
	21:47	3 06:08 (WEA 17-1)	21:00	35 07:37 (WEA 17-3)	19:51	18:41	16:40	16:14			
14	05:20		06:06	07:02 (WEA 17-3)	06:58	07:49	07:45	08:30			
	21:46		20:58	34 07:36 (WEA 17-3)	19:49	18:38	16:38	16:14			
15	05:22		06:08	07:02 (WEA 17-3)	07:00	07:51	07:47	08:31			
	21:45		20:56	35 07:37 (WEA 17-3)	19:46	18:36	16:37	16:14			
16	05:23		06:10	07:03 (WEA 17-3)	07:01	07:53	07:49	08:32			
	21:44		20:54	34 07:37 (WEA 17-3)	19:44	18:34	16:35	16:14			
17	05:24		06:11	07:02 (WEA 17-3)	07:03	07:54	07:51	08:33			
	21:43		20:52	33 07:35 (WEA 17-3)	19:42	18:32	16:34	16:14			
18	05:25		06:13	07:03 (WEA 17-3)	07:05	07:56	07:52	08:33			
	21:42		20:50	32 07:35 (WEA 17-3)	19:39	18:30	16:33	16:14			
19	05:27		06:15	07:03 (WEA 17-3)	07:06	07:58	07:54	08:34			
	21:41		20:48	31 07:34 (WEA 17-3)	19:37	18:27	16:31	16:14			
20	05:28		06:16	07:04 (WEA 17-3)	07:08	08:00	07:56	08:35			
	21:39		20:46	29 07:33 (WEA 17-3)	19:34	18:25	16:30	16:15			
21	05:29		06:18	07:04 (WEA 17-3)	07:10	08:01	07:58	08:35			
	21:38		20:43	27 07:31 (WEA 17-3)	19:32	18:23	16:29	16:15			
22	05:31		06:20	07:06 (WEA 17-3)	07:11	08:03	07:59	08:36			
	21:37		20:41	24 07:30 (WEA 17-3)	19:30	18:21	16:28	16:16			
23	05:32		06:21	07:07 (WEA 17-3)	07:13	08:05	08:01	08:37			
	21:36		20:39	22 07:29 (WEA 17-3)	19:27	18:19	16:26	16:16			
24	05:34		06:23	07:09 (WEA 17-3)	07:15	08:07	08:03	08:37			
	21:34		20:37	17 07:26 (WEA 17-3)	19:25	18:17	16:25	16:17			
25	05:35		06:25	07:12 (WEA 17-3)	07:16	08:09	08:04	08:37			
	21:33		20:35	11 07:23 (WEA 17-3)	19:23	18:15	16:24	16:17			
26	05:36		06:26		07:18	08:10	08:06	08:38			
	21:31		20:33		19:20	18:13	16:23	16:18			
27	05:38		06:28		07:20	08:12	08:08	08:38			
	21:30		20:30		19:18	18:11	16:22	16:19			
28	05:39	07:18 (WEA 17-3)	06:30		07:21	07:14	08:09	08:38			
	21:28	5 07:23 (WEA 17-3)	20:28		19:15	17:09	16:21	16:19			
29	05:41	07:15 (WEA 17-3)	06:31		07:23	07:16	08:11	08:38			
	21:27	12 07:27 (WEA 17-3)	20:26		19:13	17:07	16:20	16:20			
30	05:42	07:12 (WEA 17-3)	06:33		07:25	07:18	08:12	08:39			
	21:25	17 07:29 (WEA 17-3)	20:24		19:11	17:05	16:20	16:21			
31	05:44	07:10 (WEA 17-3)	06:35			07:20		08:39			
	21:24	20 07:30 (WEA 17-3)	20:21			17:03		16:22			
Sonnenscheinstunden	505		456		382	332	265	241			
astr.max.mögl.Beschattung		268		734							

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:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 11a - Große Haar 2/Ost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:49	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:19	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:54	05:10	05:11	05:50	06:41	07:32	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:31	08:21
	16:29	17:21	18:14	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:02	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:57	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:43	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:31	18:23	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:43	16:14
12	08:35	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:42	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:51	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:32	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:31	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:51	08:33
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:30	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:30	16:33	16:14
19	08:29	07:39	06:36	06:25	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:35	06:31	06:20	05:25	05:05	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:16
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:03	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:22	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:42	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:10	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:20	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:03	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:09	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:20		08:39
	17:10		19:58		21:38		21:24	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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



Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 11b - Große Haar 2/West
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai		Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	05:59 20:52		05:12 21:39 19:33 (WEA 17-3)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54		05:12 21:40 75 20:48 (WEA 17-2) 19:33 (WEA 17-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55		05:11 21:41 75 20:48 (WEA 17-2) 19:33 (WEA 17-3)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	05:54 20:57		05:10 21:42 76 20:49 (WEA 17-2) 19:33 (WEA 17-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59		05:09 21:43 76 20:49 (WEA 17-2) 19:33 (WEA 17-3)
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	05:50 21:00		05:08 21:44 75 20:48 (WEA 17-2) 19:33 (WEA 17-3)
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02		05:08 21:45 76 20:49 (WEA 17-2) 19:33 (WEA 17-3)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04		05:07 21:46 76 20:49 (WEA 17-2) 19:33 (WEA 17-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05		05:07 21:47 76 20:49 (WEA 17-2) 19:33 (WEA 17-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:43 21:07		05:06 21:48 76 20:50 (WEA 17-2) 19:34 (WEA 17-3)
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17	05:41 21:09		05:06 21:49 76 20:49 (WEA 17-2) 19:34 (WEA 17-3)
12	08:35 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10	15	19:49 (WEA 17-3) 20:04 (WEA 17-3) 21:50 75 20:49 (WEA 17-2) 19:34 (WEA 17-3)
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	05:37 21:12	21	19:47 (WEA 17-3) 20:08 (WEA 17-3) 21:50 76 20:50 (WEA 17-2) 19:35 (WEA 17-3)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14	25	19:44 (WEA 17-3) 20:09 (WEA 17-3) 21:51 75 20:50 (WEA 17-2) 19:35 (WEA 17-3)
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15	35	19:43 (WEA 17-3) 20:34 (WEA 17-2) 21:52 75 20:50 (WEA 17-2) 19:36 (WEA 17-3)
16	08:31 16:43	07:45 17:40	06:43 18:32	06:31 20:26	05:33 21:17	43	19:41 (WEA 17-3) 20:37 (WEA 17-2) 21:52 76 20:50 (WEA 17-2) 19:34 (WEA 17-3)
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	50	19:40 (WEA 17-3) 20:39 (WEA 17-2) 21:53 76 20:50 (WEA 17-2) 19:35 (WEA 17-3)
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20	56	19:38 (WEA 17-3) 20:40 (WEA 17-2) 21:53 75 20:50 (WEA 17-2) 19:36 (WEA 17-3)
19	08:29 16:48	07:39 17:46	06:36 18:37	06:25 20:31	05:28 21:21	60	19:38 (WEA 17-3) 20:42 (WEA 17-2) 21:53 75 20:51 (WEA 17-2) 19:36 (WEA 17-3)
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23	63	19:37 (WEA 17-3) 20:43 (WEA 17-2) 21:54 75 20:51 (WEA 17-2) 19:36 (WEA 17-3)
21	08:26 16:52	07:35 17:49	06:31 18:40	06:20 20:35	05:25 21:24	66	19:37 (WEA 17-3) 20:44 (WEA 17-2) 21:54 75 20:51 (WEA 17-2) 19:36 (WEA 17-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	69	19:35 (WEA 17-3) 20:44 (WEA 17-2) 21:54 75 20:51 (WEA 17-2) 19:36 (WEA 17-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	69	19:35 (WEA 17-3) 20:44 (WEA 17-2) 21:55 75 20:51 (WEA 17-2) 19:37 (WEA 17-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	70	19:35 (WEA 17-3) 20:45 (WEA 17-2) 21:55 75 20:52 (WEA 17-2) 19:37 (WEA 17-3)
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:42	05:20 21:30	72	19:34 (WEA 17-3) 20:46 (WEA 17-2) 21:55 75 20:52 (WEA 17-2) 19:37 (WEA 17-3)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	05:19 21:31	72	19:34 (WEA 17-3) 20:46 (WEA 17-2) 21:55 75 20:52 (WEA 17-2) 19:37 (WEA 17-3)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33	73	19:34 (WEA 17-3) 20:47 (WEA 17-2) 21:55 76 20:53 (WEA 17-2) 19:37 (WEA 17-3)
28	08:17 17:04	07:20 18:03	06:15 19:53	06:05 20:47	05:16 21:34	74	19:33 (WEA 17-3) 20:47 (WEA 17-2) 21:55 75 20:52 (WEA 17-2) 19:38 (WEA 17-3)
29	08:16 17:06		06:13 19:54	06:03 20:48	05:15 21:35	74	19:33 (WEA 17-3) 20:47 (WEA 17-2) 21:54 75 20:53 (WEA 17-2) 19:37 (WEA 17-3)
30	08:15 17:08		06:10 19:56	06:01 20:50	05:14 21:37	74	19:33 (WEA 17-3) 20:47 (WEA 17-2) 21:54 76 20:53 (WEA 17-2) 19:37 (WEA 17-3)
31	08:13 17:10		07:08 19:58		05:13 21:38	74	19:33 (WEA 17-3) 20:47 (WEA 17-2)
Sonnenscheinstunden	256	275	366	416	487		502
astr.max.mögl.Beschattung						1155	2262

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 11b - Große Haar 2/West
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember		
1	05:08 21:54	19:38 (WEA 17-3) 20:54 (WEA 17-2)	05:45 21:22	19:58 (WEA 17-3) 20:17 (WEA 17-3)	06:36 20:19	07:26 19:08	07:21 17:01	08:14 16:19
2	05:09 21:54	19:39 (WEA 17-3) 20:54 (WEA 17-2)	05:47 21:20	20:01 (WEA 17-3) 20:13 (WEA 17-3)	06:38 20:17	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	19:38 (WEA 17-3) 20:54 (WEA 17-2)	05:49 21:19		06:40 20:14	07:30 19:04	07:25 16:57	08:17 16:17
4	05:11 21:53	19:39 (WEA 17-3) 20:54 (WEA 17-2)	05:50 21:17		06:41 20:12	07:32 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	19:39 (WEA 17-3) 20:55 (WEA 17-2)	05:52 21:15		06:43 20:10	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	19:40 (WEA 17-3) 20:55 (WEA 17-2)	05:53 21:13		06:45 20:07	07:35 18:57	07:31 16:51	08:21 16:16
7	05:13 21:51	19:39 (WEA 17-3) 20:55 (WEA 17-2)	05:55 21:11		06:46 20:05	07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	19:39 (WEA 17-3) 20:55 (WEA 17-2)	05:57 21:10		06:48 20:03	07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	19:40 (WEA 17-3) 20:55 (WEA 17-2)	05:58 21:08		06:50 20:00	07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	19:40 (WEA 17-3) 20:55 (WEA 17-2)	06:00 21:06		06:51 19:58	07:42 18:47	07:38 16:45	08:26 16:14
11	05:17 21:49	19:40 (WEA 17-3) 20:56 (WEA 17-2)	06:01 21:04		06:53 19:56	07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	19:41 (WEA 17-3) 20:56 (WEA 17-2)	06:03 21:02		06:55 19:53	07:45 18:43	07:42 16:41	08:28 16:14
13	05:19 21:47	19:41 (WEA 17-3) 20:56 (WEA 17-2)	06:05 21:00		06:56 19:51	07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	19:41 (WEA 17-3) 20:56 (WEA 17-2)	06:06 20:58		06:58 19:49	07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	19:41 (WEA 17-3) 20:56 (WEA 17-2)	06:08 20:56		07:00 19:46	07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	19:43 (WEA 17-3) 20:56 (WEA 17-2)	06:10 20:54		07:01 19:44	07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	19:43 (WEA 17-3) 20:56 (WEA 17-2)	06:11 20:52		07:03 19:41	07:54 18:32	07:51 16:34	08:33 16:14
18	05:25 21:42	19:43 (WEA 17-3) 20:56 (WEA 17-2)	06:13 20:50		07:05 19:39	07:56 18:30	07:52 16:33	08:33 16:14
19	05:27 21:41	19:44 (WEA 17-3) 20:55 (WEA 17-2)	06:15 20:48		07:06 19:37	07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	19:44 (WEA 17-3) 20:55 (WEA 17-2)	06:16 20:45		07:08 19:34	08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	19:45 (WEA 17-3) 20:55 (WEA 17-2)	06:18 20:43		07:10 19:32	08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	19:46 (WEA 17-3) 20:55 (WEA 17-2)	06:20 20:41		07:11 19:30	08:03 18:21	07:59 16:27	08:36 16:16
23	05:32 21:36	19:46 (WEA 17-3) 20:54 (WEA 17-2)	06:21 20:39		07:13 19:27	08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	19:47 (WEA 17-3) 20:54 (WEA 17-2)	06:23 20:37		07:15 19:25	08:07 18:17	08:03 16:25	08:37 16:17
25	05:35 21:33	19:48 (WEA 17-3) 20:53 (WEA 17-2)	06:25 20:35		07:16 19:22	08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	19:48 (WEA 17-3) 20:51 (WEA 17-2)	06:26 20:32		07:18 19:20	08:10 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	19:50 (WEA 17-3) 20:51 (WEA 17-2)	06:28 20:30		07:20 19:18	08:12 18:11	08:07 16:22	08:38 16:19
28	05:39 21:28	19:51 (WEA 17-3) 20:49 (WEA 17-2)	06:30 20:28		07:21 19:15	07:14 17:09	08:09 16:21	08:38 16:19
29	05:41 21:27	19:52 (WEA 17-3) 20:46 (WEA 17-2)	06:31 20:26		07:23 19:13	07:16 17:07	08:11 16:20	08:38 16:20
30	05:42 21:25	19:54 (WEA 17-3) 20:21 (WEA 17-3)	06:33 20:23		07:25 19:11	07:18 17:05	08:12 16:19	08:38 16:21
31	05:44 21:24	19:55 (WEA 17-3) 20:19 (WEA 17-3)	06:35 20:21			07:20 17:03		08:39 16:22
	Sonnenscheinstunden	505	456		382	332	265	241
	astr.max.mögl.Beschattung	2074	31					

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 12a - Holle 10/Ost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
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- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:49	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:19	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:54	05:10	05:11	05:50	06:41	07:32	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:31	08:21
	16:29	17:21	18:14	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:02	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:57	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:31	18:23	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:43	16:14
12	08:35	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:42	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:51	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:32	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:31	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:51	08:33
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:30	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:30	16:33	16:14
19	08:29	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:35	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:03	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:22	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:42	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:10	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:20	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:03	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:09	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:20		08:39
	17:10		19:58		21:38		21:24	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 12b - Holle 10/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni
1	08:39	08:12	07:17	07:06		05:59		18:46 (WEA 17-3) 05:12
	16:23	17:12	18:04	20:00		20:52	51	20:05 (WEA 17-2) 21:39
2	08:38	08:10	07:15	07:03		19:00 (WEA 17-3) 05:57		18:49 (WEA 17-3) 05:12
	16:24	17:13	18:06	20:01	6	19:06 (WEA 17-3) 20:54	44	20:04 (WEA 17-2) 21:40
3	08:38	08:08	07:13	07:01		18:54 (WEA 17-3) 05:55		18:53 (WEA 17-3) 05:11
	16:25	17:15	18:08	20:03	18	19:12 (WEA 17-3) 20:55	35	20:04 (WEA 17-2) 21:41
4	08:38	08:07	07:11	06:59		18:50 (WEA 17-3) 05:54		19:38 (WEA 17-2) 05:10
	16:27	17:17	18:10	20:05	24	19:14 (WEA 17-3) 20:57	26	20:04 (WEA 17-2) 21:42
5	08:38	08:05	07:08	06:56		18:48 (WEA 17-3) 05:52		19:38 (WEA 17-2) 05:09
	16:28	17:19	18:12	20:07	28	19:16 (WEA 17-3) 20:59	25	20:03 (WEA 17-2) 21:43
6	08:38	08:03	07:06	06:54		18:46 (WEA 17-3) 05:50		19:38 (WEA 17-2) 05:08
	16:29	17:21	18:14	20:08	32	19:18 (WEA 17-3) 21:00	24	20:02 (WEA 17-2) 21:44
7	08:37	08:02	07:04	06:52		18:44 (WEA 17-3) 05:48		19:39 (WEA 17-2) 05:08
	16:30	17:23	18:15	20:10	34	19:18 (WEA 17-3) 21:02	22	20:01 (WEA 17-2) 21:45
8	08:37	08:00	07:02	06:49		18:43 (WEA 17-3) 05:46		19:40 (WEA 17-2) 05:07
	16:32	17:25	18:17	20:12	36	19:19 (WEA 17-3) 21:04	20	20:00 (WEA 17-2) 21:46
9	08:36	07:58	06:59	06:47		18:42 (WEA 17-3) 05:44		19:41 (WEA 17-2) 05:07
	16:33	17:27	18:19	20:14	38	19:20 (WEA 17-3) 21:05	18	19:59 (WEA 17-2) 21:47
10	08:36	07:56	06:57	06:45		18:41 (WEA 17-3) 05:42		19:43 (WEA 17-2) 05:06
	16:34	17:29	18:21	20:15	40	19:21 (WEA 17-3) 21:07	14	19:57 (WEA 17-2) 21:48
11	08:35	07:54	06:55	06:42		18:39 (WEA 17-3) 05:41		19:46 (WEA 17-2) 05:06
	16:36	17:31	18:23	20:17	42	19:21 (WEA 17-3) 21:09	9	19:55 (WEA 17-2) 21:49
12	08:35	07:52	06:52	06:40		18:39 (WEA 17-3) 05:39		05:05
	16:37	17:32	18:24	20:19	42	19:21 (WEA 17-3) 21:10		21:50
13	08:34	07:51	06:50	06:38		18:38 (WEA 17-3) 05:37		05:05
	16:39	17:34	18:26	20:21	44	19:22 (WEA 17-3) 21:12		21:50
14	08:33	07:49	06:48	06:36		18:38 (WEA 17-3) 05:36		05:05
	16:40	17:36	18:28	20:22	44	19:22 (WEA 17-3) 21:14		21:51
15	08:32	07:47	06:45	06:33		18:38 (WEA 17-3) 05:34		05:05
	16:42	17:38	18:30	20:24	44	19:22 (WEA 17-3) 21:15		21:52
16	08:31	07:45	06:43	06:31		18:36 (WEA 17-3) 05:33		05:04
	16:43	17:40	18:32	20:26	45	19:21 (WEA 17-3) 21:17		21:52
17	08:31	07:43	06:41	06:29		18:36 (WEA 17-3) 05:31		05:04
	16:45	17:42	18:33	20:28	45	19:21 (WEA 17-3) 21:18		21:53
18	08:30	07:41	06:38	06:27		18:36 (WEA 17-3) 05:29		05:04
	16:47	17:44	18:35	20:29	45	19:21 (WEA 17-3) 21:20		21:53
19	08:29	07:39	06:36	06:24		18:36 (WEA 17-3) 05:28		05:04
	16:48	17:46	18:37	20:31	45	19:21 (WEA 17-3) 21:21		21:53
20	08:28	07:37	06:34	06:22		18:37 (WEA 17-3) 05:27		05:04
	16:50	17:48	18:39	20:33	54	19:58 (WEA 17-2) 21:23		21:54
21	08:26	07:35	06:31	06:20		18:37 (WEA 17-3) 05:25		05:04
	16:52	17:49	18:40	20:35	60	20:01 (WEA 17-2) 21:24		21:54
22	08:25	07:32	06:29	06:18		18:37 (WEA 17-3) 05:24		05:05
	16:53	17:51	18:42	20:36	62	20:02 (WEA 17-2) 21:26		21:54
23	08:24	07:30	06:27	06:16		18:38 (WEA 17-3) 05:22		05:05
	16:55	17:53	18:44	20:38	62	20:03 (WEA 17-2) 21:27		21:55
24	08:23	07:28	06:24	06:14		18:38 (WEA 17-3) 05:21		05:05
	16:57	17:55	18:46	20:40	64	20:04 (WEA 17-2) 21:29		21:55
25	08:22	07:26	07:22	06:12		18:39 (WEA 17-3) 05:20		05:05
	16:59	17:57	19:47	20:42	64	20:05 (WEA 17-2) 21:30		21:55
26	08:20	07:24	07:20	06:10		18:40 (WEA 17-3) 05:19		05:06
	17:01	17:59	19:49	20:43	63	20:05 (WEA 17-2) 21:31		21:55
27	08:19	07:22	07:17	06:07		18:41 (WEA 17-3) 05:18		05:06
	17:02	18:01	19:51	20:45	61	20:05 (WEA 17-2) 21:33		21:55
28	08:18	07:20	07:15	06:05		18:42 (WEA 17-3) 05:16		05:07
	17:04	18:03	19:53	20:47	59	20:05 (WEA 17-2) 21:34		21:55
29	08:16		07:13	06:03		18:43 (WEA 17-3) 05:15		05:07
	17:06		19:54	20:48	57	20:05 (WEA 17-2) 21:35		21:54
30	08:15		07:10	06:01		18:45 (WEA 17-3) 05:14		05:08
	17:08		19:56	20:50	53	20:05 (WEA 17-2) 21:37		21:54
31	08:13		07:08			05:13		
	17:10		19:58			21:38		
Sonnenscheinstunden	256	275	366	416		487		502
astr.max.mögl.Beschattung				1311		288		

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 12b - Holle 10/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember			
1	05:08 21:54	05:45 21:22	06:36 20:19	18:39 (WEA 17-3) 19:21 (WEA 17-3)	07:26 17:01	08:14 16:19			
2	05:09 21:54	05:47 21:20	19:58 (WEA 17-2) 20:02 (WEA 17-2)	06:38 20:17	42 41	18:38 (WEA 17-3) 19:19 (WEA 17-3)	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:49 21:19	19:55 (WEA 17-2) 20:06 (WEA 17-2)	06:40 20:14	40	18:39 (WEA 17-3) 19:19 (WEA 17-3)	07:30 19:04	07:25 16:57	08:17 16:17
4	05:11 21:53	05:50 21:17	19:52 (WEA 17-2) 20:08 (WEA 17-2)	06:41 20:12	38	18:39 (WEA 17-3) 19:17 (WEA 17-3)	07:32 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	05:52 21:15	19:51 (WEA 17-2) 20:10 (WEA 17-2)	06:43 20:10	36	18:40 (WEA 17-3) 19:16 (WEA 17-3)	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	05:53 21:13	19:49 (WEA 17-2) 20:10 (WEA 17-2)	06:45 20:07	34	18:41 (WEA 17-3) 19:15 (WEA 17-3)	07:35 18:57	07:31 16:51	08:21 16:16
7	05:13 21:51	05:55 21:11	19:49 (WEA 17-2) 20:11 (WEA 17-2)	06:46 20:05	32	18:41 (WEA 17-3) 19:13 (WEA 17-3)	07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	05:57 21:10	19:47 (WEA 17-2) 20:12 (WEA 17-2)	06:48 20:03	28	18:43 (WEA 17-3) 19:11 (WEA 17-3)	07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	05:58 21:08	19:47 (WEA 17-2) 20:13 (WEA 17-2)	06:50 20:00	24	18:44 (WEA 17-3) 19:08 (WEA 17-3)	07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	06:00 21:06	19:46 (WEA 17-2) 20:12 (WEA 17-2)	06:51 19:58	18	18:47 (WEA 17-3) 19:05 (WEA 17-3)	07:42 18:47	07:38 16:45	08:26 16:14
11	05:17 21:49	06:01 21:04	19:01 (WEA 17-3) 20:13 (WEA 17-2)	06:53 19:56	7	18:53 (WEA 17-3) 19:00 (WEA 17-3)	07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	18:56 (WEA 17-3) 20:13 (WEA 17-2)	06:55 19:53			07:45 18:43	07:42 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	18:54 (WEA 17-3) 20:13 (WEA 17-2)	06:56 19:51			07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	18:52 (WEA 17-3) 20:13 (WEA 17-2)	06:58 19:49			07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	06:08 20:56	18:50 (WEA 17-3) 20:13 (WEA 17-2)	07:00 19:46			07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	18:48 (WEA 17-3) 20:12 (WEA 17-2)	07:01 19:44			07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:11 20:52	18:47 (WEA 17-3) 20:12 (WEA 17-2)	07:03 19:41			07:54 18:32	07:51 16:34	08:33 16:14
18	05:25 21:42	06:13 20:50	18:46 (WEA 17-3) 20:12 (WEA 17-2)	07:05 19:39			07:56 18:30	07:52 16:33	08:33 16:14
19	05:27 21:41	06:15 20:48	18:44 (WEA 17-3) 20:10 (WEA 17-2)	07:06 19:37			07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:16 20:45	18:44 (WEA 17-3) 20:10 (WEA 17-2)	07:08 19:34			08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	18:42 (WEA 17-3) 20:08 (WEA 17-2)	07:10 19:32			08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	06:20 20:41	18:42 (WEA 17-3) 20:07 (WEA 17-2)	07:11 19:30			08:03 18:21	07:59 16:27	08:36 16:15
23	05:32 21:36	06:21 20:39	18:41 (WEA 17-3) 20:04 (WEA 17-2)	07:13 19:27			08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	18:40 (WEA 17-3) 20:01 (WEA 17-2)	07:15 19:25			08:07 18:17	08:03 16:25	08:37 16:17
25	05:35 21:33	06:25 20:35	18:40 (WEA 17-3) 19:24 (WEA 17-3)	07:16 19:22			08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	18:39 (WEA 17-3) 19:24 (WEA 17-3)	07:18 19:20			08:10 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	18:39 (WEA 17-3) 19:24 (WEA 17-3)	07:20 19:18			08:12 18:11	08:07 16:22	08:38 16:19
28	05:39 21:28	06:30 20:28	18:38 (WEA 17-3) 19:23 (WEA 17-3)	07:21 19:15			07:14 17:09	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	18:38 (WEA 17-3) 19:23 (WEA 17-3)	07:23 19:13			07:16 17:07	08:11 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	18:38 (WEA 17-3) 19:22 (WEA 17-3)	07:25 19:11			07:18 17:05	08:12 16:19	08:38 16:21
31	05:44 21:24	06:35 20:21	18:38 (WEA 17-3) 19:21 (WEA 17-3)				07:20 17:03		08:39 16:22
Sonnenscheinstunden	505	456	382	340	332	265	241		
astr.max.mögl.Beschattung		1280							

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	



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 13a - Holle 9/Ost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:19	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:54	05:10	05:11	05:50	06:41	07:32	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:31	08:21
	16:29	17:21	18:14	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:02	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:57	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:31	18:23	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:43	16:14
12	08:35	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:42	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:51	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:32	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:31	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:51	08:33
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:30	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:30	16:33	16:14
19	08:29	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:28	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:35	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:03	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:22	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:42	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:10	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:20	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:03	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:09	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:20		08:39
	17:10		19:58		21:38		21:24	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 13b - Holle 9/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	18:14 (WEA 17-3) 05:59 20:00	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	18:15 (WEA 17-3) 05:57 18:51 (WEA 17-3) 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	18:16 (WEA 17-3) 05:55 18:50 (WEA 17-3) 20:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	18:16 (WEA 17-3) 05:54 18:48 (WEA 17-3) 20:57	05:10 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	18:17 (WEA 17-3) 05:52 18:47 (WEA 17-3) 20:59	05:09 21:43
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	18:19 (WEA 17-3) 05:50 18:46 (WEA 17-3) 21:00	05:08 21:44
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	18:20 (WEA 17-3) 05:48 19:38 (WEA 17-2) 21:02	05:08 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	18:22 (WEA 17-3) 05:46 19:40 (WEA 17-2) 21:04	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	18:25 (WEA 17-3) 05:44 19:42 (WEA 17-2) 21:05	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	19:20 (WEA 17-2) 05:42 19:43 (WEA 17-2) 21:07	05:06 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17	19:18 (WEA 17-2) 05:41 19:43 (WEA 17-2) 21:09	05:06 21:49
12	08:35 16:37	07:52 17:32	06:52 18:24	06:40 20:19	19:18 (WEA 17-2) 05:39 19:43 (WEA 17-2) 21:10	05:05 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	19:17 (WEA 17-2) 05:37 19:44 (WEA 17-2) 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	19:17 (WEA 17-2) 05:36 19:44 (WEA 17-2) 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	19:17 (WEA 17-2) 05:34 19:44 (WEA 17-2) 21:15	05:05 21:52
16	08:31 16:43	07:45 17:40	06:43 18:32	06:31 20:26	19:16 (WEA 17-2) 05:33 19:43 (WEA 17-2) 21:17	05:04 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28	19:16 (WEA 17-2) 05:31 19:42 (WEA 17-2) 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29	19:16 (WEA 17-2) 05:29 19:42 (WEA 17-2) 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31	19:17 (WEA 17-2) 05:28 19:41 (WEA 17-2) 21:21	05:04 21:53
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	19:17 (WEA 17-2) 05:27 19:40 (WEA 17-2) 21:23	05:04 21:54
21	08:26 16:52	07:35 17:49	06:31 18:40	06:20 20:35	19:18 (WEA 17-2) 05:25 19:39 (WEA 17-2) 21:24	05:04 21:54
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	19:20 (WEA 17-2) 05:24 19:38 (WEA 17-2) 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	19:21 (WEA 17-2) 05:22 19:36 (WEA 17-2) 21:27	05:05 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	19:24 (WEA 17-2) 05:21 19:33 (WEA 17-2) 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:42	18:16 (WEA 17-3) 06:12 18:55 (WEA 17-3) 20:42	05:05 21:55
26	08:20 17:01	07:24 17:59	07:20 19:49	06:10 20:43	18:15 (WEA 17-3) 06:10 18:54 (WEA 17-3) 20:43	05:06 21:55
27	08:19 17:02	07:22 18:01	07:17 19:51	06:07 20:45	18:15 (WEA 17-3) 06:07 18:54 (WEA 17-3) 20:45	05:06 21:55
28	08:18 17:04	07:20 18:03	07:15 19:53	06:05 20:47	18:15 (WEA 17-3) 06:05 18:55 (WEA 17-3) 20:47	05:07 21:55
29	08:16 17:06	07:13 19:54	07:13 19:54	06:03 20:48	18:14 (WEA 17-3) 06:03 18:54 (WEA 17-3) 20:48	05:07 21:54
30	08:15 17:08	07:10 19:56	07:10 19:56	06:01 20:50	18:14 (WEA 17-3) 06:01 18:53 (WEA 17-3) 20:50	05:08 21:54
31	08:13 17:10	07:08 19:58	07:08 19:58	05:13 21:38	18:15 (WEA 17-3) 05:13 18:53 (WEA 17-3) 21:38	05:08 21:54
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 275	366 531	416 644	487 549	502 1356

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 13b - Holle 9/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember			
1	05:08	19:56 (WEA 17-1)	05:45	06:36	19:18 (WEA 17-2)	07:26	07:21	08:14	
	21:54	46 20:42 (WEA 17-1)	21:22	20:19	25 19:43 (WEA 17-2)	19:08	17:01	16:19	
2	05:09	19:57 (WEA 17-1)	05:47	06:38	19:17 (WEA 17-2)	07:28	07:23	08:15	
	21:54	45 20:42 (WEA 17-1)	21:20	20:17	25 19:42 (WEA 17-2)	19:06	16:59	16:18	
3	05:10	19:56 (WEA 17-1)	05:48	06:40	19:18 (WEA 17-2)	07:30	07:25	08:17	
	21:53	46 20:42 (WEA 17-1)	21:19	20:14	23 19:41 (WEA 17-2)	19:04	16:57	16:17	
4	05:11	19:57 (WEA 17-1)	05:50	06:41	18:22 (WEA 17-3)	07:32	07:27	08:18	
	21:53	45 20:42 (WEA 17-1)	21:17	20:12	33 19:39 (WEA 17-2)	19:01	16:55	16:17	
5	05:11	19:57 (WEA 17-1)	05:52	06:43	18:19 (WEA 17-3)	07:33	07:29	08:19	
	21:52	45 20:42 (WEA 17-1)	21:15	20:10	36 19:37 (WEA 17-2)	18:59	16:53	16:16	
6	05:12	19:58 (WEA 17-1)	05:53	06:45	18:17 (WEA 17-3)	07:35	07:31	08:21	
	21:52	45 20:43 (WEA 17-1)	21:13	20:07	35 19:35 (WEA 17-2)	18:57	16:51	16:16	
7	05:13	19:57 (WEA 17-1)	05:55	06:46	18:14 (WEA 17-3)	07:37	07:32	08:22	
	21:51	45 20:42 (WEA 17-1)	21:11	20:05	27 18:41 (WEA 17-3)	18:54	16:50	16:15	
8	05:14	19:58 (WEA 17-1)	05:57	06:48	18:12 (WEA 17-3)	07:38	07:34	08:23	
	21:51	44 20:42 (WEA 17-1)	21:10	20:03	30 18:42 (WEA 17-3)	18:52	16:48	16:15	
9	05:15	19:58 (WEA 17-1)	05:58	06:50	18:10 (WEA 17-3)	07:40	07:36	08:24	
	21:50	44 20:42 (WEA 17-1)	21:08	20:00	32 18:42 (WEA 17-3)	18:50	16:46	16:14	
10	05:16	19:58 (WEA 17-1)	06:00	06:51	18:09 (WEA 17-3)	07:42	07:38	08:26	
	21:49	44 20:42 (WEA 17-1)	21:06	19:58	34 18:43 (WEA 17-3)	18:47	16:45	16:14	
11	05:17	19:59 (WEA 17-1)	06:01	06:53	18:08 (WEA 17-3)	07:44	07:40	08:27	
	21:49	43 20:42 (WEA 17-1)	21:04	19:56	36 18:44 (WEA 17-3)	18:45	16:43	16:14	
12	05:18	19:59 (WEA 17-1)	06:03	06:55	18:07 (WEA 17-3)	07:45	07:42	08:28	
	21:48	43 20:42 (WEA 17-1)	21:02	19:53	37 18:44 (WEA 17-3)	18:43	16:41	16:14	
13	05:19	19:59 (WEA 17-1)	06:05	06:56	18:06 (WEA 17-3)	07:47	07:43	08:29	
	21:47	43 20:42 (WEA 17-1)	21:00	19:51	38 18:44 (WEA 17-3)	18:41	16:40	16:14	
14	05:20	20:00 (WEA 17-1)	06:06	06:58	18:05 (WEA 17-3)	07:49	07:45	08:30	
	21:46	42 20:42 (WEA 17-1)	20:58	19:49	39 18:44 (WEA 17-3)	18:38	16:38	16:14	
15	05:22	20:00 (WEA 17-1)	06:08	07:00	18:04 (WEA 17-3)	07:51	07:47	08:31	
	21:45	41 20:41 (WEA 17-1)	20:56	19:46	40 18:44 (WEA 17-3)	18:36	16:37	16:14	
16	05:23	20:01 (WEA 17-1)	06:10	07:01	18:04 (WEA 17-3)	07:52	07:49	08:32	
	21:44	41 20:42 (WEA 17-1)	20:54	19:44	40 18:44 (WEA 17-3)	18:34	16:35	16:14	
17	05:24	20:02 (WEA 17-1)	06:11	07:03	18:03 (WEA 17-3)	07:54	07:51	08:33	
	21:43	40 20:42 (WEA 17-1)	20:52	19:41	40 18:43 (WEA 17-3)	18:32	16:34	16:14	
18	05:25	20:02 (WEA 17-1)	06:13	07:05	18:03 (WEA 17-3)	07:56	07:52	08:33	
	21:42	39 20:41 (WEA 17-1)	20:50	19:39	40 18:43 (WEA 17-3)	18:30	16:33	16:14	
19	05:27	20:02 (WEA 17-1)	06:15	07:06	18:04 (WEA 17-3)	07:58	07:54	08:34	
	21:41	38 20:40 (WEA 17-1)	20:48	19:37	38 18:42 (WEA 17-3)	18:27	16:31	16:14	
20	05:28	20:03 (WEA 17-1)	06:16	19:29 (WEA 17-2)	07:08	18:03 (WEA 17-3)	08:00	07:56	08:35
	21:39	37 20:40 (WEA 17-1)	20:45	19:40 (WEA 17-2)	19:34	38 18:41 (WEA 17-3)	18:25	16:30	16:15
21	05:29	20:04 (WEA 17-1)	06:18	19:25 (WEA 17-2)	07:10	18:03 (WEA 17-3)	08:01	07:57	08:35
	21:38	36 20:40 (WEA 17-1)	20:43	19:41 (WEA 17-2)	19:32	37 18:40 (WEA 17-3)	18:23	16:29	16:15
22	05:31	20:05 (WEA 17-1)	06:20	19:24 (WEA 17-2)	07:11	18:04 (WEA 17-3)	08:03	07:59	08:36
	21:37	34 20:39 (WEA 17-1)	20:41	19:43 (WEA 17-2)	19:30	36 18:40 (WEA 17-3)	18:21	16:27	16:15
23	05:32	20:05 (WEA 17-1)	06:21	19:22 (WEA 17-2)	07:13	18:04 (WEA 17-3)	08:05	08:01	08:36
	21:36	33 20:38 (WEA 17-1)	20:39	19:43 (WEA 17-2)	19:27	34 18:38 (WEA 17-3)	18:19	16:26	16:16
24	05:33	20:07 (WEA 17-1)	06:23	19:21 (WEA 17-2)	07:15	18:05 (WEA 17-3)	08:07	08:03	08:37
	21:34	31 20:38 (WEA 17-1)	20:37	19:44 (WEA 17-2)	19:25	31 18:36 (WEA 17-3)	18:17	16:25	16:17
25	05:35	20:08 (WEA 17-1)	06:25	19:20 (WEA 17-2)	07:16	18:06 (WEA 17-3)	08:09	08:04	08:37
	21:33	28 20:36 (WEA 17-1)	20:35	19:45 (WEA 17-2)	19:22	29 18:35 (WEA 17-3)	18:15	16:24	16:17
26	05:36	20:08 (WEA 17-1)	06:26	19:19 (WEA 17-2)	07:18	18:07 (WEA 17-3)	08:10	08:06	08:38
	21:31	27 20:35 (WEA 17-1)	20:32	19:45 (WEA 17-2)	19:20	25 18:32 (WEA 17-3)	18:13	16:23	16:18
27	05:38	20:11 (WEA 17-1)	06:28	19:19 (WEA 17-2)	07:20	18:09 (WEA 17-3)	08:12	08:07	08:38
	21:30	23 20:34 (WEA 17-1)	20:30	19:45 (WEA 17-2)	19:18	21 18:30 (WEA 17-3)	18:11	16:22	16:19
28	05:39	20:12 (WEA 17-1)	06:30	19:18 (WEA 17-2)	07:21	18:12 (WEA 17-3)	07:14	08:09	08:38
	21:28	20 20:32 (WEA 17-1)	20:28	19:44 (WEA 17-2)	19:15	15 18:27 (WEA 17-3)	17:09	16:21	16:19
29	05:41	20:14 (WEA 17-1)	06:31	19:18 (WEA 17-2)	07:23	19:18 (WEA 17-2)	07:23	07:16	08:38
	21:27	15 20:29 (WEA 17-1)	20:26	19:45 (WEA 17-2)	19:13		17:07	16:20	16:20
30	05:42	20:19 (WEA 17-1)	06:33	19:17 (WEA 17-2)	07:25		07:18	08:12	08:38
	21:25	6 20:25 (WEA 17-1)	20:23	19:44 (WEA 17-2)	19:11		17:05	16:19	16:21
31	05:44		06:35	19:17 (WEA 17-2)			07:20		08:39
	21:24		20:21	19:43 (WEA 17-2)			17:03		16:22
Sonnenscheinstunden	505	456		382	914		332	265	241
astr.max.mögl.Beschattung	1109	273							

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 14a - Holle 7/Ost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:19	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:54	05:10	05:11	05:50	06:41	07:32	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:31	08:21
	16:29	17:21	18:14	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:02	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:23	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:43	16:14
12	08:35	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:42	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:51	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:32	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:31	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:51	08:33
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:30	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:30	16:33	16:14
19	08:29	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:28	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:35	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:03	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:22	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:42	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:10	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:18	07:20	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:03	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:09	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:20		08:39
	17:10		19:58		21:38		21:24	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 14b - Holle 7/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April		Mai		Juni		
1	08:39	08:12	07:17		07:06		19:16 (WEA 17-2) 05:59		19:43 (WEA 17-1) 05:12		19:32 (WEA 17-1)
	16:23	17:12	18:04		20:00	13	19:29 (WEA 17-2) 20:52	15	19:58 (WEA 17-1) 21:39	40	20:12 (WEA 17-1)
2	08:38	08:10	07:15		07:03		19:14 (WEA 17-2) 05:57		19:40 (WEA 17-1) 05:12		19:32 (WEA 17-1)
	16:24	17:13	18:06		20:01	17	19:31 (WEA 17-2) 20:54	21	20:01 (WEA 17-1) 21:40	40	20:12 (WEA 17-1)
3	08:38	08:08	07:13		07:01		19:12 (WEA 17-2) 05:55		19:38 (WEA 17-1) 05:11		19:32 (WEA 17-1)
	16:25	17:15	18:08		20:03	20	19:32 (WEA 17-2) 20:55	25	20:03 (WEA 17-1) 21:41	39	20:11 (WEA 17-1)
4	08:38	08:07	07:11		06:59		19:10 (WEA 17-2) 05:54		19:37 (WEA 17-1) 05:10		19:34 (WEA 17-1)
	16:27	17:17	18:10		20:05	22	19:32 (WEA 17-2) 20:57	28	20:05 (WEA 17-1) 21:42	38	20:12 (WEA 17-1)
5	08:38	08:05	07:08		06:56		19:09 (WEA 17-2) 05:52		19:35 (WEA 17-1) 05:09		19:34 (WEA 17-1)
	16:28	17:19	18:12		20:07	24	19:33 (WEA 17-2) 20:59	31	20:06 (WEA 17-1) 21:43	37	20:11 (WEA 17-1)
6	08:38	08:03	07:06		06:54		19:09 (WEA 17-2) 05:50		19:34 (WEA 17-1) 05:08		19:34 (WEA 17-1)
	16:29	17:21	18:14		20:08	25	19:34 (WEA 17-2) 21:00	33	20:07 (WEA 17-1) 21:44	37	20:11 (WEA 17-1)
7	08:37	08:02	07:04		06:52		19:07 (WEA 17-2) 05:48		19:32 (WEA 17-1) 05:08		19:35 (WEA 17-1)
	16:30	17:23	18:15		20:10	26	19:33 (WEA 17-2) 21:02	35	20:07 (WEA 17-1) 21:45	36	20:11 (WEA 17-1)
8	08:37	08:00	07:02		06:49		19:07 (WEA 17-2) 05:46		19:32 (WEA 17-1) 05:07		19:35 (WEA 17-1)
	16:32	17:25	18:17	8	17:31 (WEA 17-3) 20:12	26	19:33 (WEA 17-2) 21:04	37	20:09 (WEA 17-1) 21:46	36	20:11 (WEA 17-1)
9	08:36	07:58	06:59		06:47		19:07 (WEA 17-2) 05:44		19:31 (WEA 17-1) 05:07		19:36 (WEA 17-1)
	16:33	17:27	18:19	16	17:35 (WEA 17-3) 20:14	26	19:33 (WEA 17-2) 21:05	38	20:09 (WEA 17-1) 21:47	35	20:11 (WEA 17-1)
10	08:36	07:56	06:57		06:45		19:07 (WEA 17-2) 05:42		19:30 (WEA 17-1) 05:06		19:37 (WEA 17-1)
	16:34	17:29	18:21	22	17:37 (WEA 17-3) 20:15	26	19:33 (WEA 17-2) 21:07	39	20:09 (WEA 17-1) 21:48	34	20:11 (WEA 17-1)
11	08:35	07:54	06:55		06:42		19:07 (WEA 17-2) 05:41		19:30 (WEA 17-1) 05:06		19:36 (WEA 17-1)
	16:36	17:30	18:23	26	17:39 (WEA 17-3) 20:17	25	19:32 (WEA 17-2) 21:09	40	20:10 (WEA 17-1) 21:49	34	20:10 (WEA 17-1)
12	08:35	07:52	06:52		06:40		19:07 (WEA 17-2) 05:39		19:29 (WEA 17-1) 05:05		19:37 (WEA 17-1)
	16:37	17:32	18:24	29	17:41 (WEA 17-3) 20:19	24	19:31 (WEA 17-2) 21:10	41	20:10 (WEA 17-1) 21:50	34	20:11 (WEA 17-1)
13	08:34	07:51	06:50		06:38		19:08 (WEA 17-2) 05:37		19:29 (WEA 17-1) 05:05		19:38 (WEA 17-1)
	16:39	17:34	18:26	31	17:41 (WEA 17-3) 20:21	22	19:30 (WEA 17-2) 21:12	42	20:11 (WEA 17-1) 21:50	33	20:11 (WEA 17-1)
14	08:33	07:49	06:48		06:36		19:09 (WEA 17-2) 05:36		19:28 (WEA 17-1) 05:05		19:38 (WEA 17-1)
	16:40	17:36	18:28	33	17:42 (WEA 17-3) 20:22	20	19:29 (WEA 17-2) 21:14	43	20:11 (WEA 17-1) 21:51	33	20:11 (WEA 17-1)
15	08:32	07:47	06:45		06:33		19:10 (WEA 17-2) 05:34		19:29 (WEA 17-1) 05:05		19:38 (WEA 17-1)
	16:42	17:38	18:30	35	17:42 (WEA 17-3) 20:24	18	19:28 (WEA 17-2) 21:15	43	20:12 (WEA 17-1) 21:52	32	20:10 (WEA 17-1)
16	08:31	07:45	06:43		06:31		19:11 (WEA 17-2) 05:33		19:28 (WEA 17-1) 05:04		19:38 (WEA 17-1)
	16:43	17:40	18:32	35	17:42 (WEA 17-3) 20:26	13	19:24 (WEA 17-2) 21:17	44	20:12 (WEA 17-1) 21:52	32	20:10 (WEA 17-1)
17	08:31	07:43	06:41		06:29		19:09 (WEA 17-2) 05:31		19:28 (WEA 17-1) 05:04		19:39 (WEA 17-1)
	16:45	17:42	18:33	36	17:43 (WEA 17-3) 20:28	6	19:21 (WEA 17-2) 21:18	44	20:12 (WEA 17-1) 21:53	31	20:10 (WEA 17-1)
18	08:30	07:41	06:38		06:27		19:05 (WEA 17-2) 05:29		19:28 (WEA 17-1) 05:04		19:39 (WEA 17-1)
	16:47	17:44	18:35	37	17:42 (WEA 17-3) 20:29		21:20	44	20:12 (WEA 17-1) 21:53	32	20:11 (WEA 17-1)
19	08:29	07:39	06:36		06:24		19:05 (WEA 17-2) 05:28		19:28 (WEA 17-1) 05:04		19:39 (WEA 17-1)
	16:48	17:46	18:37	38	17:43 (WEA 17-3) 20:31		21:21	44	20:12 (WEA 17-1) 21:53	32	20:11 (WEA 17-1)
20	08:28	07:37	06:34		06:22		19:06 (WEA 17-2) 05:27		19:28 (WEA 17-1) 05:04		19:40 (WEA 17-1)
	16:50	17:48	18:39	37	17:43 (WEA 17-3) 20:33		21:23	44	20:12 (WEA 17-1) 21:54	32	20:12 (WEA 17-1)
21	08:26	07:35	06:31		06:20		19:05 (WEA 17-2) 05:25		19:29 (WEA 17-1) 05:04		19:41 (WEA 17-1)
	16:52	17:49	18:40	37	17:42 (WEA 17-3) 20:35		21:24	44	20:13 (WEA 17-1) 21:54	31	20:12 (WEA 17-1)
22	08:25	07:32	06:29		06:18		19:06 (WEA 17-2) 05:24		19:28 (WEA 17-1) 05:05		19:41 (WEA 17-1)
	16:53	17:51	18:42	36	17:41 (WEA 17-3) 20:36		21:26	44	20:12 (WEA 17-1) 21:54	31	20:12 (WEA 17-1)
23	08:24	07:30	06:27		06:16		19:06 (WEA 17-2) 05:22		19:28 (WEA 17-1) 05:05		19:41 (WEA 17-1)
	16:55	17:53	18:44	35	17:41 (WEA 17-3) 20:38		21:27	44	20:12 (WEA 17-1) 21:55	31	20:12 (WEA 17-1)
24	08:23	07:28	06:24		06:14		19:05 (WEA 17-2) 05:21		19:29 (WEA 17-1) 05:05		19:41 (WEA 17-1)
	16:57	17:55	18:46	34	17:39 (WEA 17-3) 20:40		21:29	43	20:12 (WEA 17-1) 21:55	32	20:13 (WEA 17-1)
25	08:22	07:26	06:22		06:12		19:05 (WEA 17-2) 05:20		19:29 (WEA 17-1) 05:05		19:41 (WEA 17-1)
	16:59	17:57	18:47	33	18:39 (WEA 17-3) 20:42		21:30	43	20:12 (WEA 17-1) 21:55	32	20:13 (WEA 17-1)
26	08:20	07:24	06:20		06:10		19:05 (WEA 17-2) 05:19		19:29 (WEA 17-1) 05:06		19:41 (WEA 17-1)
	17:01	17:59	18:49	31	18:37 (WEA 17-3) 20:43		21:31	43	20:12 (WEA 17-1) 21:55	31	20:12 (WEA 17-1)
27	08:19	07:22	06:17		06:07		19:04 (WEA 17-2) 05:18		19:30 (WEA 17-1) 05:06		19:42 (WEA 17-1)
	17:02	18:01	19:51	28	18:36 (WEA 17-3) 20:45		21:33	42	20:12 (WEA 17-1) 21:55	31	20:13 (WEA 17-1)
28	08:18	07:20	06:15		06:05		19:04 (WEA 17-2) 05:16		19:30 (WEA 17-1) 05:07		19:41 (WEA 17-1)
	17:04	18:03	19:53	25	18:34 (WEA 17-3) 20:47		21:34	42	20:12 (WEA 17-1) 21:55	32	20:13 (WEA 17-1)
29	08:16		07:13		06:03		19:03 (WEA 17-2) 05:15		19:30 (WEA 17-1) 05:07		19:42 (WEA 17-1)
	17:06		19:54	22	18:32 (WEA 17-3) 20:48		21:35	42	20:12 (WEA 17-1) 21:54	32	20:14 (WEA 17-1)
30	08:15		07:10		06:01		19:50 (WEA 17-1) 05:14		19:31 (WEA 17-1) 05:08		19:41 (WEA 17-1)
	17:08		19:56	16	18:29 (WEA 17-3) 20:50	3	19:53 (WEA 17-1) 21:37	41	20:12 (WEA 17-1) 21:54	33	20:14 (WEA 17-1)
31	08:13		07:08		05:59		05:13		19:31 (WEA 17-1) 05:07		
	17:10		19:58	11	19:25 (WEA 17-2) 20:50		21:38	40	20:11 (WEA 17-1) 21:53		
	Sonnenscheinstunden	256	275	366	416		487		502		
	astr.max.mögl.Beschattung			691		356		1199		1013	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 14b - Holle 7/West
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember				
1	05:08	19:41 (WEA 17-1)	05:45	19:40 (WEA 17-1)	06:36	19:07 (WEA 17-2)	07:26	17:49 (WEA 17-3)	07:21	08:14				
	21:54	34	20:15 (WEA 17-1)	21:22	42	20:22 (WEA 17-1)	20:19	24	19:31 (WEA 17-2)	19:08	32	18:21 (WEA 17-3)	17:01	16:19
2	05:09	19:42 (WEA 17-1)	05:47	19:40 (WEA 17-1)	06:38	19:06 (WEA 17-2)	07:28	17:50 (WEA 17-3)	07:23	08:15				
	21:54	34	20:16 (WEA 17-1)	21:20	41	20:21 (WEA 17-1)	20:17	25	19:31 (WEA 17-2)	19:06	30	18:20 (WEA 17-3)	16:59	16:18
3	05:10	19:41 (WEA 17-1)	05:48	19:41 (WEA 17-1)	06:40	19:05 (WEA 17-2)	07:30	17:51 (WEA 17-3)	07:25	08:17				
	21:53	34	20:15 (WEA 17-1)	21:19	40	20:21 (WEA 17-1)	20:14	26	19:31 (WEA 17-2)	19:04	27	18:18 (WEA 17-3)	16:57	16:17
4	05:11	19:41 (WEA 17-1)	05:50	19:41 (WEA 17-1)	06:41	19:04 (WEA 17-2)	07:32	17:52 (WEA 17-3)	07:27	08:18				
	21:53	35	20:16 (WEA 17-1)	21:17	39	20:20 (WEA 17-1)	20:12	26	19:30 (WEA 17-2)	19:01	24	18:16 (WEA 17-3)	16:55	16:17
5	05:11	19:41 (WEA 17-1)	05:52	19:42 (WEA 17-1)	06:43	19:04 (WEA 17-2)	07:33	17:54 (WEA 17-3)	07:29	08:19				
	21:52	36	20:17 (WEA 17-1)	21:15	37	20:19 (WEA 17-1)	20:10	26	19:30 (WEA 17-2)	18:59	20	18:14 (WEA 17-3)	16:53	16:16
6	05:12	19:41 (WEA 17-1)	05:53	19:42 (WEA 17-1)	06:45	19:04 (WEA 17-2)	07:35	17:57 (WEA 17-3)	07:31	08:21				
	21:52	36	20:17 (WEA 17-1)	21:13	36	20:18 (WEA 17-1)	20:07	26	19:30 (WEA 17-2)	18:57	13	18:10 (WEA 17-3)	16:51	16:16
7	05:13	19:40 (WEA 17-1)	05:55	19:43 (WEA 17-1)	06:46	19:04 (WEA 17-2)	07:37	17:58 (WEA 17-3)	07:32	08:22				
	21:51	37	20:17 (WEA 17-1)	21:11	34	20:17 (WEA 17-1)	20:05	25	19:29 (WEA 17-2)	18:54			16:50	16:15
8	05:14	19:40 (WEA 17-1)	05:57	19:43 (WEA 17-1)	06:48	19:04 (WEA 17-2)	07:38	17:59 (WEA 17-3)	07:34	08:23				
	21:51	37	20:17 (WEA 17-1)	21:10	33	20:16 (WEA 17-1)	20:03	24	19:28 (WEA 17-2)	18:52			16:48	16:15
9	05:15	19:40 (WEA 17-1)	05:58	19:45 (WEA 17-1)	06:50	19:04 (WEA 17-2)	07:40	17:59 (WEA 17-3)	07:36	08:24				
	21:50	38	20:18 (WEA 17-1)	21:08	30	20:15 (WEA 17-1)	20:00	23	19:27 (WEA 17-2)	18:50			16:46	16:14
10	05:16	19:40 (WEA 17-1)	06:00	19:46 (WEA 17-1)	06:51	19:05 (WEA 17-2)	07:42	17:59 (WEA 17-3)	07:38	08:26				
	21:49	39	20:19 (WEA 17-1)	21:06	27	20:13 (WEA 17-1)	19:58	21	19:26 (WEA 17-2)	18:47			16:45	16:14
11	05:17	19:40 (WEA 17-1)	06:01	19:48 (WEA 17-1)	06:53	19:07 (WEA 17-2)	07:44	17:59 (WEA 17-3)	07:40	08:27				
	21:49	39	20:19 (WEA 17-1)	21:04	23	20:11 (WEA 17-1)	19:56	17	19:24 (WEA 17-2)	18:45			16:43	16:14
12	05:18	19:40 (WEA 17-1)	06:03	19:49 (WEA 17-1)	06:55	19:08 (WEA 17-2)	07:45	17:59 (WEA 17-3)	07:42	08:28				
	21:48	39	20:19 (WEA 17-1)	21:02	20	20:09 (WEA 17-1)	19:53	13	19:21 (WEA 17-2)	18:43			16:41	16:14
13	05:19	19:39 (WEA 17-1)	06:05	19:53 (WEA 17-1)	06:56	18:10 (WEA 17-3)	07:47	17:59 (WEA 17-3)	07:43	08:29				
	21:47	41	20:20 (WEA 17-1)	21:00	13	20:06 (WEA 17-1)	19:51	11	19:17 (WEA 17-2)	18:41			16:40	16:14
14	05:20	19:39 (WEA 17-1)	06:06			06:58			18:04 (WEA 17-3)	07:49			07:45	08:30
	21:46	41	20:20 (WEA 17-1)	20:58		19:49		15	18:19 (WEA 17-3)	18:38			16:38	16:14
15	05:22	19:39 (WEA 17-1)	06:08			07:00			18:01 (WEA 17-3)	07:51			07:47	08:31
	21:45	41	20:20 (WEA 17-1)	20:56		19:46		21	18:22 (WEA 17-3)	18:36			16:37	16:14
16	05:23	19:40 (WEA 17-1)	06:10			07:01			17:59 (WEA 17-3)	07:52			07:49	08:32
	21:44	41	20:21 (WEA 17-1)	20:54		19:44		25	18:24 (WEA 17-3)	18:34			16:35	16:14
17	05:24	19:39 (WEA 17-1)	06:11			07:03			17:56 (WEA 17-3)	07:54			07:51	08:33
	21:43	43	20:22 (WEA 17-1)	20:52		19:41		28	18:24 (WEA 17-3)	18:32			16:34	16:14
18	05:25	19:39 (WEA 17-1)	06:13			07:05			17:55 (WEA 17-3)	07:56			07:52	08:33
	21:42	43	20:22 (WEA 17-1)	20:50		19:39		30	18:25 (WEA 17-3)	18:30			16:33	16:14
19	05:27	19:39 (WEA 17-1)	06:15			07:06			17:54 (WEA 17-3)	07:58			07:54	08:34
	21:41	43	20:22 (WEA 17-1)	20:48		19:37		32	18:26 (WEA 17-3)	18:27			16:31	16:14
20	05:28	19:38 (WEA 17-1)	06:16			07:08			17:52 (WEA 17-3)	08:00			07:56	08:35
	21:39	44	20:22 (WEA 17-1)	20:45		19:34		34	18:26 (WEA 17-3)	18:25			16:30	16:15
21	05:29	19:39 (WEA 17-1)	06:18			07:10			17:51 (WEA 17-3)	08:01			07:57	08:35
	21:38	44	20:23 (WEA 17-1)	20:43		19:32		35	18:26 (WEA 17-3)	18:23			16:29	16:15
22	05:31	19:39 (WEA 17-1)	06:20			07:11			17:51 (WEA 17-3)	08:03			07:59	08:36
	21:37	44	20:23 (WEA 17-1)	20:41		19:30		36	18:27 (WEA 17-3)	18:21			16:27	16:15
23	05:32	19:38 (WEA 17-1)	06:21			07:13			17:49 (WEA 17-3)	08:05			08:01	08:36
	21:36	44	20:22 (WEA 17-1)	20:39		19:27		37	18:26 (WEA 17-3)	18:19			16:26	16:16
24	05:33	19:39 (WEA 17-1)	06:23			07:15			17:49 (WEA 17-3)	08:07			08:03	08:37
	21:34	44	20:23 (WEA 17-1)	20:37		19:25		37	18:26 (WEA 17-3)	18:17			16:25	16:17
25	05:35	19:39 (WEA 17-1)	06:25			07:16			17:49 (WEA 17-3)	08:09			08:04	08:37
	21:33	44	20:23 (WEA 17-1)	20:35		19:22		37	18:26 (WEA 17-3)	18:15			16:24	16:17
26	05:36	19:38 (WEA 17-1)	06:26			07:18			17:48 (WEA 17-3)	08:10			08:06	08:38
	21:31	44	20:22 (WEA 17-1)	20:32		19:20		37	18:25 (WEA 17-3)	18:13			16:23	16:18
27	05:38	19:39 (WEA 17-1)	06:28			07:20			17:48 (WEA 17-3)	08:12			08:07	08:38
	21:30	44	20:23 (WEA 17-1)	20:30	7	19:24 (WEA 17-2)	19:18	37	18:25 (WEA 17-3)	18:11			16:22	16:19
28	05:39	19:39 (WEA 17-1)	06:30			07:21			17:48 (WEA 17-3)	07:14			08:09	08:38
	21:28	43	20:22 (WEA 17-1)	20:28	14	19:27 (WEA 17-2)	19:15	36	18:24 (WEA 17-3)	17:09			16:21	16:19
29	05:41	19:38 (WEA 17-1)	06:31			07:23			17:48 (WEA 17-3)	07:16			08:11	08:38
	21:27	44	20:22 (WEA 17-1)	20:26	17	19:28 (WEA 17-2)	19:13	35	18:23 (WEA 17-3)	17:07			16:20	16:20
30	05:42	19:39 (WEA 17-1)	06:33			07:25			17:49 (WEA 17-3)	07:18			08:12	08:38
	21:25	43	20:22 (WEA 17-1)	20:23	20	19:29 (WEA 17-2)	19:11	33	18:22 (WEA 17-3)	17:05			16:19	16:21
31	05:44	19:39 (WEA 17-1)	06:35			07:26			17:49 (WEA 17-3)	07:20			08:13	08:39
	21:24	42	20:21 (WEA 17-1)	20:21	22	19:30 (WEA 17-2)			17:03				16:18	16:22
	Sonnenscheinstunden	505	456			382			332				265	241
	astr.max.mögl.Beschattung	1255	495			832			146					

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)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 15a - Holle 5/Süd

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	18:45 (WEA 17-1) 05:59	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	18:43 (WEA 17-1) 05:57	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	18:41 (WEA 17-1) 05:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	18:39 (WEA 17-1) 05:53	05:10 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	18:38 (WEA 17-1) 05:52	05:09 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	18:37 (WEA 17-1) 05:50	05:08 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	18:36 (WEA 17-1) 05:48	05:08 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	18:35 (WEA 17-1) 05:46	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	18:35 (WEA 17-1) 05:44	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	18:35 (WEA 17-1) 05:42	05:06 21:48
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	18:33 (WEA 17-1) 05:41	05:06 21:49
12	08:35 16:37	07:52 17:32	06:52 18:24	06:40 20:19	18:33 (WEA 17-1) 05:39	05:05 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	18:33 (WEA 17-1) 05:37	05:05 21:50
14	08:33 16:40	07:49 17:36	16:41 (WEA 17-3) 06:48	17:49 (WEA 17-2) 06:36	18:33 (WEA 17-1) 05:36	05:05 21:51
15	08:32 16:42	07:47 17:38	16:39 (WEA 17-3) 06:45	17:45 (WEA 17-2) 06:33	18:34 (WEA 17-1) 05:34	05:05 21:52
16	08:31 16:43	07:45 17:40	16:37 (WEA 17-3) 06:43	17:44 (WEA 17-2) 06:31	18:34 (WEA 17-1) 05:33	05:04 21:52
17	08:31 16:45	07:43 17:42	16:35 (WEA 17-3) 06:41	17:42 (WEA 17-2) 06:29	18:33 (WEA 17-1) 05:31	05:04 21:53
18	08:30 16:47	07:41 17:44	16:33 (WEA 17-3) 06:38	17:40 (WEA 17-2) 06:27	18:33 (WEA 17-1) 05:29	05:04 21:53
19	08:29 16:48	07:39 17:46	16:32 (WEA 17-3) 06:36	17:40 (WEA 17-2) 06:24	18:34 (WEA 17-1) 05:29	05:04 21:53
20	08:28 16:50	07:37 17:48	16:32 (WEA 17-3) 06:34	17:40 (WEA 17-2) 06:22	18:36 (WEA 17-1) 05:27	05:04 21:54
21	08:26 16:52	07:35 17:49	16:31 (WEA 17-3) 06:31	17:38 (WEA 17-2) 06:20	18:36 (WEA 17-1) 05:25	05:04 21:54
22	08:25 16:53	07:32 17:51	16:31 (WEA 17-3) 06:29	17:39 (WEA 17-2) 06:18	18:38 (WEA 17-1) 05:24	05:05 21:54
23	08:24 16:55	07:30 17:53	16:30 (WEA 17-3) 06:27	17:39 (WEA 17-2) 06:16	18:39 (WEA 17-1) 05:22	05:05 21:55
24	08:23 16:57	07:28 17:55	16:29 (WEA 17-3) 06:24	17:38 (WEA 17-2) 06:14	18:40 (WEA 17-1) 05:21	05:05 21:55
25	08:22 16:59	07:26 17:57	16:29 (WEA 17-3) 07:22	18:39 (WEA 17-2) 06:12	18:42 (WEA 17-1) 05:20	05:05 21:55
26	08:20 17:01	07:24 17:59	16:30 (WEA 17-3) 07:20	18:39 (WEA 17-2) 06:10	19:03 (WEA 17-1) 21:30	05:19 05:06
27	08:19 17:02	07:22 18:01	16:30 (WEA 17-3) 07:17	18:40 (WEA 17-2) 06:07	18:51 (WEA 17-1) 05:18	05:06 21:55
28	08:18 17:04	07:20 18:03	16:30 (WEA 17-3) 07:15	18:42 (WEA 17-2) 06:05	18:54 (WEA 17-1) 21:33	05:18 21:55
29	08:16 17:06		17:01 (WEA 17-3) 07:13	18:44 (WEA 17-2) 06:03		05:16 21:54
30	08:15 17:08			18:53 (WEA 17-2) 20:48		05:15 21:54
31	08:13 17:10			18:51 (WEA 17-1) 06:01		05:14 21:54
				19:06 (WEA 17-1) 20:50		21:37 21:54
				18:48 (WEA 17-1) 19:58		05:13 21:38
				19:10 (WEA 17-1) 416		21:38 502
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung		423	519	925		

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 15a - Holle 5/Süd

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	18:33 (WEA 17-1) 19:16 (WEA 17-1)	07:26 19:08	07:21 17:01
2	05:09 21:54	05:47 21:20	06:38 20:17	43 18:32 (WEA 17-1) 43 19:15 (WEA 17-1)	07:28 19:06	07:23 16:59
3	05:10 21:53	05:48 21:19	06:40 20:14	43 18:32 (WEA 17-1) 43 19:15 (WEA 17-1)	07:30 19:04	07:25 16:57
4	05:11 21:53	05:50 21:17	06:41 20:12	41 18:32 (WEA 17-1) 41 19:13 (WEA 17-1)	07:32 19:01	07:27 16:55
5	05:11 21:52	05:52 21:15	06:43 20:10	41 18:32 (WEA 17-1) 41 19:13 (WEA 17-1)	07:33 18:59	07:29 16:53
6	05:12 21:52	05:53 21:13	06:45 20:07	40 18:33 (WEA 17-1) 40 19:13 (WEA 17-1)	07:35 18:57	07:31 16:51
7	05:13 21:51	05:55 21:11	06:46 20:05	39 18:32 (WEA 17-1) 39 19:11 (WEA 17-1)	07:37 18:54	17:18 (WEA 17-3) 07:32
8	05:14 21:51	05:56 21:10	06:48 20:03	37 18:33 (WEA 17-1) 37 19:10 (WEA 17-1)	07:38 18:52	5 17:23 (WEA 17-3) 17:13 (WEA 17-3)
9	05:15 21:50	05:58 21:08	06:50 20:00	35 18:33 (WEA 17-1) 35 19:08 (WEA 17-1)	07:40 18:50	15 17:28 (WEA 17-3) 17:10 (WEA 17-3)
10	05:16 21:49	06:00 21:06	06:51 19:58	33 18:34 (WEA 17-1) 33 19:07 (WEA 17-1)	07:42 18:47	20 17:30 (WEA 17-3) 17:08 (WEA 17-3)
11	05:17 21:49	06:01 21:04	06:53 19:56	33 18:36 (WEA 17-1) 30 19:06 (WEA 17-1)	07:44 18:45	24 17:32 (WEA 17-3) 17:06 (WEA 17-3)
12	05:18 21:48	06:03 21:02	06:55 19:53	30 18:37 (WEA 17-1) 26 19:03 (WEA 17-1)	07:45 18:43	26 17:32 (WEA 17-3) 17:05 (WEA 17-3)
13	05:19 21:47	06:05 21:00	06:56 19:51	22 18:39 (WEA 17-1) 22 19:01 (WEA 17-1)	07:47 18:41	28 17:33 (WEA 17-3) 17:04 (WEA 17-3)
14	05:20 21:46	06:06 20:58	06:58 19:49	16 18:41 (WEA 17-1) 16 18:57 (WEA 17-1)	07:49 18:38	30 17:34 (WEA 17-3) 17:03 (WEA 17-3)
15	05:22 21:45	06:08 20:56	07:00 19:46	16 18:35 (WEA 17-2) 10 18:50 (WEA 17-1)	07:51 18:36	31 17:34 (WEA 17-3) 17:02 (WEA 17-3)
16	05:23 21:44	06:10 20:54	07:01 19:44	14 18:32 (WEA 17-2) 14 18:46 (WEA 17-2)	07:52 07:54	33 17:35 (WEA 17-3) 17:02 (WEA 17-3)
17	05:24 21:43	06:11 20:52	8 18:55 (WEA 17-1) 19:03 (WEA 17-1)	07:03 19:41	18 18:29 (WEA 17-2) 18 18:47 (WEA 17-2)	07:51 17:02 (WEA 17-3)
18	05:25 21:42	06:13 20:50	16 18:51 (WEA 17-1) 19:07 (WEA 17-1)	07:05 19:39	18 18:28 (WEA 17-2) 20 18:48 (WEA 17-2)	33 17:35 (WEA 17-3) 17:01 (WEA 17-3)
19	05:27 21:41	06:15 20:48	22 18:47 (WEA 17-1) 19:09 (WEA 17-1)	07:06 19:37	22 18:27 (WEA 17-2) 22 18:49 (WEA 17-2)	33 17:34 (WEA 17-3) 17:01 (WEA 17-3)
20	05:28 21:39	06:16 20:45	25 18:46 (WEA 17-1) 19:11 (WEA 17-1)	07:08 19:34	23 18:25 (WEA 17-2) 23 18:48 (WEA 17-2)	33 17:34 (WEA 17-3) 17:01 (WEA 17-3)
21	05:29 21:38	06:18 20:43	29 18:43 (WEA 17-1) 19:12 (WEA 17-1)	07:10 19:32	25 18:24 (WEA 17-2) 25 18:49 (WEA 17-2)	33 17:34 (WEA 17-3) 17:01 (WEA 17-3)
22	05:31 21:37	06:20 20:41	31 18:42 (WEA 17-1) 19:13 (WEA 17-1)	07:11 19:30	25 18:24 (WEA 17-2) 25 18:49 (WEA 17-2)	32 17:33 (WEA 17-3) 17:01 (WEA 17-3)
23	05:32 21:36	06:21 20:39	34 18:40 (WEA 17-1) 19:14 (WEA 17-1)	07:13 19:27	25 18:23 (WEA 17-2) 25 18:48 (WEA 17-2)	30 17:33 (WEA 17-3) 17:02 (WEA 17-3)
24	05:33 21:34	06:23 20:37	36 18:39 (WEA 17-1) 19:15 (WEA 17-1)	07:15 19:25	28 18:23 (WEA 17-2) 28 18:48 (WEA 17-2)	30 17:32 (WEA 17-3) 17:03 (WEA 17-3)
25	05:35 21:33	06:25 20:35	38 18:38 (WEA 17-1) 19:16 (WEA 17-1)	07:16 19:22	26 18:23 (WEA 17-2) 26 18:48 (WEA 17-2)	26 17:31 (WEA 17-3) 17:04 (WEA 17-3)
26	05:36 21:31	06:26 20:32	38 18:37 (WEA 17-1) 19:15 (WEA 17-1)	07:18 19:20	24 18:23 (WEA 17-2) 24 18:46 (WEA 17-2)	26 17:30 (WEA 17-3) 17:05 (WEA 17-3)
27	05:38 21:30	06:28 20:30	40 18:36 (WEA 17-1) 19:16 (WEA 17-1)	07:20 19:18	21 18:24 (WEA 17-2) 21 18:45 (WEA 17-2)	24 17:29 (WEA 17-3) 17:07 (WEA 17-3)
28	05:39 21:28	06:30 20:28	41 18:35 (WEA 17-1) 19:16 (WEA 17-1)	07:21 19:15	19 18:25 (WEA 17-2) 19 18:44 (WEA 17-2)	20 17:27 (WEA 17-3) 16:09 (WEA 17-3)
29	05:41 21:27	06:31 20:26	42 18:34 (WEA 17-1) 19:16 (WEA 17-1)	07:23 19:13	16 18:25 (WEA 17-2) 16 18:41 (WEA 17-2)	16 16:25 (WEA 17-3) 16:12 (WEA 17-3)
30	05:42 21:25	06:33 20:23	42 18:33 (WEA 17-1) 19:15 (WEA 17-1)	07:25 19:11	11 18:28 (WEA 17-2) 11 18:39 (WEA 17-2)	10 16:22 (WEA 17-3) 16:20
31	05:44 21:24	06:35 20:21	43 18:33 (WEA 17-1) 19:16 (WEA 17-1)	07:26 19:11	11 18:39 (WEA 17-2) 17:05	16:21 16:22
Sonnenscheinstunden	505	456	382	332	595	265
astr.max.mögl.Beschattung		485	811			241

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 15b - Holle 5/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	20:03 20:01	05:57 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	05:53 20:57	05:10 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:44
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	05:50 21:00	05:08 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:42 21:07	05:06 21:48
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:35 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50
13	08:34 16:39	07:51 17:34	16:43 (WEA 17-3) 16:49 (WEA 17-3)	06:50 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	16:39 (WEA 17-3) 16:53 (WEA 17-3)	06:48 18:28	05:36 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	16:36 (WEA 17-3) 16:56 (WEA 17-3)	06:45 18:30	05:34 21:15	05:05 21:52
16	08:31 16:43	07:45 17:40	16:35 (WEA 17-3) 16:58 (WEA 17-3)	06:43 18:32	05:33 21:17	05:04 21:52
17	08:31 16:45	07:43 17:42	16:33 (WEA 17-3) 16:59 (WEA 17-3)	06:41 18:33	05:31 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	16:31 (WEA 17-3) 16:59 (WEA 17-3)	06:38 18:35	05:29 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	16:31 (WEA 17-3) 17:00 (WEA 17-3)	06:36 18:37	05:28 21:21	05:04 21:53
20	08:28 16:50	07:37 17:48	16:30 (WEA 17-3) 17:01 (WEA 17-3)	06:34 18:39	05:27 21:23	05:04 21:54
21	08:26 16:52	07:35 17:49	16:30 (WEA 17-3) 17:02 (WEA 17-3)	06:31 18:40	05:25 21:24	05:04 21:54
22	08:25 16:53	07:32 17:51	16:29 (WEA 17-3) 17:02 (WEA 17-3)	06:29 18:42	05:24 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	16:29 (WEA 17-3) 17:02 (WEA 17-3)	06:27 18:44	05:22 21:27	05:05 21:55
24	08:23 16:57	07:28 17:55	16:28 (WEA 17-3) 17:02 (WEA 17-3)	06:24 18:46	05:21 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	16:28 (WEA 17-3) 17:02 (WEA 17-3)	07:22 19:47	05:20 21:30	05:05 21:55
26	08:20 17:01	07:24 17:59	16:29 (WEA 17-3) 17:02 (WEA 17-3)	07:20 19:49	05:19 21:32	05:06 21:55
27	08:19 17:02	07:22 18:01	16:29 (WEA 17-3) 17:02 (WEA 17-3)	07:17 19:51	05:18 21:33	05:06 21:55
28	08:18 17:04	07:20 18:03	16:29 (WEA 17-3) 17:00 (WEA 17-3)	07:15 19:53	05:16 21:34	05:07 21:55
29	08:16 17:06		07:13 19:54	06:03 20:48	05:15 21:35	05:07 21:54
30	08:15 17:08		07:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10		07:08 19:58	06:00 20:50	05:13 21:38	
	Sonnenscheinstunden	256	275	366	416	502
	astr.max.mögl.Beschattung		440	523	929	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 16 - Holle 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:39 16:23	14:11 (WEA 17-3) 14:39 (WEA 17-3)	08:12 17:12	14:39 (WEA 17-1) 16:29 (WEA 17-2)	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:39 16:24	14:12 (WEA 17-3) 14:39 (WEA 17-3)	08:10 17:13	14:40 (WEA 17-1) 16:31 (WEA 17-2)	07:15 18:06	07:03 20:01	05:57 20:54	05:12 21:40
3	08:38 16:25	14:13 (WEA 17-3) 14:40 (WEA 17-3)	08:08 17:15	14:39 (WEA 17-1) 16:31 (WEA 17-2)	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41
4	08:38 16:27	14:14 (WEA 17-3) 14:58 (WEA 17-1)	08:07 17:17	14:39 (WEA 17-1) 16:32 (WEA 17-2)	07:11 18:10	06:59 20:05	05:54 20:57	05:10 21:43
5	08:38 16:28	14:15 (WEA 17-3) 15:02 (WEA 17-1)	08:05 17:19	14:40 (WEA 17-1) 16:32 (WEA 17-2)	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:44
6	08:38 16:29	14:15 (WEA 17-3) 15:04 (WEA 17-1)	08:03 17:21	14:41 (WEA 17-1) 16:33 (WEA 17-2)	07:06 18:14	06:54 20:08	05:50 21:00	05:08 21:45
7	08:37 16:30	14:17 (WEA 17-3) 15:07 (WEA 17-1)	08:02 17:23	14:41 (WEA 17-1) 16:33 (WEA 17-2)	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:46
8	08:37 16:32	14:17 (WEA 17-3) 15:08 (WEA 17-1)	08:00 17:25	14:41 (WEA 17-1) 16:33 (WEA 17-2)	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46
9	08:36 16:33	14:18 (WEA 17-3) 15:10 (WEA 17-1)	07:58 17:27	14:42 (WEA 17-1) 16:33 (WEA 17-2)	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47
10	08:36 16:34	14:20 (WEA 17-3) 15:12 (WEA 17-1)	07:56 17:29	14:42 (WEA 17-1) 16:33 (WEA 17-2)	06:57 18:21	06:45 20:15	05:42 21:07	05:06 21:48
11	08:35 16:36	14:21 (WEA 17-3) 15:13 (WEA 17-1)	07:54 17:31	14:43 (WEA 17-1) 16:33 (WEA 17-2)	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:35 16:37	14:23 (WEA 17-3) 15:14 (WEA 17-1)	07:52 17:32	14:44 (WEA 17-1) 16:33 (WEA 17-2)	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50
13	08:34 16:39	14:25 (WEA 17-3) 15:16 (WEA 17-1)	07:51 17:34	14:45 (WEA 17-1) 16:32 (WEA 17-2)	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	14:43 (WEA 17-1) 15:17 (WEA 17-1)	07:49 17:36	14:46 (WEA 17-1) 16:31 (WEA 17-2)	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51
15	08:32 16:42	14:43 (WEA 17-1) 15:18 (WEA 17-1)	07:47 17:38	14:47 (WEA 17-1) 16:31 (WEA 17-2)	06:45 18:30	06:33 20:24	05:34 21:15	05:05 21:52
16	08:31 16:43	14:42 (WEA 17-1) 15:19 (WEA 17-1)	07:45 17:40	14:48 (WEA 17-1) 16:29 (WEA 17-2)	06:43 18:32	06:31 20:26	05:33 21:17	05:04 21:52
17	08:31 16:45	14:42 (WEA 17-1) 15:21 (WEA 17-1)	07:43 17:42	14:50 (WEA 17-1) 16:28 (WEA 17-2)	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	14:42 (WEA 17-1) 15:22 (WEA 17-1)	07:41 17:44	14:51 (WEA 17-1) 16:24 (WEA 17-2)	06:38 18:35	06:27 20:29	05:29 21:20	05:04 21:53
19	08:29 16:48	14:42 (WEA 17-1) 15:23 (WEA 17-1)	07:39 17:46	14:54 (WEA 17-1) 15:21 (WEA 17-1)	06:36 18:37	06:24 20:31	05:28 21:21	05:04 21:54
20	08:28 16:50	14:41 (WEA 17-1) 15:24 (WEA 17-1)	07:37 17:48	14:57 (WEA 17-1) 15:18 (WEA 17-1)	06:34 18:39	06:22 20:33	05:27 21:23	05:04 21:54
21	08:26 16:52	14:40 (WEA 17-1) 15:24 (WEA 17-1)	07:35 17:49	15:02 (WEA 17-1) 15:14 (WEA 17-1)	06:31 18:40	06:20 20:35	05:25 21:24	05:04 21:54
22	08:25 16:53	14:40 (WEA 17-1) 15:26 (WEA 17-1)	07:32 17:51		06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	14:41 (WEA 17-1) 15:27 (WEA 17-1)	07:30 17:53		06:27 18:44	06:16 20:38	05:22 21:27	05:05 21:55
24	08:23 16:57	14:40 (WEA 17-1) 15:27 (WEA 17-1)	07:28 17:55		06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	14:40 (WEA 17-1) 15:28 (WEA 17-1)	07:26 17:57		07:22 19:47	06:12 20:42	05:20 21:30	05:05 21:55
26	08:20 17:01	14:39 (WEA 17-1) 15:28 (WEA 17-1)	07:24 17:59		07:20 19:49	06:10 20:43	05:19 21:32	05:06 21:55
27	08:19 17:02	14:40 (WEA 17-1) 16:20 (WEA 17-2)	07:22 18:01		07:17 19:51	06:07 20:45	05:18 21:33	05:06 21:55
28	08:18 17:04	14:39 (WEA 17-1) 16:23 (WEA 17-2)	07:20 18:03		07:15 19:53	06:05 20:47	05:16 21:34	05:07 21:55
29	08:16 17:06	14:39 (WEA 17-1) 16:25 (WEA 17-2)			07:13 19:54	06:03 20:48	05:15 21:35	05:07 21:55
30	08:15 17:08	14:39 (WEA 17-1) 16:27 (WEA 17-2)			07:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10	14:39 (WEA 17-1) 16:28 (WEA 17-2)			07:08 19:58		05:13 21:38	
	Sonnenscheinstunden	256	275	366	416	487	502	
	astr.max.mögl.Beschattung	1370	1364					

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 16 - Holle 2

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	14:12 (WEA 17-1) 08:14 16:03 (WEA 17-2) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	77 14:12 (WEA 17-1) 08:15 16:03 (WEA 17-2) 16:18
3	05:10 21:53	05:48 21:19	06:40 20:14	07:30 19:04	07:25 16:57	79 14:11 (WEA 17-1) 08:17 16:03 (WEA 17-2) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	80 14:11 (WEA 17-1) 08:18 16:03 (WEA 17-2) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	81 14:11 (WEA 17-1) 08:19 16:03 (WEA 17-2) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:51	81 14:10 (WEA 17-1) 08:21 16:03 (WEA 17-2) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	81 14:10 (WEA 17-1) 08:22 16:03 (WEA 17-2) 16:15
8	05:14 21:51	05:56 21:10	06:48 20:03	07:38 18:52	07:34 16:48	80 14:10 (WEA 17-1) 08:23 16:02 (WEA 17-2) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	80 14:10 (WEA 17-1) 08:24 16:02 (WEA 17-2) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	80 14:10 (WEA 17-1) 08:26 16:01 (WEA 17-2) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	78 14:11 (WEA 17-1) 08:27 16:01 (WEA 17-2) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:42 16:41	76 14:11 (WEA 17-1) 08:28 16:01 (WEA 17-2) 16:14
13	05:19 21:47	06:05 21:00	06:57 19:51	07:47 18:41	07:43 16:40	74 14:11 (WEA 17-1) 08:29 16:00 (WEA 17-2) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	72 14:12 (WEA 17-1) 08:30 15:57 (WEA 17-2) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	67 14:12 (WEA 17-1) 08:31 15:56 (WEA 17-2) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	07:49 16:35	64 14:13 (WEA 17-1) 08:32 15:53 (WEA 17-2) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	07:51 16:34	55 14:13 (WEA 17-1) 08:33 15:02 (WEA 17-1) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	07:52 16:33	49 14:13 (WEA 17-1) 08:33 15:01 (WEA 17-1) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	48 14:14 (WEA 17-1) 08:34 15:01 (WEA 17-1) 16:14
20	05:28 21:39	06:16 20:46	07:08 19:34	08:00 18:25	07:56 16:30	47 14:15 (WEA 17-1) 08:35 15:01 (WEA 17-1) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:58 16:29	46 14:15 (WEA 17-1) 08:35 15:01 (WEA 17-1) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	46 14:16 (WEA 17-1) 08:36 15:00 (WEA 17-1) 16:15
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	44 14:17 (WEA 17-1) 08:37 15:00 (WEA 17-1) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	43 14:19 (WEA 17-1) 08:37 15:00 (WEA 17-1) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15	08:04 16:24	41 14:20 (WEA 17-1) 08:37 15:00 (WEA 17-1) 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:13	08:06 16:23	40 14:20 (WEA 17-1) 08:38 14:59 (WEA 17-1) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:07 16:22	39 14:21 (WEA 17-1) 08:38 14:58 (WEA 17-1) 16:18
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	08:09 16:21	37 14:23 (WEA 17-1) 08:38 14:58 (WEA 17-1) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	08:11 16:20	35 14:23 (WEA 17-1) 08:38 14:57 (WEA 17-1) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	08:12 16:19	34 14:07 (WEA 17-3) 08:39 14:57 (WEA 17-1) 16:21
31	05:44 21:24	06:35 20:21		07:20 17:03	08:13 16:02 (WEA 17-2)	41 14:07 (WEA 17-3) 08:39 14:57 (WEA 17-1) 16:21
	Sonnenscheinstunden 505	456	382	332	265	241
	astr.max.mögl.Beschattung			517	1796	1004

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 17a - Neuenstadt 25/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:39	11:17 (WEA 17-3)	08:12	09:52 (WEA 17-1)	07:17	07:06	05:59	05:12
	16:23	55 13:44 (WEA 17-2)	17:12	51 10:43 (WEA 17-1)	18:04	20:00	20:52	21:39
2	08:39	11:21 (WEA 17-3)	08:10	09:51 (WEA 17-1)	07:15	07:03	05:57	05:12
	16:24	49 13:45 (WEA 17-2)	17:13	52 10:43 (WEA 17-1)	18:06	20:01	20:54	21:40
3	08:38	12:58 (WEA 17-2)	08:08	09:51 (WEA 17-1)	07:13	07:01	05:55	05:11
	16:25	48 13:46 (WEA 17-2)	17:15	52 10:43 (WEA 17-1)	18:08	20:03	20:55	21:41
4	08:38	12:58 (WEA 17-2)	08:07	09:51 (WEA 17-1)	07:11	06:59	05:54	05:10
	16:27	47 13:45 (WEA 17-2)	17:17	52 10:43 (WEA 17-1)	18:10	20:05	20:57	21:43
5	08:38	12:59 (WEA 17-2)	08:05	09:51 (WEA 17-1)	07:08	06:56	05:52	05:09
	16:28	47 13:46 (WEA 17-2)	17:19	51 10:42 (WEA 17-1)	18:12	20:07	20:59	21:44
6	08:38	10:05 (WEA 17-1)	08:03	09:52 (WEA 17-1)	07:06	06:54	05:50	05:08
	16:29	54 13:46 (WEA 17-2)	17:21	51 10:43 (WEA 17-1)	18:14	20:08	21:00	21:45
7	08:37	10:03 (WEA 17-1)	08:02	09:52 (WEA 17-1)	07:04	06:52	05:48	05:08
	16:30	60 13:47 (WEA 17-2)	17:23	51 10:43 (WEA 17-1)	18:15	20:10	21:02	21:46
8	08:37	10:01 (WEA 17-1)	08:00	09:53 (WEA 17-1)	07:02	06:49	05:46	05:07
	16:32	63 13:46 (WEA 17-2)	17:25	49 10:42 (WEA 17-1)	18:17	20:12	21:04	21:46
9	08:36	10:01 (WEA 17-1)	07:58	09:53 (WEA 17-1)	06:59	06:47	05:44	05:07
	16:33	65 13:47 (WEA 17-2)	17:27	49 10:42 (WEA 17-1)	18:19	20:14	21:05	21:47
10	08:36	09:59 (WEA 17-1)	07:56	09:53 (WEA 17-1)	06:57	06:45	05:43	05:06
	16:34	68 13:47 (WEA 17-2)	17:29	49 10:42 (WEA 17-1)	18:21	20:15	21:07	21:48
11	08:35	09:58 (WEA 17-1)	07:54	09:54 (WEA 17-1)	06:55	06:42	05:41	05:06
	16:36	70 13:47 (WEA 17-2)	17:31	47 10:41 (WEA 17-1)	18:23	20:17	21:09	21:49
12	08:35	09:57 (WEA 17-1)	07:53	09:55 (WEA 17-1)	06:52	06:40	05:39	05:05
	16:37	71 13:47 (WEA 17-2)	17:32	45 10:40 (WEA 17-1)	18:24	20:19	21:10	21:50
13	08:34	09:57 (WEA 17-1)	07:51	09:55 (WEA 17-1)	06:50	06:38	05:37	05:05
	16:39	72 13:47 (WEA 17-2)	17:34	44 10:39 (WEA 17-1)	18:26	20:21	21:12	21:50
14	08:33	09:56 (WEA 17-1)	07:49	09:56 (WEA 17-1)	06:48	06:36	05:36	05:05
	16:40	74 13:47 (WEA 17-2)	17:36	42 10:38 (WEA 17-1)	18:28	20:22	21:14	21:51
15	08:32	09:55 (WEA 17-1)	07:47	09:57 (WEA 17-1)	06:46	06:33	05:34	05:05
	16:42	75 13:47 (WEA 17-2)	17:38	40 10:37 (WEA 17-1)	18:30	20:24	21:15	21:52
16	08:32	09:55 (WEA 17-1)	07:45	09:58 (WEA 17-1)	06:43	06:31	05:33	05:04
	16:43	76 13:47 (WEA 17-2)	17:40	38 10:36 (WEA 17-1)	18:32	20:26	21:17	21:52
17	08:31	09:54 (WEA 17-1)	07:43	10:00 (WEA 17-1)	06:41	06:29	05:31	05:04
	16:45	76 13:46 (WEA 17-2)	17:42	34 10:34 (WEA 17-1)	18:33	20:28	21:18	21:53
18	08:30	09:54 (WEA 17-1)	07:41	10:01 (WEA 17-1)	06:39	06:27	05:29	05:04
	16:47	76 13:46 (WEA 17-2)	17:44	31 10:32 (WEA 17-1)	18:35	20:29	21:20	21:53
19	08:29	09:54 (WEA 17-1)	07:39	10:03 (WEA 17-1)	06:36	06:25	05:28	05:04
	16:48	76 13:46 (WEA 17-2)	17:46	26 10:29 (WEA 17-1)	18:37	20:31	21:21	21:54
20	08:28	09:54 (WEA 17-1)	07:37	10:06 (WEA 17-1)	06:34	06:22	05:27	05:04
	16:50	76 13:46 (WEA 17-2)	17:48	20 10:26 (WEA 17-1)	18:39	20:33	21:23	21:54
21	08:26	09:53 (WEA 17-1)	07:35	10:10 (WEA 17-1)	06:31	06:20	05:25	05:04
	16:52	74 13:44 (WEA 17-2)	17:50	12 10:22 (WEA 17-1)	18:40	20:35	21:24	21:54
22	08:25	09:53 (WEA 17-1)	07:33		06:29	06:18	05:24	05:05
	16:53	73 13:44 (WEA 17-2)	17:51		18:42	20:36	21:26	21:54
23	08:24	09:53 (WEA 17-1)	07:30		06:27	06:16	05:22	05:05
	16:55	72 13:43 (WEA 17-2)	17:53		18:44	20:38	21:27	21:55
24	08:23	09:52 (WEA 17-1)	07:28		06:24	06:14	05:21	05:05
	16:57	70 13:41 (WEA 17-2)	17:55		18:46	20:40	21:29	21:55
25	08:22	09:52 (WEA 17-1)	07:26		07:22	06:12	05:20	05:05
	16:59	66 13:39 (WEA 17-2)	17:57		19:47	20:42	21:30	21:55
26	08:20	09:51 (WEA 17-1)	07:24		07:20	06:10	05:19	05:06
	17:01	61 13:36 (WEA 17-2)	17:59		19:49	20:43	21:32	21:55
27	08:19	09:52 (WEA 17-1)	07:22		07:17	06:07	05:18	05:06
	17:02	48 10:40 (WEA 17-1)	18:01		19:51	20:45	21:33	21:55
28	08:18	09:51 (WEA 17-1)	07:20		07:15	06:05	05:16	05:07
	17:04	49 10:40 (WEA 17-1)	18:03		19:53	20:47	21:34	21:55
29	08:16	09:52 (WEA 17-1)			07:13	06:03	05:15	05:07
	17:06	50 10:42 (WEA 17-1)			19:54	20:49	21:36	21:55
30	08:15	09:51 (WEA 17-1)			07:10	06:01	05:14	05:08
	17:08	51 10:42 (WEA 17-1)			19:56	20:50	21:37	21:54
31	08:13	09:51 (WEA 17-1)			07:08		05:13	
	17:10	51 10:42 (WEA 17-1)			19:58		21:38	
Sonnenscheinstunden	256	275		366	416	487	502	
astr.max.mögl.Beschattung	1963	886						

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 17a - Neuenstadt 25/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	09:23 (WEA 17-1) 08:14 10:11 (WEA 17-1) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	48 09:23 (WEA 17-1) 08:15 10:11 (WEA 17-1) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:30 19:04	07:25 16:57	48 09:23 (WEA 17-1) 08:17 10:12 (WEA 17-1) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	49 09:22 (WEA 17-1) 08:18 10:12 (WEA 17-1) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	50 09:22 (WEA 17-1) 08:19 10:13 (WEA 17-1) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:52	51 09:22 (WEA 17-1) 08:21 10:13 (WEA 17-1) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	51 09:22 (WEA 17-1) 08:22 10:13 (WEA 17-1) 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:39 18:52	07:34 16:48	51 09:22 (WEA 17-1) 08:23 10:13 (WEA 17-1) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	51 09:22 (WEA 17-1) 08:25 10:13 (WEA 17-1) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	51 09:22 (WEA 17-1) 08:26 10:13 (WEA 17-1) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	52 09:22 (WEA 17-1) 08:27 10:14 (WEA 17-1) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:42 16:41	51 09:23 (WEA 17-1) 08:28 10:14 (WEA 17-1) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	50 09:23 (WEA 17-1) 08:29 10:13 (WEA 17-1) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	49 09:24 (WEA 17-1) 08:30 10:13 (WEA 17-1) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	49 09:24 (WEA 17-1) 08:31 10:13 (WEA 17-1) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:53 18:34	07:49 16:35	48 09:25 (WEA 17-1) 08:32 10:13 (WEA 17-1) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	07:51 16:34	61 09:25 (WEA 17-1) 08:33 13:10 (WEA 17-2) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	07:52 16:33	66 09:26 (WEA 17-1) 08:33 13:13 (WEA 17-2) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	70 09:26 (WEA 17-1) 08:34 13:15 (WEA 17-2) 16:14
20	05:28 21:39	06:16 20:46	07:08 19:34	08:00 18:25	07:56 16:30	72 09:27 (WEA 17-1) 08:35 13:17 (WEA 17-2) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:58 16:29	73 09:28 (WEA 17-1) 08:35 13:19 (WEA 17-2) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	74 09:29 (WEA 17-1) 08:36 13:20 (WEA 17-2) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	76 09:30 (WEA 17-1) 08:37 13:22 (WEA 17-2) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	76 09:31 (WEA 17-1) 08:37 13:23 (WEA 17-2) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:09 18:15	08:04 16:24	76 09:32 (WEA 17-1) 08:37 13:24 (WEA 17-2) 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:10 18:13	08:06 16:23	76 09:32 (WEA 17-1) 08:38 13:24 (WEA 17-2) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:08 16:22	76 09:34 (WEA 17-1) 08:38 13:26 (WEA 17-2) 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	08:09 16:21	76 09:35 (WEA 17-1) 08:38 13:27 (WEA 17-2) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	08:11 16:20	74 09:37 (WEA 17-1) 08:38 13:28 (WEA 17-2) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	08:12 16:19	72 09:38 (WEA 17-1) 08:39 13:28 (WEA 17-2) 16:21
31	05:44 21:24	06:35 20:21		07:20 17:03	08:12 16:18	72 09:38 (WEA 17-1) 08:39 13:28 (WEA 17-2) 16:21
	Sonnenscheinstunden 505	456	382	332	265	1818
	astr.max.mögl.Beschattung			343		1901

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

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

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 17b - Neuenstadt 25/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

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

	Januar	Februar	März	April	Mai	Juni		
1	08:39	11:14 (WEA 17-3)	08:12	09:50 (WEA 17-1)	07:17	07:06	05:59	05:12
	16:23	58 13:42 (WEA 17-2)	17:12	50 10:40 (WEA 17-1)	18:04	20:00	20:52	21:39
2	08:39	11:16 (WEA 17-3)	08:10	09:49 (WEA 17-1)	07:15	07:03	05:57	05:12
	16:24	55 13:43 (WEA 17-2)	17:13	51 10:40 (WEA 17-1)	18:06	20:01	20:54	21:40
3	08:38	12:55 (WEA 17-2)	08:08	09:49 (WEA 17-1)	07:13	07:01	05:55	05:11
	16:25	49 13:44 (WEA 17-2)	17:15	51 10:40 (WEA 17-1)	18:08	20:03	20:55	21:41
4	08:38	12:55 (WEA 17-2)	08:07	09:49 (WEA 17-1)	07:11	06:59	05:54	05:10
	16:27	48 13:43 (WEA 17-2)	17:17	51 10:40 (WEA 17-1)	18:10	20:05	20:57	21:43
5	08:38	12:56 (WEA 17-2)	08:05	09:49 (WEA 17-1)	07:08	06:56	05:52	05:09
	16:28	48 13:44 (WEA 17-2)	17:19	51 10:40 (WEA 17-1)	18:12	20:07	20:59	21:44
6	08:38	12:56 (WEA 17-2)	08:03	09:50 (WEA 17-1)	07:06	06:54	05:50	05:08
	16:29	48 13:44 (WEA 17-2)	17:21	51 10:41 (WEA 17-1)	18:14	20:08	21:00	21:45
7	08:37	12:58 (WEA 17-2)	08:02	09:50 (WEA 17-1)	07:04	06:52	05:48	05:08
	16:30	47 13:45 (WEA 17-2)	17:23	51 10:41 (WEA 17-1)	18:15	20:10	21:02	21:46
8	08:37	10:02 (WEA 17-1)	08:00	09:50 (WEA 17-1)	07:02	06:49	05:46	05:07
	16:32	56 13:44 (WEA 17-2)	17:25	50 10:40 (WEA 17-1)	18:17	20:12	21:04	21:46
9	08:36	10:01 (WEA 17-1)	07:58	09:51 (WEA 17-1)	06:59	06:47	05:44	05:07
	16:33	60 13:45 (WEA 17-2)	17:27	49 10:40 (WEA 17-1)	18:19	20:14	21:05	21:47
10	08:36	09:59 (WEA 17-1)	07:56	09:51 (WEA 17-1)	06:57	06:45	05:43	05:06
	16:34	64 13:45 (WEA 17-2)	17:29	48 10:39 (WEA 17-1)	18:21	20:15	21:07	21:48
11	08:35	09:58 (WEA 17-1)	07:54	09:52 (WEA 17-1)	06:55	06:42	05:41	05:06
	16:36	66 13:45 (WEA 17-2)	17:31	47 10:39 (WEA 17-1)	18:23	20:17	21:09	21:49
12	08:35	09:57 (WEA 17-1)	07:53	09:52 (WEA 17-1)	06:52	06:40	05:39	05:05
	16:37	68 13:45 (WEA 17-2)	17:32	46 10:38 (WEA 17-1)	18:24	20:19	21:10	21:50
13	08:34	09:56 (WEA 17-1)	07:51	09:53 (WEA 17-1)	06:50	06:38	05:37	05:05
	16:39	70 13:45 (WEA 17-2)	17:34	44 10:37 (WEA 17-1)	18:26	20:21	21:12	21:50
14	08:33	09:55 (WEA 17-1)	07:49	09:54 (WEA 17-1)	06:48	06:36	05:36	05:05
	16:40	71 13:45 (WEA 17-2)	17:36	43 10:37 (WEA 17-1)	18:28	20:22	21:14	21:51
15	08:32	09:54 (WEA 17-1)	07:47	09:55 (WEA 17-1)	06:46	06:33	05:34	05:05
	16:42	73 13:45 (WEA 17-2)	17:38	41 10:36 (WEA 17-1)	18:30	20:24	21:15	21:52
16	08:32	09:53 (WEA 17-1)	07:45	09:56 (WEA 17-1)	06:43	06:31	05:33	05:04
	16:43	74 13:45 (WEA 17-2)	17:40	38 10:34 (WEA 17-1)	18:32	20:26	21:17	21:52
17	08:31	09:53 (WEA 17-1)	07:43	09:57 (WEA 17-1)	06:41	06:29	05:31	05:04
	16:45	74 13:44 (WEA 17-2)	17:42	36 10:33 (WEA 17-1)	18:33	20:28	21:18	21:53
18	08:30	09:53 (WEA 17-1)	07:41	09:58 (WEA 17-1)	06:39	06:27	05:29	05:04
	16:47	74 13:44 (WEA 17-2)	17:44	32 10:30 (WEA 17-1)	18:35	20:29	21:20	21:53
19	08:29	09:52 (WEA 17-1)	07:39	10:00 (WEA 17-1)	06:36	06:25	05:28	05:04
	16:48	75 13:44 (WEA 17-2)	17:46	28 10:28 (WEA 17-1)	18:37	20:31	21:21	21:54
20	08:28	09:52 (WEA 17-1)	07:37	10:02 (WEA 17-1)	06:34	06:22	05:27	05:04
	16:50	75 13:44 (WEA 17-2)	17:48	24 10:26 (WEA 17-1)	18:39	20:33	21:23	21:54
21	08:26	09:51 (WEA 17-1)	07:35	10:06 (WEA 17-1)	06:31	06:20	05:25	05:04
	16:52	74 13:42 (WEA 17-2)	17:50	16 10:22 (WEA 17-1)	18:40	20:35	21:24	21:54
22	08:25	09:51 (WEA 17-1)	07:33		06:29	06:18	05:24	05:05
	16:53	73 13:42 (WEA 17-2)	17:51		18:42	20:36	21:26	21:54
23	08:24	09:51 (WEA 17-1)	07:30		06:27	06:16	05:22	05:05
	16:55	72 13:41 (WEA 17-2)	17:53		18:44	20:38	21:27	21:55
24	08:23	09:50 (WEA 17-1)	07:28		06:24	06:14	05:21	05:05
	16:57	69 13:39 (WEA 17-2)	17:55		18:46	20:40	21:29	21:55
25	08:22	09:50 (WEA 17-1)	07:26		07:22	06:12	05:20	05:05
	16:59	65 13:37 (WEA 17-2)	17:57		19:47	20:42	21:30	21:55
26	08:20	09:50 (WEA 17-1)	07:24		07:20	06:10	05:19	05:06
	17:01	59 13:34 (WEA 17-2)	17:59		19:49	20:43	21:32	21:55
27	08:19	09:50 (WEA 17-1)	07:22		07:17	06:07	05:18	05:06
	17:02	47 10:37 (WEA 17-1)	18:01		19:51	20:45	21:33	21:55
28	08:18	09:49 (WEA 17-1)	07:20		07:15	06:05	05:16	05:07
	17:04	49 10:38 (WEA 17-1)	18:03		19:53	20:47	21:34	21:55
29	08:16	09:50 (WEA 17-1)			07:13	06:03	05:15	05:07
	17:06	49 10:39 (WEA 17-1)			19:54	20:49	21:36	21:55
30	08:15	09:49 (WEA 17-1)			07:10	06:01	05:14	05:08
	17:08	50 10:39 (WEA 17-1)			19:56	20:50	21:37	21:54
31	08:13	09:49 (WEA 17-1)			07:08		05:13	
	17:10	50 10:39 (WEA 17-1)			19:58		21:38	
Sonnenscheinstunden	256		275		366	416	487	502
astr.max.mögl.Beschattung	1910		898					

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 17b - Neuenstadt 25/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	09:21 (WEA 17-1) 08:14 10:09 (WEA 17-1) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	48 09:21 (WEA 17-1) 08:15 10:09 (WEA 17-1) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:30 19:04	07:25 16:57	48 09:20 (WEA 17-1) 08:17 10:10 (WEA 17-1) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	50 09:20 (WEA 17-1) 08:18 10:10 (WEA 17-1) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	50 09:20 (WEA 17-1) 08:19 10:10 (WEA 17-1) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:52	50 09:20 (WEA 17-1) 08:21 10:10 (WEA 17-1) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	51 09:20 (WEA 17-1) 08:22 10:11 (WEA 17-1) 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:39 18:52	07:34 16:48	51 09:20 (WEA 17-1) 08:23 10:11 (WEA 17-1) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	51 09:20 (WEA 17-1) 08:25 10:11 (WEA 17-1) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	51 09:20 (WEA 17-1) 08:26 10:11 (WEA 17-1) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	51 09:20 (WEA 17-1) 08:27 10:11 (WEA 17-1) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:42 16:41	50 09:21 (WEA 17-1) 08:28 10:11 (WEA 17-1) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	50 09:21 (WEA 17-1) 08:29 10:11 (WEA 17-1) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	49 09:22 (WEA 17-1) 08:30 10:11 (WEA 17-1) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	49 09:22 (WEA 17-1) 08:31 10:11 (WEA 17-1) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:53 18:34	07:49 16:35	47 09:23 (WEA 17-1) 08:32 10:10 (WEA 17-1) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	07:51 16:34	60 09:23 (WEA 17-1) 08:33 13:08 (WEA 17-2) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	07:52 16:33	65 09:24 (WEA 17-1) 08:33 13:11 (WEA 17-2) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	69 09:24 (WEA 17-1) 08:34 13:13 (WEA 17-2) 16:14
20	05:28 21:39	06:16 20:46	07:08 19:34	08:00 18:25	07:56 16:30	72 09:25 (WEA 17-1) 08:35 13:15 (WEA 17-2) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:58 10:41 (WEA 17-1)	73 09:26 (WEA 17-1) 08:35 13:17 (WEA 17-2) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	10:35 (WEA 17-1) 07:59 10:54 (WEA 17-1) 16:27	74 09:27 (WEA 17-1) 08:36 13:18 (WEA 17-2) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19	10:32 (WEA 17-1) 08:01 10:57 (WEA 17-1) 16:26	75 09:28 (WEA 17-1) 08:37 13:20 (WEA 17-2) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	10:30 (WEA 17-1) 08:03 10:59 (WEA 17-1) 16:25	75 09:29 (WEA 17-1) 08:37 13:21 (WEA 17-2) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:09 18:15	10:28 (WEA 17-1) 08:04 11:01 (WEA 17-1) 16:24	74 09:31 (WEA 17-1) 08:37 13:22 (WEA 17-2) 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:10 18:13	10:26 (WEA 17-1) 08:06 11:03 (WEA 17-1) 16:23	74 09:31 (WEA 17-1) 08:38 13:22 (WEA 17-2) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	10:25 (WEA 17-1) 08:08 11:04 (WEA 17-1) 16:22	74 09:32 (WEA 17-1) 08:38 13:24 (WEA 17-2) 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	09:24 (WEA 17-1) 08:09 10:05 (WEA 17-1) 16:21	73 09:34 (WEA 17-1) 08:38 13:25 (WEA 17-2) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	09:23 (WEA 17-1) 08:11 10:06 (WEA 17-1) 16:20	72 09:36 (WEA 17-1) 08:38 13:26 (WEA 17-2) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	09:22 (WEA 17-1) 08:12 10:07 (WEA 17-1) 16:19	70 09:37 (WEA 17-1) 08:39 13:26 (WEA 17-2) 16:21
31	05:44 21:24	06:35 20:21		07:20 17:03	09:22 (WEA 17-1) 08:12 10:08 (WEA 17-1) 16:19	61 08:39 16:22 13:42 (WEA 17-2)
	Sonnenscheinstunden 505	456	382	332	265	192
	astr.max.mögl.Beschattung			364	1796	1902

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 18a - Neuenstadt 25A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:39 16:23	11:03 (WEA 17-3) 13:37 (WEA 17-2)	08:12 17:12	09:41 (WEA 17-1) 18:04	07:17 20:00	07:06 20:52	
2	08:39 16:24	11:05 (WEA 17-3) 13:38 (WEA 17-2)	08:10 17:13	09:41 (WEA 17-1) 18:06	07:15 20:01	05:57 20:54	
3	08:38 16:25	11:06 (WEA 17-3) 13:38 (WEA 17-2)	08:08 17:15	09:41 (WEA 17-1) 18:08	07:13 20:03	05:55 20:55	
4	08:38 16:27	11:07 (WEA 17-3) 13:38 (WEA 17-2)	08:07 17:17	09:40 (WEA 17-1) 18:10	07:11 20:05	05:54 20:57	
5	08:38 16:28	11:09 (WEA 17-3) 13:39 (WEA 17-2)	08:05 17:19	09:40 (WEA 17-1) 18:12	07:08 20:07	05:52 20:59	
6	08:38 16:29	11:11 (WEA 17-3) 13:38 (WEA 17-2)	08:03 17:21	09:41 (WEA 17-1) 18:14	07:06 20:08	05:50 21:00	
7	08:37 16:30	11:11 (WEA 17-3) 13:39 (WEA 17-2)	08:02 17:23	09:41 (WEA 17-1) 18:15	07:04 20:10	05:48 21:02	
8	08:37 16:32	11:11 (WEA 17-3) 13:39 (WEA 17-2)	08:00 17:25	09:41 (WEA 17-1) 18:17	07:02 20:12	05:46 21:04	
9	08:36 16:33	11:11 (WEA 17-3) 13:40 (WEA 17-2)	07:58 17:27	09:41 (WEA 17-1) 18:19	06:59 20:14	05:44 21:05	
10	08:36 16:34	11:11 (WEA 17-3) 13:40 (WEA 17-2)	07:56 17:29	09:41 (WEA 17-1) 18:21	06:57 20:15	05:43 21:07	
11	08:35 16:36	11:11 (WEA 17-3) 13:40 (WEA 17-2)	07:54 17:31	09:41 (WEA 17-1) 18:23	06:55 20:17	05:41 21:09	
12	08:35 16:37	11:11 (WEA 17-3) 13:40 (WEA 17-2)	07:53 17:32	09:42 (WEA 17-1) 18:24	06:52 20:19	05:39 21:10	
13	08:34 16:39	11:11 (WEA 17-3) 13:40 (WEA 17-2)	07:51 17:34	09:42 (WEA 17-1) 18:26	06:50 20:21	05:37 21:12	
14	08:33 16:40	09:56 (WEA 17-1) 13:40 (WEA 17-2)	07:49 17:36	09:43 (WEA 17-1) 18:28	06:48 20:22	05:36 21:14	
15	08:32 16:42	09:53 (WEA 17-1) 13:40 (WEA 17-2)	07:47 17:38	09:43 (WEA 17-1) 18:30	06:46 20:24	05:34 21:15	
16	08:32 16:43	09:51 (WEA 17-1) 13:40 (WEA 17-2)	07:45 17:40	09:44 (WEA 17-1) 18:32	06:43 20:26	05:33 21:17	
17	08:31 16:45	09:50 (WEA 17-1) 13:40 (WEA 17-2)	07:43 17:42	09:45 (WEA 17-1) 18:33	06:41 20:28	05:31 21:18	
18	08:30 16:47	09:49 (WEA 17-1) 13:40 (WEA 17-2)	07:41 17:44	09:45 (WEA 17-1) 18:35	06:39 20:29	05:29 21:20	
19	08:29 16:48	09:48 (WEA 17-1) 13:39 (WEA 17-2)	07:39 17:46	09:46 (WEA 17-1) 18:37	06:25 20:31	05:28 21:21	
20	08:28 16:50	09:47 (WEA 17-1) 13:39 (WEA 17-2)	07:37 17:48	09:48 (WEA 17-1) 18:39	06:22 20:33	05:27 21:23	
21	08:26 16:52	09:46 (WEA 17-1) 13:38 (WEA 17-2)	07:35 17:50	09:49 (WEA 17-1) 18:40	06:20 20:35	05:25 21:24	
22	08:25 16:53	09:45 (WEA 17-1) 13:38 (WEA 17-2)	07:33 17:51	09:51 (WEA 17-1) 18:42	06:18 20:36	05:24 21:26	
23	08:24 16:55	09:45 (WEA 17-1) 13:37 (WEA 17-2)	07:30 17:53	09:54 (WEA 17-1) 18:44	06:16 20:38	05:22 21:27	
24	08:23 16:57	09:44 (WEA 17-1) 13:35 (WEA 17-2)	07:28 17:55	09:57 (WEA 17-1) 18:46	06:14 20:40	05:21 21:29	
25	08:22 16:59	09:44 (WEA 17-1) 13:35 (WEA 17-2)	07:26 17:57	09:57 (WEA 17-1) 19:47	06:12 20:42	05:20 21:30	
26	08:20 17:01	09:43 (WEA 17-1) 13:32 (WEA 17-2)	07:24 17:59	09:57 (WEA 17-1) 19:49	06:10 20:43	05:19 21:32	
27	08:19 17:02	09:43 (WEA 17-1) 13:30 (WEA 17-2)	07:22 18:01	09:57 (WEA 17-1) 19:51	06:07 20:45	05:18 21:33	
28	08:18 17:04	09:42 (WEA 17-1) 13:26 (WEA 17-2)	07:20 18:03	09:57 (WEA 17-1) 19:53	06:05 20:47	05:16 21:34	
29	08:16 17:06	09:42 (WEA 17-1) 10:28 (WEA 17-1)	07:18 18:05	09:57 (WEA 17-1) 19:54	06:03 20:49	05:15 21:36	
30	08:15 17:08	09:41 (WEA 17-1) 10:29 (WEA 17-1)	07:16 18:07	09:57 (WEA 17-1) 19:56	06:01 20:50	05:14 21:37	
31	08:13 17:10	09:41 (WEA 17-1) 10:29 (WEA 17-1)	07:14 18:09	09:57 (WEA 17-1) 19:58	06:00 20:52	05:13 21:38	
	Sonnenscheinstunden	256	275	366	416	487	502
	astr.max.mögl.Beschattung	1832	1038				

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 18a - Neuenstadt 25A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	09:11 (WEA 17-1) 08:14 10:01 (WEA 17-1) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	09:11 (WEA 17-1) 08:15 10:01 (WEA 17-1) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:30 19:04	07:25 16:57	09:10 (WEA 17-1) 08:17 10:01 (WEA 17-1) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	09:10 (WEA 17-1) 08:18 10:01 (WEA 17-1) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	09:10 (WEA 17-1) 08:19 10:02 (WEA 17-1) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:52	09:11 (WEA 17-1) 08:21 10:02 (WEA 17-1) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	09:11 (WEA 17-1) 08:22 10:02 (WEA 17-1) 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:39 18:52	07:34 16:48	09:11 (WEA 17-1) 08:23 10:01 (WEA 17-1) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	09:11 (WEA 17-1) 08:25 10:01 (WEA 17-1) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	09:12 (WEA 17-1) 08:26 10:01 (WEA 17-1) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	09:12 (WEA 17-1) 08:27 10:01 (WEA 17-1) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:42 16:41	09:13 (WEA 17-1) 08:28 10:01 (WEA 17-1) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	09:13 (WEA 17-1) 08:29 10:00 (WEA 17-1) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	09:14 (WEA 17-1) 08:30 10:00 (WEA 17-1) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	09:15 (WEA 17-1) 08:31 12:59 (WEA 17-2) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:53 18:34	07:49 16:35	09:16 (WEA 17-1) 08:32 13:04 (WEA 17-2) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	07:51 16:34	09:17 (WEA 17-1) 08:33 13:06 (WEA 17-2) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	07:52 16:33	09:18 (WEA 17-1) 08:33 13:09 (WEA 17-2) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	09:18 (WEA 17-1) 08:34 13:09 (WEA 17-2) 16:14
20	05:28 21:39	06:16 20:46	07:08 19:34	08:00 18:25	07:56 16:30	09:19 (WEA 17-1) 08:35 13:11 (WEA 17-2) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:58 16:29	09:20 (WEA 17-1) 08:35 13:13 (WEA 17-2) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	09:22 (WEA 17-1) 08:36 13:14 (WEA 17-2) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	09:23 (WEA 17-1) 08:37 13:15 (WEA 17-2) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	09:25 (WEA 17-1) 08:37 13:16 (WEA 17-2) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:09 18:15	08:04 16:24	09:27 (WEA 17-1) 08:37 13:18 (WEA 17-2) 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:10 18:13	08:06 16:23	09:28 (WEA 17-1) 08:38 13:18 (WEA 17-2) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:08 16:22	09:30 (WEA 17-1) 08:38 13:19 (WEA 17-2) 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	08:09 16:21	09:33 (WEA 17-1) 08:38 13:20 (WEA 17-2) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	08:11 16:20	09:37 (WEA 17-1) 08:38 13:21 (WEA 17-2) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	08:12 16:19	12:35 (WEA 17-2) 08:39 13:21 (WEA 17-2) 16:21
31	05:44 21:24	06:35 20:21		07:20 17:03	08:11 16:19	
	Sonnenscheinstunden 505	456	382	332	265	241
	astr.max.mögl.Beschattung			498	1715	2057

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 18b - Neuenstadt 25/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:39 16:23	11:00 (WEA 17-3) 13:34 (WEA 17-2)	08:12 17:12	09:39 (WEA 17-1) 10:27 (WEA 17-1)	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:39 16:24	11:02 (WEA 17-3) 13:35 (WEA 17-2)	08:10 17:13	09:39 (WEA 17-1) 10:27 (WEA 17-1)	07:15 18:06	07:03 20:01	05:57 20:54	05:12 21:40
3	08:38 16:25	11:03 (WEA 17-3) 13:35 (WEA 17-2)	08:08 17:15	09:38 (WEA 17-1) 10:27 (WEA 17-1)	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41
4	08:38 16:27	11:04 (WEA 17-3) 13:35 (WEA 17-2)	08:07 17:17	09:38 (WEA 17-1) 10:27 (WEA 17-1)	07:11 18:10	06:59 20:05	05:54 20:57	05:10 21:43
5	08:38 16:28	11:06 (WEA 17-3) 13:36 (WEA 17-2)	08:05 17:19	09:38 (WEA 17-1) 10:28 (WEA 17-1)	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:44
6	08:38 16:29	11:07 (WEA 17-3) 13:35 (WEA 17-2)	08:03 17:21	09:38 (WEA 17-1) 10:29 (WEA 17-1)	07:06 18:14	06:54 20:08	05:50 21:00	05:08 21:45
7	08:37 16:30	11:10 (WEA 17-3) 13:36 (WEA 17-2)	08:02 17:23	09:38 (WEA 17-1) 10:29 (WEA 17-1)	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:46
8	08:37 16:32	12:47 (WEA 17-2) 13:36 (WEA 17-2)	08:00 17:25	09:38 (WEA 17-1) 10:29 (WEA 17-1)	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46
9	08:36 16:33	12:48 (WEA 17-2) 13:37 (WEA 17-2)	07:58 17:27	09:38 (WEA 17-1) 10:29 (WEA 17-1)	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47
10	08:36 16:34	12:49 (WEA 17-2) 13:37 (WEA 17-2)	07:56 17:29	09:38 (WEA 17-1) 10:28 (WEA 17-1)	06:57 18:21	06:45 20:15	05:43 21:07	05:06 21:48
11	08:35 16:36	12:49 (WEA 17-2) 13:37 (WEA 17-2)	07:54 17:31	09:39 (WEA 17-1) 10:28 (WEA 17-1)	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:35 16:37	12:50 (WEA 17-2) 13:37 (WEA 17-2)	07:53 17:32	09:39 (WEA 17-1) 10:28 (WEA 17-1)	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50
13	08:34 16:39	12:50 (WEA 17-2) 13:37 (WEA 17-2)	07:51 17:34	09:39 (WEA 17-1) 10:28 (WEA 17-1)	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	12:51 (WEA 17-2) 13:37 (WEA 17-2)	07:49 17:36	09:40 (WEA 17-1) 10:27 (WEA 17-1)	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51
15	08:32 16:42	12:52 (WEA 17-2) 13:37 (WEA 17-2)	07:47 17:38	09:40 (WEA 17-1) 10:26 (WEA 17-1)	06:46 18:30	06:33 20:24	05:34 21:15	05:05 21:52
16	08:32 16:43	09:52 (WEA 17-1) 13:37 (WEA 17-2)	07:45 17:40	09:41 (WEA 17-1) 10:26 (WEA 17-1)	06:43 18:32	06:31 20:26	05:33 21:17	05:04 21:52
17	08:31 16:45	09:49 (WEA 17-1) 13:37 (WEA 17-2)	07:43 17:42	09:42 (WEA 17-1) 10:25 (WEA 17-1)	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	09:48 (WEA 17-1) 13:37 (WEA 17-2)	07:41 17:44	09:42 (WEA 17-1) 10:23 (WEA 17-1)	06:39 18:35	06:27 20:29	05:29 21:20	05:04 21:53
19	08:29 16:48	09:47 (WEA 17-1) 13:36 (WEA 17-2)	07:39 17:46	09:43 (WEA 17-1) 10:22 (WEA 17-1)	06:36 18:37	06:25 20:31	05:28 21:21	05:04 21:54
20	08:28 16:50	09:46 (WEA 17-1) 13:36 (WEA 17-2)	07:37 17:48	09:44 (WEA 17-1) 10:20 (WEA 17-1)	06:34 18:39	06:22 20:33	05:27 21:23	05:04 21:54
21	08:26 16:52	09:44 (WEA 17-1) 13:35 (WEA 17-2)	07:35 17:50	09:46 (WEA 17-1) 10:19 (WEA 17-1)	06:31 18:40	06:20 20:35	05:25 21:24	05:04 21:54
22	08:25 16:53	09:44 (WEA 17-1) 13:35 (WEA 17-2)	07:33 17:51	09:48 (WEA 17-1) 10:17 (WEA 17-1)	06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	09:43 (WEA 17-1) 13:34 (WEA 17-2)	07:30 17:53	09:50 (WEA 17-1) 10:14 (WEA 17-1)	06:27 18:44	06:16 20:38	05:22 21:27	05:05 21:55
24	08:23 16:57	09:42 (WEA 17-1) 13:33 (WEA 17-2)	07:28 17:55	09:53 (WEA 17-1) 10:10 (WEA 17-1)	06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	09:42 (WEA 17-1) 13:32 (WEA 17-2)	07:26 17:57		07:22 19:47	06:12 20:42	05:20 21:30	05:05 21:55
26	08:20 17:01	09:41 (WEA 17-1) 13:29 (WEA 17-2)	07:24 17:59		07:20 19:49	06:10 20:43	05:19 21:32	05:06 21:55
27	08:19 17:02	09:41 (WEA 17-1) 13:27 (WEA 17-2)	07:22 18:01		07:17 19:51	06:07 20:45	05:18 21:33	05:06 21:55
28	08:18 17:04	09:40 (WEA 17-1) 13:23 (WEA 17-2)	07:20 18:03		07:15 19:53	06:05 20:47	05:16 21:34	05:07 21:55
29	08:16 17:06	09:40 (WEA 17-1) 10:25 (WEA 17-1)			07:13 19:54	06:03 20:49	05:15 21:36	05:07 21:55
30	08:15 17:08	09:39 (WEA 17-1) 10:25 (WEA 17-1)			07:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10	09:39 (WEA 17-1) 10:25 (WEA 17-1)			07:08 19:58		05:13 21:38	
	Sonnenscheinstunden	256			366	416	487	502
	astr.max.mögl.Beschattung	1796		1045				

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 18b - Neuenstadt 25/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	09:08 (WEA 17-1) 08:14 09:58 (WEA 17-1) 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	09:08 (WEA 17-1) 08:15 09:58 (WEA 17-1) 16:18
3	05:10 21:53	05:49 21:19	06:40 20:14	07:30 19:04	07:25 16:57	09:08 (WEA 17-1) 08:17 09:58 (WEA 17-1) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	09:08 (WEA 17-1) 08:18 09:58 (WEA 17-1) 16:17
5	05:11 21:53	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	09:08 (WEA 17-1) 08:19 09:58 (WEA 17-1) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:52	09:08 (WEA 17-1) 08:21 09:58 (WEA 17-1) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	09:08 (WEA 17-1) 08:22 09:58 (WEA 17-1) 16:15
8	05:14 21:51	05:57 21:10	06:48 20:03	07:39 18:52	07:34 16:48	09:09 (WEA 17-1) 08:23 09:58 (WEA 17-1) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	09:09 (WEA 17-1) 08:25 09:58 (WEA 17-1) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	09:09 (WEA 17-1) 08:26 09:58 (WEA 17-1) 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	09:10 (WEA 17-1) 08:27 09:57 (WEA 17-1) 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:42 16:41	09:10 (WEA 17-1) 08:28 09:57 (WEA 17-1) 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	09:11 (WEA 17-1) 08:29 09:57 (WEA 17-1) 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	09:12 (WEA 17-1) 08:30 09:56 (WEA 17-1) 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	09:13 (WEA 17-1) 08:31 12:56 (WEA 17-2) 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:53 18:34	07:49 16:35	09:14 (WEA 17-1) 08:32 13:01 (WEA 17-2) 16:14
17	05:24 21:43	06:11 20:52	07:03 19:42	07:54 18:32	07:51 16:34	09:15 (WEA 17-1) 08:33 13:03 (WEA 17-2) 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:30	07:52 16:33	09:16 (WEA 17-1) 08:33 13:06 (WEA 17-2) 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	09:16 (WEA 17-1) 08:34 13:07 (WEA 17-2) 16:14
20	05:28 21:39	06:16 20:46	07:08 19:34	08:00 18:25	07:56 16:30	09:17 (WEA 17-1) 08:35 13:08 (WEA 17-2) 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:58 16:29	09:19 (WEA 17-1) 08:35 13:10 (WEA 17-2) 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	09:20 (WEA 17-1) 08:36 13:11 (WEA 17-2) 16:16
23	05:32 21:36	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	09:22 (WEA 17-1) 08:37 13:12 (WEA 17-2) 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	09:24 (WEA 17-1) 08:37 13:13 (WEA 17-2) 16:17
25	05:35 21:33	06:25 20:35	07:16 19:23	08:09 18:15	08:04 16:24	09:26 (WEA 17-1) 08:37 13:15 (WEA 17-2) 16:17
26	05:36 21:31	06:26 20:33	07:18 19:20	08:10 18:13	08:06 16:23	09:27 (WEA 17-1) 08:38 13:15 (WEA 17-2) 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:08 16:22	09:31 (WEA 17-1) 08:38 13:16 (WEA 17-2) 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:09	08:09 16:21	09:36 (WEA 17-1) 08:38 13:17 (WEA 17-2) 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:07	08:11 16:20	09:09 (WEA 17-1) 08:11 09:57 (WEA 17-1) 16:20
30	05:42 21:25	06:33 20:24	07:25 19:11	07:18 17:05	08:12 16:19	09:09 (WEA 17-1) 08:12 09:57 (WEA 17-1) 16:19
31	05:44 21:24	06:35 20:21		07:20 17:03	08:13 16:18	09:08 (WEA 17-1) 08:13 09:58 (WEA 17-1) 16:19
	Sonnenscheinstunden 505	456	382	332	265	241
	astr.max.mögl.Beschattung			522	1649	2108

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 19 - Holle 2/Südost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:39	08:12	15:43 (WEA 17-3)	07:17	16:31 (WEA 17-1)	07:06	05:59	05:12
	16:23	17:12	26 16:09 (WEA 17-3)	18:04	49 17:20 (WEA 17-2)	20:00	20:52	21:39
2	08:39	08:10	15:44 (WEA 17-3)	07:15	16:31 (WEA 17-1)	07:03	05:57	05:11
	16:24	17:13	26 16:10 (WEA 17-3)	18:06	48 17:19 (WEA 17-2)	20:01	20:54	21:40
3	08:38	08:08	15:45 (WEA 17-3)	07:13	16:31 (WEA 17-1)	07:01	05:55	05:11
	16:25	17:15	24 16:09 (WEA 17-3)	18:08	47 17:18 (WEA 17-2)	20:03	20:55	21:41
4	08:38	08:07	15:46 (WEA 17-3)	07:11	16:31 (WEA 17-1)	06:59	05:53	05:10
	16:26	17:17	22 16:08 (WEA 17-3)	18:10	44 17:15 (WEA 17-2)	20:05	20:57	21:42
5	08:38	08:05	15:47 (WEA 17-3)	07:08	16:31 (WEA 17-1)	06:56	05:52	05:09
	16:28	17:19	20 16:07 (WEA 17-3)	18:12	41 17:12 (WEA 17-2)	20:07	20:59	21:44
6	08:38	08:03	15:49 (WEA 17-3)	07:06	16:32 (WEA 17-1)	06:54	05:50	05:08
	16:29	17:21	16 16:05 (WEA 17-3)	18:14	35 17:07 (WEA 17-1)	20:08	21:00	21:45
7	08:37	08:02	15:52 (WEA 17-3)	07:04	16:31 (WEA 17-1)	06:52	05:48	05:08
	16:30	17:23	12 16:04 (WEA 17-3)	18:15	34 17:05 (WEA 17-1)	20:10	21:02	21:45
8	08:37	08:00	15:56 (WEA 17-3)	07:02	16:32 (WEA 17-1)	06:49	05:46	05:07
	16:31	17:25	4 16:00 (WEA 17-3)	18:17	33 17:05 (WEA 17-1)	20:12	21:04	21:46
9	08:36	07:58		06:59	16:34 (WEA 17-1)	06:47	05:44	05:07
	16:33	17:27		18:19	30 17:04 (WEA 17-1)	20:14	21:05	21:47
10	08:36	07:56		06:57	16:34 (WEA 17-1)	06:45	05:42	05:06
	16:34	17:29		18:21	28 17:02 (WEA 17-1)	20:15	21:07	21:48
11	08:35	07:54		06:55	16:36 (WEA 17-1)	06:42	05:41	05:06
	16:36	17:30		18:23	24 17:00 (WEA 17-1)	20:17	21:09	21:49
12	08:35	15:49 (WEA 17-3)	07:52	06:52	16:38 (WEA 17-1)	06:40	05:39	05:05
	16:37	4 15:53 (WEA 17-3)	17:32	18:24	20 16:58 (WEA 17-1)	20:19	21:10	21:50
13	08:34	15:46 (WEA 17-3)	07:51	06:50	16:40 (WEA 17-1)	06:38	05:37	05:05
	16:39	10 15:56 (WEA 17-3)	17:34	18:26	14 16:54 (WEA 17-1)	20:21	21:12	21:50
14	08:33	15:45 (WEA 17-3)	07:49	06:48		06:36	05:36	05:05
	16:40	13 15:58 (WEA 17-3)	17:36	18:28		20:22	21:14	21:51
15	08:32	15:44 (WEA 17-3)	07:47	06:45		06:33	05:34	05:05
	16:42	16 16:00 (WEA 17-3)	17:38	18:30		20:24	21:15	21:52
16	08:31	15:43 (WEA 17-3)	07:45	06:43		06:31	05:32	05:04
	16:43	18 16:01 (WEA 17-3)	17:40	18:32		20:26	21:17	21:52
17	08:31	15:43 (WEA 17-3)	07:43	06:41		06:29	05:31	05:04
	16:45	19 16:02 (WEA 17-3)	17:42	18:33		20:28	21:18	21:53
18	08:30	15:42 (WEA 17-3)	07:41	16:46 (WEA 17-1)	06:38	06:27	05:29	05:04
	16:47	22 16:04 (WEA 17-3)	17:44	13 17:12 (WEA 17-2)	18:35	20:29	21:20	21:53
19	08:29	15:42 (WEA 17-3)	07:39	16:42 (WEA 17-1)	06:36	06:24	05:28	05:04
	16:48	23 16:05 (WEA 17-3)	17:46	28 17:16 (WEA 17-2)	18:37	20:31	21:21	21:54
20	08:28	15:42 (WEA 17-3)	07:37	16:40 (WEA 17-1)	06:34	06:22	05:27	05:04
	16:50	24 16:06 (WEA 17-3)	17:48	37 17:18 (WEA 17-1)	18:39	20:33	21:23	21:54
21	08:26	15:41 (WEA 17-3)	07:35	16:38 (WEA 17-1)	06:31	06:20	05:25	05:04
	16:52	25 16:06 (WEA 17-3)	17:49	42 17:20 (WEA 17-2)	18:40	20:35	21:24	21:54
22	08:25	15:41 (WEA 17-3)	07:32	16:37 (WEA 17-1)	06:29	06:18	05:24	05:05
	16:53	26 16:07 (WEA 17-3)	17:51	44 17:21 (WEA 17-2)	18:42	20:36	21:26	21:54
23	08:24	15:42 (WEA 17-3)	07:30	16:36 (WEA 17-1)	06:27	06:16	05:22	05:05
	16:55	26 16:08 (WEA 17-3)	17:53	46 17:22 (WEA 17-2)	18:44	20:38	21:27	21:55
24	08:23	15:41 (WEA 17-3)	07:28	16:34 (WEA 17-1)	06:24	06:14	05:21	05:05
	16:57	27 16:08 (WEA 17-3)	17:55	47 17:21 (WEA 17-2)	18:46	20:40	21:29	21:55
25	08:22	15:42 (WEA 17-3)	07:26	16:33 (WEA 17-1)	07:22	06:12	05:20	05:05
	16:59	27 16:09 (WEA 17-3)	17:57	49 17:22 (WEA 17-2)	19:47	20:42	21:30	21:55
26	08:20	15:41 (WEA 17-3)	07:24	16:33 (WEA 17-1)	07:20	06:09	05:19	05:06
	17:00	28 16:09 (WEA 17-3)	17:59	49 17:22 (WEA 17-2)	19:49	20:43	21:32	21:55
27	08:19	15:42 (WEA 17-3)	07:22	16:32 (WEA 17-1)	07:17	06:07	05:18	05:07
	17:02	28 16:10 (WEA 17-3)	18:01	50 17:22 (WEA 17-2)	19:51	20:45	21:33	21:55
28	08:18	15:42 (WEA 17-3)	07:20	16:31 (WEA 17-1)	07:15	06:05	05:16	05:07
	17:04	28 16:10 (WEA 17-3)	18:03	49 17:20 (WEA 17-2)	19:53	20:47	21:34	21:55
29	08:16	15:42 (WEA 17-3)		07:13		06:03	05:15	05:07
	17:06	27 16:09 (WEA 17-3)		19:54		20:48	21:35	21:55
30	08:15	15:43 (WEA 17-3)		07:10		06:01	05:14	05:08
	17:08	27 16:10 (WEA 17-3)		19:56		20:50	21:37	21:54
31	08:13	15:43 (WEA 17-3)		07:08			05:13	
	17:10	27 16:10 (WEA 17-3)		19:58			21:38	
Sonnenscheinstunden	256	275		366		416	487	502
astr.max.mögl.Beschattung	445	604		447				

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 19 - Holle 2/Südost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober		November		Dezember	
1	05:08	05:45	06:36	07:26	10	17:22 (WEA 17-1)	07:21	08:14	15:30 (WEA 17-3)
	21:54	21:22	20:19	19:08		17:32 (WEA 17-1)	17:01	16:19	15:35 (WEA 17-3)
2	05:09	05:47	06:38	07:28	18	17:18 (WEA 17-1)	07:23	08:15	
	21:54	21:20	20:17	19:06		17:36 (WEA 17-1)	16:59	16:18	
3	05:10	05:48	06:40	07:30	23	17:14 (WEA 17-1)	07:25	08:17	
	21:53	21:19	20:14	19:04		17:37 (WEA 17-1)	16:57	16:17	
4	05:10	05:50	06:41	07:32	26	17:13 (WEA 17-1)	07:27	08:18	
	21:53	21:17	20:12	19:01		17:39 (WEA 17-1)	16:55	15:24 (WEA 17-3)	08:18
5	05:11	05:52	06:43	07:33	29	17:11 (WEA 17-1)	07:29	08:19	
	21:52	21:15	20:10	18:59		17:40 (WEA 17-1)	16:53	15:31 (WEA 17-3)	16:17
6	05:12	05:53	06:45	07:35	31	17:10 (WEA 17-1)	07:31	08:21	
	21:52	21:13	20:07	18:57		17:41 (WEA 17-1)	16:51	15:21 (WEA 17-3)	16:16
7	05:13	05:55	06:46	07:37	33	17:08 (WEA 17-1)	07:32	08:22	
	21:51	21:11	20:05	18:54		17:41 (WEA 17-1)	16:50	15:19 (WEA 17-3)	16:15
8	05:14	05:56	06:48	07:38	35	17:07 (WEA 17-1)	07:34	08:23	
	21:51	21:10	20:03	18:52		17:07 (WEA 17-1)	07:34	15:17 (WEA 17-3)	16:15
9	05:15	05:58	06:50	07:40	36	17:42 (WEA 17-1)	16:48	08:24	
	21:50	21:08	20:00	18:50		17:06 (WEA 17-1)	07:36	15:16 (WEA 17-3)	16:14
10	05:16	06:00	06:51	07:42	43	17:42 (WEA 17-1)	16:46	08:26	
	21:49	21:06	19:58	18:47		17:42 (WEA 17-1)	16:46	15:15 (WEA 17-3)	16:14
11	05:17	06:01	06:53	07:44	46	17:49 (WEA 17-2)	16:45	08:27	
	21:49	21:04	19:56	18:45		17:04 (WEA 17-1)	07:40	15:15 (WEA 17-3)	16:14
12	05:18	06:03	06:55	07:45	48	17:50 (WEA 17-2)	16:43	08:28	
	21:48	21:02	19:53	18:43		17:04 (WEA 17-1)	07:42	15:15 (WEA 17-3)	16:14
13	05:19	06:05	06:56	07:47	47	17:51 (WEA 17-2)	16:41	08:29	
	21:47	21:00	19:51	18:41		17:04 (WEA 17-1)	07:43	15:14 (WEA 17-3)	16:14
14	05:20	06:06	06:58	07:49	48	17:52 (WEA 17-2)	16:40	08:30	
	21:46	20:58	19:49	18:38		17:04 (WEA 17-1)	07:45	15:14 (WEA 17-3)	16:14
15	05:21	06:08	07:00	07:51	49	17:53 (WEA 17-2)	16:38	08:31	
	21:45	20:56	19:46	18:36		17:53 (WEA 17-2)	16:38	15:15 (WEA 17-3)	16:14
16	05:23	06:10	07:01	07:52	50	17:04 (WEA 17-1)	07:47	08:32	
	21:44	20:54	19:44	18:34		17:04 (WEA 17-1)	07:47	15:15 (WEA 17-3)	16:14
17	05:24	06:11	07:03	07:54	49	17:54 (WEA 17-2)	16:35	08:33	
	21:43	20:52	19:41	18:32		17:05 (WEA 17-1)	07:51	15:14 (WEA 17-3)	16:14
18	05:25	06:13	07:05	07:56	49	17:54 (WEA 17-2)	16:34	08:34	
	21:42	20:50	19:39	18:30		17:05 (WEA 17-1)	07:52	15:15 (WEA 17-3)	16:14
19	05:27	06:15	07:06	07:58	48	17:53 (WEA 17-2)	16:33	08:34	
	21:41	20:48	19:37	18:27		17:05 (WEA 17-1)	07:54	15:15 (WEA 17-3)	16:14
20	05:28	06:16	07:08	08:00	47	17:52 (WEA 17-2)	16:31	08:35	
	21:39	20:45	19:34	18:25		17:06 (WEA 17-1)	07:56	15:16 (WEA 17-3)	16:14
21	05:29	06:18	07:10	08:01	46	17:52 (WEA 17-2)	16:30	08:36	
	21:38	20:43	19:32	18:23		17:07 (WEA 17-1)	07:58	15:16 (WEA 17-3)	16:15
22	05:31	06:20	07:11	08:03	44	17:51 (WEA 17-2)	16:29	08:36	
	21:37	20:41	19:30	18:21		17:51 (WEA 17-2)	16:29	15:17 (WEA 17-3)	16:15
23	05:32	06:21	07:13	08:05	41	17:09 (WEA 17-1)	07:59	08:36	
	21:36	20:39	19:27	18:19		17:50 (WEA 17-2)	16:27	15:18 (WEA 17-3)	16:15
24	05:33	06:23	07:15	08:07	41	17:11 (WEA 17-1)	08:01	08:36	
	21:34	20:37	19:25	18:17		17:48 (WEA 17-2)	16:26	15:19 (WEA 17-3)	16:16
25	05:35	06:25	07:16	08:09	34	17:13 (WEA 17-1)	08:03	08:37	
	21:33	20:35	19:22	18:15		17:46 (WEA 17-2)	16:25	15:19 (WEA 17-3)	16:16
26	05:36	06:26	07:18	08:10	26	17:18 (WEA 17-1)	08:04	08:37	
	21:31	20:32	19:20	18:13		17:24 (WEA 17-1)	16:24	15:19 (WEA 17-3)	16:17
27	05:38	06:28	07:20	08:12	6		08:06	08:38	
	21:30	20:30	19:18	18:11			16:23	15:21 (WEA 17-3)	16:18
28	05:39	06:30	07:21	07:14	19		08:07	08:38	
	21:28	20:28	19:15	17:09			16:22	15:22 (WEA 17-3)	16:18
29	05:41	06:31	07:23	07:16	16		08:09	08:38	
	21:27	20:26	19:13	17:07			16:21	15:24 (WEA 17-3)	16:19
30	05:42	06:33	07:25	07:18	13		08:11	08:38	
	21:25	20:23	19:11	17:05			16:20	15:25 (WEA 17-3)	16:20
31	05:44	06:35		07:20	10		08:12	08:38	
	21:24	20:21		17:03			16:19	15:27 (WEA 17-3)	16:21
Sonnenscheinstunden	505	456	382	332		265	597	241	
astr.max.mögl.Beschattung					914				5

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 20a - Zur Dasslage 1/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2018**

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	18:04	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:11	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	18:06	20:01	20:54	21:40	21:54	21:20	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	18:03	20:03	20:55	21:41	21:53	21:19	19:04	16:57	16:17
4	08:38	08:07	07:11	07:00	05:59	05:53	05:10	05:50	06:41	07:32	07:27	08:18
	16:26	17:17	18:10	18:05	20:05	20:57	21:42	21:53	21:17	19:01	16:55	16:17
5	08:38	08:05	07:08	07:00	05:56	05:52	05:09	05:11	05:52	06:43	07:33	08:19
	16:28	17:19	18:12	18:07	20:07	20:59	21:43	21:52	21:15	19:00	16:53	16:16
6	08:38	08:03	07:06	07:00	06:54	05:50	05:08	05:12	05:53	06:45	07:35	08:21
	16:29	17:21	18:13	18:08	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:16
7	08:37	08:02	07:04	07:00	06:52	05:48	05:08	05:13	05:55	06:46	07:37	08:22
	16:30	17:23	18:15	18:10	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:15
8	08:37	08:00	07:02	07:00	06:49	05:46	05:07	05:14	05:56	06:48	07:38	08:23
	16:31	17:25	18:17	18:12	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:15
9	08:36	07:58	06:59	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	08:24
	16:33	17:27	18:19	18:14	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:14
10	08:36	07:56	06:57	06:55	06:45	05:42	05:06	05:16	06:00	06:51	07:42	08:26
	16:34	17:29	18:21	18:16	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:14
11	08:35	07:54	06:55	06:52	06:42	05:41	05:06	05:17	06:01	06:53	07:44	08:27
	16:36	17:30	18:23	18:18	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:14
12	08:35	07:52	06:52	06:50	06:40	05:39	05:05	05:18	06:03	06:55	07:45	08:28
	16:37	17:32	18:24	18:19	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:14
13	08:34	07:51	06:50	06:48	06:38	05:37	05:05	05:19	06:05	06:56	07:47	08:29
	16:39	17:34	18:26	18:21	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:14
14	08:33	07:49	06:48	06:46	06:36	05:36	05:05	05:20	06:06	06:58	07:49	08:30
	16:40	17:36	18:28	18:23	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:14
15	08:32	07:47	06:45	06:43	06:33	05:34	05:05	05:21	06:08	07:00	07:51	08:31
	16:42	17:38	18:30	18:25	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:14
16	08:31	07:45	06:43	06:41	06:31	05:32	05:04	05:23	06:10	07:01	07:52	08:32
	16:43	17:40	18:31	18:26	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:14
17	08:31	07:43	06:41	06:39	06:29	05:31	05:04	05:24	06:11	07:03	07:54	08:33
	16:45	17:42	18:33	18:28	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:14
18	08:30	07:41	06:38	06:36	06:27	05:29	05:04	05:25	06:13	07:05	07:56	08:33
	16:47	17:44	18:35	18:30	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:14
19	08:29	07:39	06:36	06:34	06:24	05:28	05:04	05:27	06:15	07:06	07:58	08:34
	16:48	17:46	18:37	18:32	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:14
20	08:28	07:37	06:34	06:32	06:22	05:26	05:04	05:28	06:16	07:08	08:00	08:35
	16:50	17:48	18:39	18:34	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:15
21	08:26	07:35	06:31	06:29	06:20	05:25	05:04	05:29	06:18	07:10	08:01	08:35
	16:52	17:49	18:40	18:35	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:15
22	08:25	07:32	06:29	06:27	06:18	05:24	05:05	05:31	06:20	07:11	08:03	08:36
	16:53	17:51	18:42	18:37	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:15
23	08:24	07:30	06:27	06:25	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:36
	16:55	17:53	18:44	18:39	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:16
24	08:23	07:28	06:24	06:22	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:37
	16:57	17:55	18:46	18:41	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:16
25	08:22	07:26	06:22	06:20	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:37
	16:59	17:57	18:47	18:42	20:42	21:30	21:55	21:33	20:35	19:22	18:15	16:17
26	08:20	07:24	06:20	06:18	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:38
	17:00	17:59	18:49	18:44	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:18
27	08:19	07:22	06:17	06:15	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:38
	17:02	18:01	18:51	18:46	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:18
28	08:17	07:20	06:15	06:13	06:05	05:16	05:07	05:39	06:30	07:21	08:14	08:38
	17:04	18:02	18:53	18:48	20:47	21:34	21:55	21:28	20:28	19:15	18:08	16:19
29	08:16		07:13	07:11	06:03	05:15	05:07	05:41	06:31	07:23	08:16	08:38
	17:06		17:54	17:49	20:48	21:35	21:54	21:27	20:26	19:13	18:07	16:20
30	08:15		07:10	07:08	06:01	05:14	05:08	05:42	06:33	07:25	08:18	08:38
	17:08		17:56	17:51	20:50	21:37	21:54	21:25	20:23	19:11	18:05	16:21
31	08:13		07:08	07:06		05:13		05:44	06:35		07:20	08:39
	17:10		17:58	17:53		21:38		21:24	20:21		17:03	16:22
Sonnenscheinstunden	256	275	346		416	487	502	505	456	382	332	265
astr.max.mögl.Beschattung			12								364	241

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)

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 20b - Zur Dasslage 1/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:12 17:12	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54	05:11 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41
4	08:38 16:26	08:07 17:17	07:11 18:10	06:59 20:05	05:53 20:57	05:10 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:43
6	08:38 16:29	08:03 17:21	07:06 18:13	06:54 20:08	05:50 21:00	05:08 21:45
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:45
8	08:37 16:31	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:42 21:07	05:06 21:48
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:35 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15	05:05 21:52
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	05:32 21:17	05:04 21:52
17	08:31 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	06:40 18:35	06:27 20:29	05:29 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31	05:28 21:21	05:04 21:53
20	08:28 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:26 21:23	05:04 21:54
21	08:26 16:52	07:35 17:49	06:31 18:40	06:20 20:35	05:25 21:24	05:04 21:54
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	05:05 21:55
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:42	05:20 21:30	05:05 21:55
26	08:20 17:00	07:24 17:59	07:20 19:49	06:09 20:43	05:19 21:31	05:06 21:55
27	08:19 17:02	07:22 18:01	07:17 19:51	06:07 20:45	05:18 21:33	05:06 21:55
28	08:17 17:04	07:20 18:02	07:15 19:53	06:05 20:47	05:16 21:34	05:07 21:55
29	08:16 17:06		07:13 19:54	06:03 20:48	05:15 21:35	05:07 21:54
30	08:15 17:08		07:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10		07:08 19:58	05:58 20:52	05:13 21:38	
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung		365		74		

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

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

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 20b - Zur Dasslage 1/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September		Oktober		November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19		07:26 19:08		18:15 (WEA 17-2) 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17		07:28 19:06	21	18:15 (WEA 17-2) 18:36 (WEA 17-2)	07:23 16:18
3	05:10 21:53	05:48 21:19	06:40 20:14		07:30 19:04	21	18:15 (WEA 17-2) 18:34 (WEA 17-2)	07:25 16:17
4	05:10 21:53	05:50 21:17	06:41 20:12		07:32 19:01	19	18:16 (WEA 17-2) 18:33 (WEA 17-2)	07:27 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10		07:33 18:59	17	18:17 (WEA 17-2) 18:32 (WEA 17-2)	07:29 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07		07:35 18:57	15	18:19 (WEA 17-2) 18:30 (WEA 17-2)	07:31 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05		07:37 18:54	11	18:21 (WEA 17-2) 18:26 (WEA 17-2)	07:32 16:15
8	05:14 21:51	05:56 21:10	06:48 20:03		07:38 18:52	5	18:26 (WEA 17-2)	07:34 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00		07:40 18:50			07:36 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	10	07:42 18:47			07:38 16:14
11	05:17 21:49	06:01 21:04	06:53 19:56	17	07:44 18:45			07:40 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	21	07:45 18:43			07:42 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	24	07:47 18:41			07:43 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	26	07:49 18:38		17:20 (WEA 17-3)	07:45 16:14
15	05:21 21:45	06:08 20:56	07:00 19:46	28	07:51 18:36	10	17:30 (WEA 17-3)	07:47 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	30	07:52 18:34	16	17:17 (WEA 17-3) 17:33 (WEA 17-3)	07:49 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	30	07:54 18:32	19	17:15 (WEA 17-3) 17:34 (WEA 17-3)	07:49 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	32	07:56 18:29	21	17:12 (WEA 17-3) 17:35 (WEA 17-3)	07:52 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	32	07:58 18:27	23	17:11 (WEA 17-3) 17:36 (WEA 17-3)	07:54 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	32	08:00 18:25	25	17:11 (WEA 17-3) 17:36 (WEA 17-3)	07:56 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	32	08:01 18:23	25	17:10 (WEA 17-3) 17:36 (WEA 17-3)	07:57 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	31	08:03 18:21	26	17:10 (WEA 17-3) 17:36 (WEA 17-3)	07:59 16:15
23	05:32 21:36	06:21 20:39	07:13 19:27	30	08:05 18:19	26	17:10 (WEA 17-3) 17:36 (WEA 17-3)	08:01 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	29	08:07 18:17	26	17:10 (WEA 17-3) 17:36 (WEA 17-3)	08:03 16:16
25	05:35 21:33	06:25 20:35	07:16 19:22	27	08:09 18:15	25	17:11 (WEA 17-3) 17:36 (WEA 17-3)	08:04 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	25	08:10 18:13	25	17:11 (WEA 17-3) 17:35 (WEA 17-3)	08:06 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	22	08:12 18:11	24	17:12 (WEA 17-3) 17:34 (WEA 17-3)	08:07 16:18
28	05:39 21:28	06:30 20:28	07:21 19:15	21	07:14 17:08	22	16:13 (WEA 17-3) 16:33 (WEA 17-3)	08:09 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	20	07:16 17:07	20	16:14 (WEA 17-3) 16:32 (WEA 17-3)	08:11 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	20	07:18 17:05	18	16:16 (WEA 17-3) 16:30 (WEA 17-3)	08:12 16:21
31	05:44 21:24	06:35 20:21		21	07:20 17:03	14	16:19 (WEA 17-3) 16:27 (WEA 17-3)	08:39 16:22
Sonnenscheinstunden	505	456	382		332	483		265
astr.max.mögl.Beschattung			560					241

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 21a - Zur Dasslage 3/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:39	08:12	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:11	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:17
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:19	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:53	05:10	05:10	05:50	06:41	07:32	07:27	08:18
	16:26	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:31	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:02	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:31	17:25	18:17	20:12	21:04	21:46	21:51	21:10	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:23	20:17	21:09	21:49	21:49	21:04	19:56	18:45	16:43	16:14
12	08:35	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:42	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:51	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:14	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:21	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:52	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:33
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:30	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:29	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:35	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:35	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:55	21:36	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:03	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:16
25	08:22	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:00	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:18
28	08:17	07:20	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:20		08:39
	17:10		19:58		21:38		21:24	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 21b - Zur Dasslage 3/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:39 16:23	08:12 17:12	07:17 18:04	17:04 (WEA 17-3) 07:06	19:00 (WEA 17-1) 05:59	05:12 21:39		
2	08:38 16:24	08:10 17:13	07:15 18:06	17:04 (WEA 17-3) 07:03	18:59 (WEA 17-1) 05:57	05:11 21:40		
3	08:38 16:25	08:08 17:15	07:13 18:08	17:04 (WEA 17-3) 07:01	18:58 (WEA 17-1) 05:55	05:11 21:41		
4	08:38 16:26	08:07 17:17	07:11 18:10	17:03 (WEA 17-3) 06:59	18:56 (WEA 17-1) 05:53	05:10 21:42		
5	08:38 16:28	08:05 17:19	07:08 18:12	17:29 (WEA 17-3) 06:56	18:56 (WEA 17-1) 05:52	05:09 21:43		
6	08:38 16:29	08:03 17:21	07:06 18:13	17:03 (WEA 17-3) 06:54	18:56 (WEA 17-1) 05:50	05:08 21:44		
7	08:37 16:30	08:02 17:23	07:04 18:15	17:03 (WEA 17-3) 06:52	18:54 (WEA 17-1) 05:48	05:08 21:45		
8	08:37 16:31	08:00 17:25	07:02 18:17	17:27 (WEA 17-3) 06:49	18:55 (WEA 17-1) 05:46	05:07 21:46		
9	08:36 16:33	07:58 17:27	06:59 18:19	17:05 (WEA 17-3) 06:47	18:55 (WEA 17-1) 05:44	05:07 21:47		
10	08:36 16:34	07:56 17:29	06:57 18:21	17:25 (WEA 17-3) 06:45	18:55 (WEA 17-1) 05:42	05:06 21:48		
11	08:35 16:36	07:54 17:30	06:55 18:23	17:23 (WEA 17-3) 06:42	18:55 (WEA 17-1) 05:41	05:06 21:49		
12	08:35 16:37	07:52 17:32	06:52 18:24	17:08 (WEA 17-3) 06:40	18:55 (WEA 17-1) 05:39	05:05 21:50		
13	08:34 16:39	07:51 17:34	06:50 18:26	17:21 (WEA 17-3) 06:38	18:55 (WEA 17-1) 05:37	05:05 21:50		
14	08:33 16:40	07:49 17:36	06:48 18:28	17:12 (WEA 17-3) 06:36	18:57 (WEA 17-1) 05:36	05:05 21:51		
15	08:32 16:42	07:47 17:38	06:45 18:30	06:52 06:33	19:20 (WEA 17-1) 05:34	05:05 21:52		
16	08:31 16:43	07:45 17:40	06:43 18:31	20:22 06:31	18:59 (WEA 17-1) 05:32	05:04 21:52		
17	08:30 16:45	07:43 17:42	06:41 18:33	20:26 06:29	19:03 (WEA 17-1) 05:31	05:04 21:53		
18	08:30 16:47	07:41 17:44	06:38 18:35	18:09 (WEA 17-2) 06:27	19:12 (WEA 17-1) 05:29	05:04 21:53		
19	08:29 16:48	07:39 17:46	06:36 18:37	18:10 (WEA 17-2) 06:24	19:20 (WEA 17-1) 05:28	05:04 21:53		
20	08:27 16:50	07:37 17:48	06:34 18:39	18:12 (WEA 17-2) 06:22	18:59 (WEA 17-1) 05:27	05:04 21:54		
21	08:26 16:52	07:35 17:49	06:31 18:40	17:55 (WEA 17-2) 06:20	19:00 (WEA 17-1) 05:25	05:04 21:54		
22	08:25 16:53	07:32 17:51	06:29 18:42	18:13 (WEA 17-2) 06:18	19:15 (WEA 17-1) 05:24	05:05 21:54		
23	08:24 16:55	07:30 17:53	06:27 18:44	17:52 (WEA 17-2) 06:16	19:03 (WEA 17-1) 05:22	05:05 21:55		
24	08:23 16:57	07:28 17:55	17:12 (WEA 17-3) 06:24	18:12 (WEA 17-2) 06:14	19:15 (WEA 17-1) 05:21	05:05 21:55		
25	08:22 16:59	07:26 17:57	17:22 (WEA 17-3) 07:22	18:11 (WEA 17-2) 06:12	19:12 (WEA 17-1) 05:20	05:05 21:55		
26	08:20 17:00	07:24 17:59	17:09 (WEA 17-3) 07:22	18:52 (WEA 17-2) 06:12	19:11 (WEA 17-2) 05:20	05:05 21:55		
27	08:19 17:02	07:22 18:01	17:06 (WEA 17-3) 07:17	18:52 (WEA 17-2) 06:09	19:11 (WEA 17-2) 05:19	05:06 21:55		
28	08:17 17:04	07:20 18:02	17:28 (WEA 17-3) 07:15	19:09 (WEA 17-2) 06:07	19:09 (WEA 17-2) 05:18	05:06 21:55		
29	08:16 17:06		17:05 (WEA 17-3) 07:15	18:53 (WEA 17-2) 06:05	19:08 (WEA 17-2) 05:18	05:07 21:55		
30	08:15 17:08		17:28 (WEA 17-3) 07:13	18:55 (WEA 17-2) 06:05	19:06 (WEA 17-2) 05:16	05:07 21:55		
31	08:13 17:10			19:06 (WEA 17-2) 06:03	19:04 (WEA 17-1) 05:14	05:08 21:55		
	Sonnenscheinstunden	256	275	366	416	431	487	502
	astr.max.mögl.Beschattung		90		507		431	

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 21b - Zur Dasslage 3/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	October	November	December
1	05:08 21:54	05:45 21:22	06:36 20:19	18:55 (WEA 17-1) 19:22 (WEA 17-1)	07:26 19:08	07:21 17:01
2	05:09 21:54	05:47 21:20	06:38 20:17	18:53 (WEA 17-1) 19:22 (WEA 17-1)	07:28 19:06	07:23 16:59
3	05:10 21:53	05:48 21:19	06:40 20:14	18:53 (WEA 17-1) 19:22 (WEA 17-1)	07:30 19:04	17:47 (WEA 17-3) 17:58 (WEA 17-3)
4	05:10 21:53	05:50 21:17	06:41 20:12	18:52 (WEA 17-1) 19:22 (WEA 17-1)	07:32 19:01	17:44 (WEA 17-3) 18:00 (WEA 17-3)
5	05:11 21:52	05:52 21:15	06:43 20:10	18:52 (WEA 17-1) 19:22 (WEA 17-1)	07:33 18:59	17:43 (WEA 17-3) 18:02 (WEA 17-3)
6	05:12 21:52	05:53 21:13	06:45 20:07	18:52 (WEA 17-1) 19:22 (WEA 17-1)	07:35 18:57	17:41 (WEA 17-3) 18:03 (WEA 17-3)
7	05:13 21:51	05:55 21:11	06:46 20:05	18:51 (WEA 17-1) 19:21 (WEA 17-1)	07:37 18:54	17:39 (WEA 17-3) 18:03 (WEA 17-3)
8	05:14 21:51	05:56 21:10	06:48 20:03	18:51 (WEA 17-1) 19:21 (WEA 17-1)	07:38 18:52	17:39 (WEA 17-3) 18:03 (WEA 17-3)
9	05:15 21:50	05:58 21:08	06:50 20:00	18:50 (WEA 17-1) 19:19 (WEA 17-1)	07:40 18:50	17:38 (WEA 17-3) 18:04 (WEA 17-3)
10	05:16 21:49	06:00 21:06	06:51 19:58	18:51 (WEA 17-1) 19:19 (WEA 17-1)	07:42 18:47	17:38 (WEA 17-3) 18:04 (WEA 17-3)
11	05:17 21:49	06:01 21:04	06:53 19:56	18:52 (WEA 17-1) 19:18 (WEA 17-1)	07:44 18:45	17:37 (WEA 17-3) 18:03 (WEA 17-3)
12	05:18 21:48	06:03 21:02	06:55 19:53	18:52 (WEA 17-1) 19:16 (WEA 17-1)	07:45 18:43	17:37 (WEA 17-3) 18:02 (WEA 17-3)
13	05:19 21:47	06:05 21:00	06:56 19:51	18:53 (WEA 17-1) 19:14 (WEA 17-1)	07:47 18:41	17:37 (WEA 17-3) 18:02 (WEA 17-3)
14	05:20 21:46	06:06 20:58	06:58 19:49	18:54 (WEA 17-1) 19:11 (WEA 17-1)	07:49 18:38	17:37 (WEA 17-3) 18:01 (WEA 17-3)
15	05:21 21:45	06:08 20:56	07:00 19:46	18:57 (WEA 17-1) 19:08 (WEA 17-1)	07:51 18:36	17:38 (WEA 17-3) 18:01 (WEA 17-3)
16	05:23 21:44	06:10 20:54	07:01 19:44	18:45 (WEA 17-2) 18:55 (WEA 17-2)	07:52 18:34	17:39 (WEA 17-3) 17:40 (WEA 17-3)
17	05:24 21:43	06:11 20:52	07:03 19:41	18:42 (WEA 17-2) 18:56 (WEA 17-2)	07:54 18:32	17:40 (WEA 17-3) 17:58 (WEA 17-3)
18	05:25 21:42	06:13 20:50	07:05 19:39	18:41 (WEA 17-2) 18:57 (WEA 17-2)	07:56 18:29	17:41 (WEA 17-3) 17:55 (WEA 17-3)
19	05:27 21:41	06:15 20:48	07:06 19:37	18:40 (WEA 17-2) 18:58 (WEA 17-2)	07:58 18:27	17:44 (WEA 17-3) 17:52 (WEA 17-3)
20	05:28 21:39	06:16 20:45	07:08 19:34	18:38 (WEA 17-2) 18:58 (WEA 17-2)	08:00 18:25	07:56 16:30
21	05:29 21:38	06:18 20:43	07:10 19:32	18:38 (WEA 17-2) 18:58 (WEA 17-2)	08:01 18:23	07:57 16:29
22	05:31 21:37	06:20 20:41	07:11 19:30	18:38 (WEA 17-2) 18:58 (WEA 17-2)	08:03 18:21	07:59 16:27
23	05:32 21:36	06:21 20:39	07:13 19:27	18:37 (WEA 17-2) 18:57 (WEA 17-2)	08:05 18:19	08:01 16:26
24	05:33 21:34	06:23 20:37	07:15 19:25	18:37 (WEA 17-2) 18:56 (WEA 17-2)	08:07 18:17	08:03 16:25
25	05:35 21:33	06:25 20:35	07:16 19:22	18:38 (WEA 17-2) 18:56 (WEA 17-2)	08:09 18:15	08:04 16:24
26	05:36 21:31	06:26 20:32	07:18 19:20	18:38 (WEA 17-2) 18:53 (WEA 17-2)	08:10 18:13	08:06 16:23
27	05:38 21:30	06:28 20:30	07:20 19:18	18:40 (WEA 17-2) 18:52 (WEA 17-2)	08:12 18:11	08:07 16:22
28	05:39 21:28	06:30 20:28	07:21 19:15	18:43 (WEA 17-2) 19:17 (WEA 17-1)	07:14 17:08	08:09 16:21
29	05:41 21:27	06:31 20:26	07:23 19:13	18:59 (WEA 17-1) 19:19 (WEA 17-1)	07:16 17:07	08:11 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	18:57 (WEA 17-1) 19:20 (WEA 17-1)	07:18 17:05	08:12 16:19
31	05:44 21:24	06:35 20:21	07:26 19:10	18:56 (WEA 17-1) 19:21 (WEA 17-1)	07:19 17:03	08:13 16:18
Sonnenscheinstunden	505	456	382	332	352	265
astr.max.mögl.Beschattung		95	598			241

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

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

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 22a - Zur Dasslage 4/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:39 16:23	09:58 (WEA 18-3) 10:09 (WEA 18-3)	08:11 17:12	07:17 18:04	07:06 20:00	05:59 20:52	
2	08:38 16:24	09:59 (WEA 18-3) 10:09 (WEA 18-3)	08:10 17:13	08:42 (WEA 18-1) 08:52 (WEA 18-1)	07:15 18:06	20:03 20:01	05:57 20:54
3	08:38 16:25	10:00 (WEA 18-3) 10:08 (WEA 18-3)	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55	21:40 21:41
4	08:38 16:27	10:02 (WEA 18-3) 10:07 (WEA 18-3)	08:07 17:17	08:38 (WEA 18-1) 08:55 (WEA 18-1)	07:11 18:10	06:59 20:05	05:53 20:57
5	08:38 16:28	08:05 17:19	17 19	08:37 (WEA 18-1) 08:56 (WEA 18-1)	07:08 18:12	06:56 20:07	05:52 20:59
6	08:38 16:29	08:03 17:21	19	08:37 (WEA 18-1) 08:56 (WEA 18-1)	07:06 18:13	06:54 20:08	05:50 21:00
7	08:37 16:30	08:02 17:23	21	08:37 (WEA 18-1) 08:58 (WEA 18-1)	07:04 18:15	06:52 20:10	05:48 21:02
8	08:37 16:32	08:00 17:25	21	08:37 (WEA 18-1) 08:58 (WEA 18-1)	07:02 18:17	06:49 20:12	05:46 21:04
9	08:36 16:33	07:58 17:27	23	08:36 (WEA 18-1) 08:59 (WEA 18-1)	06:59 18:19	06:47 20:14	05:44 21:05
10	08:36 16:34	07:56 17:29	23	08:36 (WEA 18-1) 08:59 (WEA 18-1)	06:57 18:21	06:45 20:15	05:42 21:07
11	08:35 16:36	07:54 17:30	21	08:37 (WEA 18-1) 08:58 (WEA 18-1)	06:55 18:23	06:42 20:17	05:41 21:09
12	08:34 16:37	07:52 17:32	21	08:37 (WEA 18-1) 08:58 (WEA 18-1)	06:52 18:24	06:40 20:19	05:39 21:10
13	08:34 16:39	07:51 17:34	21	08:37 (WEA 18-1) 08:58 (WEA 18-1)	06:50 18:26	06:38 20:21	05:37 21:12
14	08:33 16:40	07:49 17:36	19	08:38 (WEA 18-1) 08:57 (WEA 18-1)	06:48 18:28	06:36 20:22	05:36 21:14
15	08:32 16:42	07:47 17:38	17	08:39 (WEA 18-1) 08:56 (WEA 18-1)	06:45 18:30	06:33 20:24	05:34 21:15
16	08:31 16:43	07:45 17:40	14	08:41 (WEA 18-1) 08:55 (WEA 18-1)	06:43 18:31	06:31 20:26	05:32 21:17
17	08:30 16:45	07:43 17:42	9	08:42 (WEA 18-1) 08:51 (WEA 18-1)	06:41 18:33	06:29 20:28	05:31 21:18
18	08:30 16:47	07:41 17:44			18:35	20:28 21:18	21:18 21:53
19	08:29 16:48	07:39 17:46			18:35 18:37	20:29 20:31	21:20 21:21
20	08:27 16:50	07:37 17:48			18:35 18:39	20:29 20:33	21:20 21:23
21	08:26 16:52	07:34 17:49			18:39 18:40	20:33 20:35	21:23 21:24
22	08:25 16:53	07:32 17:51			18:39 18:42	20:33 20:36	21:23 21:26
23	08:24 16:55	07:30 17:53			18:40 18:44	20:35 20:38	21:24 21:27
24	08:23 16:57	07:28 17:55			18:42 18:46	20:36 20:40	21:26 21:29
25	08:22 16:59	07:26 17:57			18:44 19:47	20:38 20:41	21:27 21:30
26	08:20 17:00	07:24 17:59			18:46 19:49	20:40 20:43	21:29 21:31
27	08:19 17:02	07:22 18:01			19:47 19:51	20:41 20:45	21:30 21:33
28	08:17 17:04	07:19 18:02			19:49 19:53	20:43 20:47	21:31 21:34
29	08:16 17:06				19:51 19:54	20:45 20:48	21:33 21:35
30	08:15 17:08				19:53 19:56	20:47 20:50	21:34 21:37
31	08:13 17:10				19:55 19:58	20:50 21:38	21:37 21:38
Sonnenscheinstunden	256	275	366	416	487	502	
astr.max.mögl.Beschattung	34	289					

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

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

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 22a - Zur Dasslage 4/Südost
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	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	08:06 (WEA 18-1) 08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	08:06 (WEA 18-1) 08:15 08:28 (WEA 18-1) 16:18
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	07:25 16:57	08:06 (WEA 18-1) 08:16 08:28 (WEA 18-1) 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	08:06 (WEA 18-1) 08:18 08:28 (WEA 18-1) 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	08:07 (WEA 18-1) 08:19 08:28 (WEA 18-1) 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:51	08:07 (WEA 18-1) 08:21 08:27 (WEA 18-1) 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	08:08 (WEA 18-1) 08:22 08:26 (WEA 18-1) 16:15
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	07:34 16:48	08:09 (WEA 18-1) 08:23 08:25 (WEA 18-1) 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	08:11 (WEA 18-1) 08:24 08:24 (WEA 18-1) 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	08:13 (WEA 18-1) 08:26 08:22 (WEA 18-1) 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	07:50 16:34	08:32 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	07:52 16:33	08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	08:36 16:15
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:07 16:22	08:38 16:18
28	05:39 21:28	06:30 20:28	07:21 19:15	08:14 17:08	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:16 17:07	08:11 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	08:18 17:05	08:12 16:19	08:38 16:21
31	05:44 21:24	06:35 20:21	07:19 17:03	08:19 17:03	08:13 16:18	08:38 16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung				108	185	310

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 22b - Zur Dasslage 4/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:11 17:12	07:17 18:04	07:06 20:00	19:12 (WEA 17-3) 05:59 19:30 (WEA 17-3) 20:52	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	19:11 (WEA 17-3) 05:57 19:31 (WEA 17-3) 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	19:10 (WEA 17-3) 05:55 19:32 (WEA 17-3) 20:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	19:08 (WEA 17-3) 05:53 19:32 (WEA 17-3) 20:57	20:14 (WEA 17-1) 05:10 20:22 (WEA 17-1) 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	19:08 (WEA 17-3) 05:52 19:32 (WEA 17-3) 20:59	20:12 (WEA 17-1) 05:09 20:25 (WEA 17-1) 21:43
6	08:38 16:29	08:03 17:21	07:06 18:13	06:54 20:08	19:08 (WEA 17-3) 05:50 19:32 (WEA 17-3) 21:00	20:10 (WEA 17-1) 05:08 20:27 (WEA 17-1) 21:44
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	19:07 (WEA 17-3) 05:48 19:31 (WEA 17-3) 21:02	20:09 (WEA 17-1) 05:08 20:28 (WEA 17-1) 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	19:07 (WEA 17-3) 05:46 19:31 (WEA 17-3) 21:04	20:08 (WEA 17-1) 05:07 20:29 (WEA 17-1) 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	19:07 (WEA 17-3) 05:44 19:31 (WEA 17-3) 21:05	20:07 (WEA 17-1) 05:07 20:30 (WEA 17-1) 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	19:08 (WEA 17-3) 05:42 19:30 (WEA 17-3) 21:07	20:06 (WEA 17-1) 05:06 20:30 (WEA 17-1) 21:48
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	19:07 (WEA 17-3) 05:41 19:28 (WEA 17-3) 21:09	20:06 (WEA 17-1) 05:06 20:31 (WEA 17-1) 21:49
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	19:08 (WEA 17-3) 05:39 19:27 (WEA 17-3) 21:10	20:05 (WEA 17-1) 05:05 20:31 (WEA 17-1) 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	19:10 (WEA 17-3) 05:37 19:26 (WEA 17-3) 21:12	20:06 (WEA 17-1) 05:05 20:31 (WEA 17-1) 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	19:12 (WEA 17-3) 05:36 19:24 (WEA 17-3) 21:14	20:05 (WEA 17-1) 05:05 20:31 (WEA 17-1) 21:51
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	19:16 (WEA 17-3) 05:34 19:20 (WEA 17-3) 21:15	20:05 (WEA 17-1) 05:05 20:32 (WEA 17-1) 21:52
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	05:32 21:17	20:05 (WEA 17-1) 05:04 20:31 (WEA 17-1) 21:52
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	20:05 (WEA 17-1) 05:04 20:31 (WEA 17-1) 21:53
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20	20:05 (WEA 17-1) 05:04 20:30 (WEA 17-1) 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31	05:28 21:21	20:06 (WEA 17-1) 05:04 20:31 (WEA 17-1) 21:53
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23	20:06 (WEA 17-1) 05:04 20:31 (WEA 17-1) 21:54
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:35	05:25 21:24	20:07 (WEA 17-1) 05:04 20:31 (WEA 17-1) 21:54
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	20:07 (WEA 17-1) 05:05 20:29 (WEA 17-1) 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	20:07 (WEA 17-1) 05:05 20:29 (WEA 17-1) 21:54
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	20:08 (WEA 17-1) 05:05 20:29 (WEA 17-1) 21:55
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:41	05:20 21:30	20:09 (WEA 17-1) 05:05 20:28 (WEA 17-1) 21:55
26	08:20 17:00	07:24 17:59	06:20 19:49	06:09 20:43	05:19 21:31	20:10 (WEA 17-1) 05:06 20:28 (WEA 17-1) 21:55
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33	20:11 (WEA 17-1) 05:06 20:27 (WEA 17-1) 21:55
28	08:17 17:04	07:19 18:02	06:15 19:53	06:05 20:47	05:16 21:34	20:12 (WEA 17-1) 05:07 20:26 (WEA 17-1) 21:55
29	08:16 17:06		06:13 19:54	06:03 20:48	05:15 21:35	20:13 (WEA 17-1) 05:07 20:25 (WEA 17-1) 21:54
30	08:15 17:08		06:10 19:56	06:01 20:50	05:14 21:37	20:15 (WEA 17-1) 05:08 20:23 (WEA 17-1) 21:54
31	08:13 17:10		06:08 19:58	05:59 20:52	05:13 21:38	20:18 (WEA 17-1) 05:09 20:21 (WEA 17-1) 21:54
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung			20		298	560

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 22b - Zur Dasslage 4/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:08	05:45	20:16 (WEA 17-1) 06:36	19:08 (WEA 17-3) 07:26	07:21	08:14
	21:54	21:22	26 20:42 (WEA 17-1) 20:19	19:27 (WEA 17-3) 19:08	17:01	16:19
2	05:09	05:47	20:16 (WEA 17-1) 06:38	19:06 (WEA 17-3) 07:28	07:23	08:15
	21:54	21:20	25 20:41 (WEA 17-1) 20:17	19:27 (WEA 17-3) 19:06	16:59	16:18
3	05:10	05:48	20:17 (WEA 17-1) 06:40	19:06 (WEA 17-3) 07:30	07:25	08:16
	21:53	21:18	24 20:41 (WEA 17-1) 20:14	19:28 (WEA 17-3) 19:04	16:57	16:17
4	05:11	05:50	20:17 (WEA 17-1) 06:41	19:04 (WEA 17-3) 07:32	07:27	08:18
	21:53	21:17	23 20:40 (WEA 17-1) 20:12	19:28 (WEA 17-3) 19:01	16:55	16:17
5	05:11	05:52	20:18 (WEA 17-1) 06:43	19:04 (WEA 17-3) 07:33	07:29	08:19
	21:52	21:15	22 20:40 (WEA 17-1) 20:10	19:28 (WEA 17-3) 18:59	16:53	16:16
6	05:12	05:53	20:18 (WEA 17-1) 06:45	19:04 (WEA 17-3) 07:35	07:31	08:21
	21:52	21:13	20 20:38 (WEA 17-1) 20:07	19:28 (WEA 17-3) 18:57	16:51	16:16
7	05:13	05:55	20:19 (WEA 17-1) 06:46	19:03 (WEA 17-3) 07:37	07:32	08:22
	21:51	21:11	19 20:38 (WEA 17-1) 20:05	19:27 (WEA 17-3) 18:54	16:50	16:15
8	05:14	05:56	20:20 (WEA 17-1) 06:48	19:03 (WEA 17-3) 07:38	07:34	08:23
	21:51	21:09	16 20:36 (WEA 17-1) 20:03	19:27 (WEA 17-3) 18:52	16:48	16:15
9	05:15	05:58	20:23 (WEA 17-1) 06:50	19:02 (WEA 17-3) 07:40	07:36	08:24
	21:50	21:08	11 20:34 (WEA 17-1) 20:00	19:26 (WEA 17-3) 18:50	16:46	16:14
10	05:16	06:00	20:26 (WEA 17-1) 06:51	19:03 (WEA 17-3) 07:42	07:38	08:26
	21:49	21:06	3 20:29 (WEA 17-1) 19:58	19:25 (WEA 17-3) 18:47	16:45	16:14
11	05:17	06:01	06:53	19:04 (WEA 17-3) 07:44	07:40	08:27
	21:49	21:04	19:56	19:24 (WEA 17-3) 18:45	16:43	16:14
12	05:18	06:03	06:55	19:04 (WEA 17-3) 07:45	07:41	08:28
	21:48	21:02	19:53	19:22 (WEA 17-3) 18:43	16:41	16:14
13	05:19	06:05	06:56	19:06 (WEA 17-3) 07:47	07:43	08:29
	21:47	21:00	19:51	19:20 (WEA 17-3) 18:41	16:40	16:14
14	05:20	06:06	06:58	19:09 (WEA 17-3) 07:49	07:45	08:30
	21:46	7 20:31 (WEA 17-1) 20:58	19:49	7 19:16 (WEA 17-3) 18:38	16:38	16:14
15	05:22	06:08	07:00	07:51	07:47	08:31
	21:45	11 20:33 (WEA 17-1) 20:56	19:46	18:36	16:37	16:14
16	05:23	06:10	07:01	07:52	07:49	08:32
	21:44	13 20:35 (WEA 17-1) 20:54	19:44	18:34	16:35	16:14
17	05:24	06:11	07:03	07:54	07:50	08:32
	21:43	15 20:36 (WEA 17-1) 20:52	19:41	18:32	16:34	16:14
18	05:25	06:13	07:05	07:56	07:52	08:33
	21:42	17 20:37 (WEA 17-1) 20:50	19:39	18:29	16:33	16:14
19	05:27	06:15	07:06	07:58	07:54	08:34
	21:41	19 20:38 (WEA 17-1) 20:48	19:37	18:27	16:31	16:14
20	05:28	06:16	07:08	08:00	07:56	08:35
	21:39	20 20:38 (WEA 17-1) 20:45	19:34	18:25	16:30	16:15
21	05:29	06:18	07:10	08:01	07:57	08:35
	21:38	21 20:39 (WEA 17-1) 20:43	19:32	18:23	16:29	16:15
22	05:31	06:20	07:11	08:03	07:59	08:36
	21:37	23 20:40 (WEA 17-1) 20:41	19:30	18:21	16:27	16:15
23	05:32	06:21	07:13	08:05	08:01	08:36
	21:35	23 20:40 (WEA 17-1) 20:39	19:27	18:19	16:26	16:16
24	05:33	06:23	07:15	08:07	08:03	08:37
	21:34	24 20:41 (WEA 17-1) 20:37	19:25	18:17	16:25	16:17
25	05:35	06:25	07:16	08:09	08:04	08:37
	21:33	25 20:41 (WEA 17-1) 20:35	19:22	18:15	16:24	16:17
26	05:36	06:26	07:18	08:10	08:06	08:38
	21:31	25 20:41 (WEA 17-1) 20:32	19:20	18:13	16:23	16:18
27	05:38	06:28	07:20	08:12	08:07	08:38
	21:30	26 20:42 (WEA 17-1) 20:30	19:18	18:11	16:22	16:18
28	05:39	06:30	07:21	07:14	08:09	08:38
	21:28	26 20:42 (WEA 17-1) 20:28	19:15	17:08	16:21	16:19
29	05:41	06:31	07:23	07:16	08:11	08:38
	21:27	26 20:41 (WEA 17-1) 20:26	5 19:21 (WEA 17-3) 19:13	17:07	16:20	16:20
30	05:42	06:33	07:25	07:18	08:12	08:38
	21:25	26 20:42 (WEA 17-1) 20:23	13 19:24 (WEA 17-3) 19:11	17:05	16:19	16:21
31	05:44	06:35	19:09 (WEA 17-3)	07:19		08:38
	21:24	26 20:41 (WEA 17-1) 20:21	17 19:26 (WEA 17-3)	17:03		16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung	373	224	287			

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

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



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 23a - Große Haar 9/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni
1	08:39 16:23	08:11 17:12	07:17 18:04	07:06 20:00		05:59 20:52	24	19:52 (WEA 17-3) 20:16 (WEA 17-3) 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01		05:57 20:54	24	19:52 (WEA 17-3) 20:16 (WEA 17-3) 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03		05:55 20:55	25	19:51 (WEA 17-3) 20:16 (WEA 17-3) 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:53 20:57	25	19:52 (WEA 17-3) 20:17 (WEA 17-3) 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07		05:52 20:59	24	19:52 (WEA 17-3) 20:16 (WEA 17-3) 21:43
6	08:38 16:29	08:03 17:21	07:06 18:13	06:54 20:08		05:50 21:00	24	19:52 (WEA 17-3) 20:16 (WEA 17-3) 21:44
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10		05:48 21:02	23	19:52 (WEA 17-3) 20:15 (WEA 17-3) 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	22	19:53 (WEA 17-3) 20:15 (WEA 17-3) 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05	21	19:53 (WEA 17-3) 20:14 (WEA 17-3) 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:42 21:07	20	19:53 (WEA 17-3) 20:13 (WEA 17-3) 21:48
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17		05:41 21:09	18	19:55 (WEA 17-3) 20:13 (WEA 17-3) 21:49
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19		05:39 21:10	16	19:55 (WEA 17-3) 20:11 (WEA 17-3) 21:50
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:21		05:37 21:12	14	19:57 (WEA 17-3) 20:11 (WEA 17-3) 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22		05:36 21:14	9	19:59 (WEA 17-3) 20:08 (WEA 17-3) 21:51
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24		05:34 21:15		05:05 21:52
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26		05:33 21:17		05:04 21:52
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28		05:31 21:18		05:04 21:53
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29		05:29 21:20		05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31		05:28 21:21		05:04 21:53
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33		05:27 21:23		05:04 21:54
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:35		05:25 21:24		05:04 21:54
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36		05:24 21:26		05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38		05:22 21:27		05:05 21:54
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40		05:21 21:29		05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:41	9	20:01 (WEA 17-3) 20:10 (WEA 17-3)	9	05:20 21:30
26	08:20 17:01	07:24 17:59	06:10 19:49	06:10 20:43	15	19:58 (WEA 17-3) 20:13 (WEA 17-3)	15	05:19 21:31
27	08:19 17:02	07:22 18:01	06:07 19:51	06:07 20:45	18	19:56 (WEA 17-3) 20:14 (WEA 17-3)	18	05:18 21:33
28	08:17 17:04	07:19 18:03	06:05 19:53	06:05 20:47	20	19:55 (WEA 17-3) 20:15 (WEA 17-3)	20	05:16 21:34
29	08:16 17:06		06:03 19:54	06:03 20:48	21	19:54 (WEA 17-3) 20:15 (WEA 17-3)	21	05:15 21:35
30	08:15 17:08		06:01 19:56	06:01 20:50	23	19:53 (WEA 17-3) 20:16 (WEA 17-3)	23	05:14 21:37
31	08:13 17:10		07:08 19:58			05:13 21:38		
Sonnenscheinstunden	256	275	366	416		487		502
astr.max.mögl.Beschattung				106		289		174

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

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

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 23a - Große Haar 9/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlungsrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	October	November	December	
1	05:08 21:13 (WEA 17-1)	05:45 21:22	20:07 (WEA 17-3)	06:36 20:19	07:26 17:01	08:14 16:19	
2	05:09 21:17 (WEA 17-1)	05:47 21:20	20:05 (WEA 17-3)	06:38 20:17	07:28 16:59	08:15 16:18	
3	05:10 21:53	05:48 21:18	20:05 (WEA 17-3)	06:40 20:14	07:30 16:57	08:16 16:17	
4	05:11 21:53	05:50 21:17	20:03 (WEA 17-3)	06:41 20:12	07:32 16:55	08:18 16:17	
5	05:11 21:52	05:52 21:15	20:03 (WEA 17-3)	06:43 20:10	07:33 16:53	08:19 16:16	
6	05:12 21:52	05:53 21:13	20:02 (WEA 17-3)	06:45 20:07	07:35 16:51	08:21 16:16	
7	05:13 21:51	05:55 21:11	20:02 (WEA 17-3)	06:46 20:05	07:37 16:50	08:22 16:15	
8	05:14 21:51	05:56 21:09	20:01 (WEA 17-3)	06:48 20:03	07:38 16:48	08:23 16:15	
9	05:15 21:50	05:58 21:08	20:01 (WEA 17-3)	06:50 20:00	07:40 16:46	08:24 16:14	
10	05:16 21:49	06:00 21:06	20:00 (WEA 17-3)	06:51 19:58	07:42 16:45	08:26 16:14	
11	05:17 21:48	06:01 21:04	20:01 (WEA 17-3)	06:53 19:56	07:44 16:43	08:27 16:14	
12	05:18 21:48	06:03 21:02	20:00 (WEA 17-3)	06:55 19:53	07:45 16:41	08:28 16:14	
13	05:19 21:47	06:05 21:00	20:01 (WEA 17-3)	06:56 19:51	07:47 16:40	08:29 16:14	
14	05:20 21:46	06:06 20:58	20:01 (WEA 17-3)	06:58 19:49	07:49 16:38	08:30 16:14	
15	05:22 21:45	06:08 20:56	20:02 (WEA 17-3)	07:00 19:46	07:51 16:37	08:31 16:14	
16	05:23 21:44	06:10 20:54	20:02 (WEA 17-3)	07:01 19:44	07:52 16:35	08:32 16:14	
17	05:24 21:43	06:11 20:52	20:03 (WEA 17-3)	07:03 19:41	07:54 16:34	08:32 16:14	
18	05:25 21:42	06:13 20:50	20:05 (WEA 17-3)	07:05 19:39	07:56 16:33	08:33 16:14	
19	05:27 21:41	06:15 20:48	20:07 (WEA 17-3)	07:06 19:37	07:58 16:31	08:34 16:14	
20	05:28 21:39	06:16 20:45	20:15 (WEA 17-3)	07:08 19:34	07:59 16:30	08:35 16:15	
21	05:29 21:38	06:18 20:43		07:10 19:32	08:01 16:29	08:35 16:15	
22	05:31 21:37	06:20 20:41		07:11 19:30	08:03 16:27	08:36 16:15	
23	05:32 21:35	06:21 20:39		07:13 19:27	08:05 16:26	08:36 16:16	
24	05:33 21:34	06:23 20:37		07:15 19:25	08:07 16:25	08:37 16:17	
25	05:35 21:33	06:25 20:35		07:16 19:22	08:09 16:24	08:37 16:17	
26	05:36 21:31	06:26 20:32		07:18 19:20	08:10 16:23	08:38 16:18	
27	05:38 21:30	06:28 20:30		07:20 19:18	08:12 16:22	08:38 16:19	
28	05:39 21:28	06:30 20:28		07:21 19:15	08:14 16:21	08:38 16:19	
29	05:41 21:27	06:31 20:26		07:23 19:13	08:16 16:20	08:38 16:20	
30	05:42 21:25	20:11 (WEA 17-3) 06:33		07:25 19:11	08:18 16:19	08:38 16:21	
31	05:44 21:24	20:17 (WEA 17-3) 06:35			07:19 17:05	08:38 16:21	
		20:08 (WEA 17-3) 06:35			07:19 17:03	08:38 16:22	
		20:19 (WEA 17-3) 06:35			07:19 17:03	08:38 16:22	
Sonnenscheinstunden	505	456		382	332	265	241
astr.max.mögl.Beschattung	21	387					

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

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

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenziertes Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 23b - Große Haar 9/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	09:23 (WEA 18-3) 09:41 (WEA 18-3)	08:11 17:12	07:17 18:04	07:06 20:00	05:59 20:52
2	08:38 16:24	09:23 (WEA 18-3) 09:42 (WEA 18-3)	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54
3	08:38 16:25	09:22 (WEA 18-3) 09:42 (WEA 18-3)	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55
4	08:38 16:27	09:23 (WEA 18-3) 09:44 (WEA 18-3)	08:07 17:17	07:11 18:10	06:59 20:05	05:53 20:57
5	08:38 16:28	09:23 (WEA 18-3) 09:45 (WEA 18-3)	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59
6	08:38 16:29	09:23 (WEA 18-3) 09:45 (WEA 18-3)	08:03 17:21	07:06 18:13	06:54 20:08	05:50 21:00
7	08:37 16:30	09:24 (WEA 18-3) 09:46 (WEA 18-3)	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02
8	08:37 16:32	09:23 (WEA 18-3) 09:47 (WEA 18-3)	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04
9	08:36 16:33	09:23 (WEA 18-3) 09:47 (WEA 18-3)	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05
10	08:36 16:34	09:24 (WEA 18-3) 09:48 (WEA 18-3)	07:56 17:29	06:57 18:21	06:45 20:15	05:42 21:07
11	08:35 16:36	09:24 (WEA 18-3) 09:49 (WEA 18-3)	07:54 17:30	06:55 18:23	06:42 20:17	05:41 21:09
12	08:34 16:37	09:24 (WEA 18-3) 09:49 (WEA 18-3)	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10
13	08:34 16:39	09:24 (WEA 18-3) 09:50 (WEA 18-3)	07:50 17:34	06:50 18:26	06:38 20:21	05:37 21:12
14	08:33 16:40	09:08 (WEA 18-4) 09:50 (WEA 18-3)	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14
15	08:32 16:42	09:05 (WEA 18-4) 09:51 (WEA 18-3)	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15
16	08:31 16:43	09:04 (WEA 18-4) 09:51 (WEA 18-3)	07:45 17:40	06:43 18:31	06:31 20:26	05:33 21:17
17	08:30 16:45	09:03 (WEA 18-4) 09:51 (WEA 18-3)	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18
18	08:30 16:47	09:03 (WEA 18-4) 09:52 (WEA 18-3)	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20
19	08:29 16:48	09:03 (WEA 18-4) 09:52 (WEA 18-3)	07:39 17:46	06:36 18:37	06:24 20:31	05:28 21:21
20	08:27 16:50	09:02 (WEA 18-4) 09:52 (WEA 18-3)	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23
21	08:26 16:52	09:02 (WEA 18-4) 09:52 (WEA 18-3)	07:34 17:49	06:31 18:40	06:20 20:35	05:25 21:24
22	08:25 16:53	09:02 (WEA 18-4) 09:52 (WEA 18-3)	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26
23	08:24 16:55	09:01 (WEA 18-4) 09:51 (WEA 18-3)	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27
24	08:23 16:57	09:02 (WEA 18-4) 09:52 (WEA 18-3)	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29
25	08:22 16:59	09:02 (WEA 18-4) 09:52 (WEA 18-3)	07:26 17:57	06:22 18:47	06:12 20:41	05:20 21:30
26	08:20 17:01	09:02 (WEA 18-4) 09:50 (WEA 18-3)	07:24 17:59	06:20 19:49	06:10 20:43	05:19 21:31
27	08:19 17:02	09:03 (WEA 18-4) 09:50 (WEA 18-3)	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33
28	08:17 17:04	09:03 (WEA 18-4) 09:48 (WEA 18-3)	07:19 18:02	06:15 19:53	06:05 20:47	05:16 21:34
29	08:16 17:06	09:03 (WEA 18-4) 09:46 (WEA 18-3)	07:17 19:54	06:13 19:54	06:03 20:48	05:15 21:35
30	08:15 17:08	09:05 (WEA 18-4) 09:23 (WEA 18-4)	07:15 19:56	06:11 19:56	06:01 20:50	05:14 21:37
31	08:13 17:10	09:05 (WEA 18-4) 09:22 (WEA 18-4)	07:13 19:58	06:09 19:58	05:13 21:38	21:54
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung	954	181	177			

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 23b - Große Haar 9/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	07:25 16:57	08:16 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:32 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:31 16:51	08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	08:26 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	07:50 16:34	08:33 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	07:52 16:33	08:35 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	08:36 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	07:56 16:30	08:37 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:57 16:29	08:38 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	08:39 16:15
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	08:39 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:03 16:25	08:40 16:17
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15	08:04 16:24	08:40 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:13	08:06 16:23	08:41 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11	08:07 16:22	08:43 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	08:14 17:09	08:09 16:21	08:45 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:16 17:07	08:11 16:20	08:47 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	08:18 17:05	08:12 16:19	09:05 16:21
31	05:44 21:24	06:35 20:21		07:19 17:03		08:38 16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung				319	729	562

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 24a - Große Haar 7/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender

2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember	
1	08:39 16:23	08:11 17:12	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39	05:08 21:54	21:04 (WEA 17-2) 21:22	05:45 20:19	06:36 19:08	07:26 17:01	08:14 16:19	
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54	05:12 21:40	05:09 21:54	21:05 (WEA 17-2) 21:22	05:47 20:17	06:38 19:06	07:28 16:59	08:15 16:18	
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41	05:10 21:53	21:05 (WEA 17-2) 21:21	05:49 20:18	06:40 19:04	07:30 16:57	08:16 16:17	
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	05:54 20:57	05:10 21:42	05:11 21:53	21:04 (WEA 17-2) 21:12	05:50 20:17	06:41 19:01	07:32 16:55	08:18 16:17	
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:43	05:11 21:52	21:02 (WEA 17-2) 21:12	05:52 20:10	06:43 18:59	07:33 16:53	08:19 16:16	
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	05:50 21:00	05:09 21:44	05:12 21:52	21:01 (WEA 17-2) 21:13	05:53 20:07	06:45 18:57	07:35 16:51	08:21 16:16	
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:45	05:13 21:51	21:01 (WEA 17-2) 21:14	05:55 20:05	06:46 18:54	07:37 16:50	08:22 16:15	
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46	05:14 21:51	21:01 (WEA 17-2) 21:14	05:57 20:09	06:48 18:52	07:38 16:48	08:23 16:15	
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47	05:15 21:50	21:01 (WEA 17-2) 21:16	05:58 20:08	06:50 18:50	07:40 16:46	08:24 16:14	
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:43 21:07	05:06 21:48	05:16 21:49	21:01 (WEA 17-2) 21:17	06:00 19:58	06:51 18:47	07:42 16:45	08:26 16:14	
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49	05:17 21:48	21:00 (WEA 17-2) 21:16	06:01 19:56	06:53 18:45	07:44 16:43	08:27 16:14	
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50	05:18 21:48	21:00 (WEA 17-2) 21:17	06:03 19:53	06:55 18:43	07:45 16:41	08:28 16:14	
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50	05:19 21:47	21:01 (WEA 17-2) 21:18	06:05 19:51	06:56 18:41	07:47 16:40	08:29 16:14	
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51	05:20 21:46	21:01 (WEA 17-2) 21:18	06:06 19:49	06:58 18:38	07:49 16:38	08:30 16:14	
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15	05:05 21:52	05:22 21:45	21:01 (WEA 17-2) 21:19	06:08 19:46	07:00 18:36	07:51 16:37	08:31 16:14	
16	08:31 16:43	07:45 17:40	06:43 18:32	06:31 20:26	05:33 21:17	05:05 21:52	05:23 21:44	21:00 (WEA 17-2) 21:18	06:10 19:44	07:01 18:34	07:52 16:35	08:32 16:14	
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53	05:24 21:43	21:00 (WEA 17-2) 21:19	06:11 19:41	07:03 18:32	07:54 16:34	08:32 16:14	
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20	05:04 21:53	05:25 21:42	21:00 (WEA 17-2) 21:19	06:13 19:39	07:05 18:30	07:56 16:33	08:33 16:14	
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31	05:28 21:21	05:04 21:53	05:27 21:41	21:01 (WEA 17-2) 21:19	06:15 19:37	07:06 18:27	07:58 16:31	08:34 16:14	
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23	05:04 21:54	05:28 21:39	21:02 (WEA 17-2) 21:20	06:16 19:34	07:08 18:25	08:00 16:30	07:56 16:15	
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:35	05:25 21:24	05:05 21:54	05:29 21:38	21:02 (WEA 17-2) 21:20	06:18 19:32	07:10 18:23	08:01 16:29	07:57 16:15	
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54	05:31 21:37	21:02 (WEA 17-2) 21:20	06:20 19:30	07:11 18:21	08:03 16:27	07:59 16:16	
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	05:05 21:54	05:32 21:35	21:02 (WEA 17-2) 21:20	06:21 19:27	07:13 18:19	08:05 16:26	08:01 16:16	
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55	05:33 21:34	21:03 (WEA 17-2) 21:21	06:23 19:25	07:15 18:17	08:07 16:25	08:03 16:17	
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:41	05:20 21:30	05:05 21:55	05:35 21:33	21:02 (WEA 17-2) 21:21	06:25 19:22	07:16 18:15	08:09 16:24	08:04 16:17	
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	05:19 21:31	05:06 21:55	05:36 21:31	21:02 (WEA 17-2) 21:21	06:26 19:20	07:18 18:13	08:10 16:23	08:06 16:18	
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33	05:06 21:55	05:38 21:30	21:03 (WEA 17-2) 21:21	06:28 19:18	07:20 18:11	08:12 16:22	08:07 16:19	
28	08:17 17:04	07:20 18:03	06:15 19:53	06:05 20:47	05:16 21:34	05:07 21:55	05:39 21:28	21:03 (WEA 17-2) 21:21	06:30 19:15	07:21 17:09	08:14 16:21	08:09 16:19	
29	08:16 17:06	07:13 19:54	06:03 20:48	05:15 21:35	05:07 21:54	05:12 21:54	05:41 21:27	21:04 (WEA 17-2) 21:21	06:31 19:13	07:23 17:07	07:16 16:20	08:11 16:20	
30	08:15 17:08	07:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54	05:10 21:54	05:42 21:25	21:04 (WEA 17-2) 21:21	06:33 19:11	07:25 17:05	07:18 16:19	08:12 16:21	
31	08:13 17:10	07:08 19:58	05:08 21:38	05:13 21:38	05:13 21:38	05:13 21:38	05:44 21:24	05:44 20:21	06:35 19:03	07:19 17:03	07:19 16:22	08:38 16:22	
	Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
	astr.max.mögl.Beschattung						448	130					

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 24b - Große Haar 7/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:39 16:23	08:11 17:12	07:17 18:04	07:06 20:00	05:59 20:52	05:12 21:39
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54	05:12 21:40
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55	05:11 21:41
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05	05:54 20:57	05:10 21:42
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59	05:09 21:43
6	08:38 16:29	08:03 17:21	07:06 18:14	06:54 20:08	05:50 21:00	05:08 21:44
7	08:37 16:30	08:02 17:23	07:04 18:15	06:52 20:10	05:48 21:02	05:08 21:45
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04	05:07 21:46
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05	05:07 21:47
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:43 21:07	05:06 21:48
11	08:35 16:36	07:54 17:31	06:55 18:23	06:42 20:17	05:41 21:09	05:06 21:49
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10	05:05 21:50
13	08:34 16:39	07:51 17:34	06:50 18:26	06:38 20:21	05:37 21:12	05:05 21:50
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:14	05:05 21:51
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15	05:05 21:52
16	08:31 16:43	07:45 17:40	06:43 18:32	06:31 20:26	05:33 21:17	05:05 21:52
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18	05:04 21:53
18	08:30 16:47	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20	05:04 21:53
19	08:29 16:48	07:39 17:46	06:36 18:37	06:24 20:31	05:28 21:21	05:04 21:53
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23	05:04 21:54
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:35	05:25 21:24	05:05 21:54
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	05:05 21:54
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	05:05 21:54
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	05:05 21:55
25	08:22 16:59	07:26 17:57	06:22 19:47	06:12 20:41	05:20 21:30	05:05 21:55
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	05:19 21:31	05:06 21:55
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33	05:06 21:55
28	08:17 17:04	07:20 18:03	06:15 19:53	06:05 20:47	05:16 21:34	05:07 21:55
29	08:16 17:06		06:13 19:54	06:03 20:48	05:15 21:35	05:07 21:54
30	08:15 17:08		06:10 19:56	06:01 20:50	05:14 21:37	05:08 21:54
31	08:13 17:10		06:08 19:58		05:13 21:38	
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung		306		198		

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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 24b - Große Haar 7/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September		Oktober		November		Dezember	
1	05:08 21:54	05:45 21:22	06:36 20:19		07:26 19:08		07:21 17:01	19	07:58 (WEA 18-3) 08:17 (WEA 18-3)	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17		07:28 19:06		07:23 16:59	17	07:59 (WEA 18-3) 08:16 (WEA 18-3)	08:15 16:18
3	05:10 21:53	05:49 21:18	06:40 20:14		07:30 19:04		07:25 16:57	13	08:01 (WEA 18-3) 08:14 (WEA 18-3)	08:16 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12		07:32 19:01		07:27 16:55	9	08:03 (WEA 18-3) 08:12 (WEA 18-3)	08:18 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10		07:33 18:59		07:29 16:53			08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07		07:35 18:57		07:31 16:51			08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05		07:37 18:54		07:32 16:50			08:22 16:15
8	05:14 21:51	05:57 21:09	06:48 20:03		07:38 18:52		07:34 16:48			08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00		07:40 18:50		07:36 16:46			08:24 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58		07:42 18:47		07:38 16:45			08:26 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56		07:44 18:45		07:40 16:43			08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53		07:45 18:43		07:41 16:41			08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51		07:47 18:41		07:43 16:40			08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49		07:49 18:38		07:45 16:38			08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46		07:51 18:36		07:47 16:37			08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44		07:52 18:34		07:49 16:35			08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41		07:54 18:32		07:50 16:34			08:32 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39		07:56 18:30		07:52 16:33			08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	10	07:57 (WEA 18-1) 08:07 (WEA 18-1)	07:58 18:27	09:05 (WEA 18-3) 09:11 (WEA 18-3)	6	07:54 09:01 (WEA 18-3)	07:54 16:31
20	05:28 21:39	06:16 20:45	07:08 19:34	14	07:54 (WEA 18-1) 08:08 (WEA 18-1)	08:00 18:25	09:01 (WEA 18-3) 09:14 (WEA 18-3)	13	07:56 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	16	07:53 (WEA 18-1) 08:09 (WEA 18-1)	08:01 18:23	09:00 (WEA 18-3) 09:16 (WEA 18-3)	16	07:57 16:29	08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	18	07:52 (WEA 18-1) 08:10 (WEA 18-1)	08:03 18:21	09:00 (WEA 18-3) 09:17 (WEA 18-3)	19	07:59 16:27	08:36 16:16
23	05:32 21:35	06:21 20:39	07:13 19:27	20	07:50 (WEA 18-1) 08:10 (WEA 18-1)	08:05 18:19	08:57 (WEA 18-3) 09:18 (WEA 18-3)	21	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	20	07:50 (WEA 18-1) 08:10 (WEA 18-1)	08:07 18:17	08:57 (WEA 18-3) 09:19 (WEA 18-3)	22	08:03 16:25	08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:22	20	07:50 (WEA 18-1) 08:10 (WEA 18-1)	08:09 18:15	08:56 (WEA 18-3) 09:19 (WEA 18-3)	23	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	19	07:49 (WEA 18-1) 08:08 (WEA 18-1)	08:10 18:13	08:56 (WEA 18-3) 09:19 (WEA 18-3)	23	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	18	07:50 (WEA 18-1) 08:08 (WEA 18-1)	08:12 18:11	08:56 (WEA 18-3) 09:19 (WEA 18-3)	23	08:07 16:22	08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	17	07:50 (WEA 18-1) 08:07 (WEA 18-1)	07:14 17:09	07:56 (WEA 18-3) 08:19 (WEA 18-3)	23	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	14	07:51 (WEA 18-1) 08:05 (WEA 18-1)	07:16 17:07	07:56 (WEA 18-3) 08:19 (WEA 18-3)	23	08:11 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	9	07:53 (WEA 18-1) 08:02 (WEA 18-1)	07:18 17:05	07:56 (WEA 18-3) 08:18 (WEA 18-3)	22	08:12 16:19	08:38 16:21
31	05:44 21:24	06:35 20:21				07:19 17:03	07:57 (WEA 18-3) 08:18 (WEA 18-3)	21		08:38 16:22
Sonnenscheinstunden	505	456	382		332	255	265	58		241
astr.max.mögl.Beschattung			195							

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 25a - Zur Dasslage 7A/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:23	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:21	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:00	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:18
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:11	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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



Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 25b - Zur Dasslage 7A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 16:23	09:23 (WEA 18-4) 17:12	08:11 17:12	07:17 18:04	08:01 (WEA 18-2) 20:00	05:59 21:39
2	08:38 16:24	09:24 (WEA 18-4) 17:13	08:10 17:13	07:15 18:06	08:01 (WEA 18-2) 20:01	05:57 21:40
3	08:38 16:25	09:23 (WEA 18-4) 17:15	08:08 17:15	07:13 18:08	08:01 (WEA 18-2) 20:03	05:55 21:41
4	08:38 16:27	09:24 (WEA 18-4) 17:17	08:07 17:17	07:11 18:10	08:02 (WEA 18-2) 20:05	05:53 21:42
5	08:38 16:28	09:24 (WEA 18-4) 17:19	08:05 17:19	07:08 18:12	08:03 (WEA 18-2) 20:07	05:52 21:43
6	08:37 16:29	09:24 (WEA 18-4) 17:21	08:03 17:21	07:06 18:13	08:05 (WEA 18-1) 20:08	05:50 21:44
7	08:37 16:30	09:25 (WEA 18-4) 17:23	08:01 17:23	07:04 18:15	08:04 (WEA 18-1) 20:10	05:48 21:45
8	08:37 16:32	09:24 (WEA 18-4) 17:25	08:00 17:25	07:02 18:17	08:05 (WEA 18-1) 20:12	05:46 21:46
9	08:36 16:33	09:24 (WEA 18-4) 17:27	07:58 17:27	06:59 18:19	08:06 (WEA 18-1) 20:14	05:44 21:47
10	08:36 16:34	09:25 (WEA 18-4) 17:29	07:56 17:29	06:57 18:21	08:07 (WEA 18-1) 20:15	05:42 21:48
11	08:35 16:36	09:25 (WEA 18-4) 17:30	07:54 17:30	06:55 18:23	08:09 (WEA 18-1) 20:17	05:41 21:49
12	08:34 16:37	09:25 (WEA 18-4) 17:32	07:52 17:32	06:52 18:24	08:28 (WEA 18-1) 20:19	05:39 21:50
13	08:34 16:39	09:25 (WEA 18-4) 17:34	07:50 17:34	06:50 18:26	08:11 (WEA 18-1) 20:19	05:37 21:50
14	08:33 16:40	09:25 (WEA 18-4) 17:36	07:49 17:36	06:48 18:28	06:38 20:21	05:35 21:51
15	08:32 16:42	09:26 (WEA 18-4) 17:38	07:47 17:38	06:45 18:30	06:36 20:22	05:34 21:51
16	08:31 16:43	09:26 (WEA 18-4) 17:40	07:45 17:40	06:43 18:31	06:33 20:24	05:32 21:51
17	08:30 16:45	09:27 (WEA 18-4) 17:42	07:43 17:42	06:41 18:33	06:31 20:26	05:31 21:52
18	08:29 16:47	09:27 (WEA 18-4) 17:44	07:41 17:44	06:38 18:35	06:29 20:28	05:29 21:53
19	08:28 16:48	09:28 (WEA 18-4) 17:46	07:39 17:46	06:36 18:37	06:27 20:29	05:28 21:53
20	08:27 16:50	09:28 (WEA 18-4) 17:48	07:37 17:48	06:34 18:39	06:24 20:31	05:27 21:53
21	08:26 16:52	09:29 (WEA 18-4) 17:49	07:34 17:49	06:31 18:40	06:22 20:32	05:25 21:54
22	08:25 16:53	09:30 (WEA 18-4) 17:51	07:32 17:51	06:29 18:42	06:20 20:34	05:24 21:54
23	08:24 16:55	09:30 (WEA 18-4) 17:53	07:30 17:53	06:27 18:44	06:18 20:36	05:22 21:54
24	08:23 16:57	09:31 (WEA 18-4) 17:55	07:28 17:55	06:24 18:46	06:16 20:38	05:21 21:54
25	08:21 16:59	09:32 (WEA 18-4) 17:57	07:26 17:57	06:22 18:48	06:14 20:40	05:20 21:55
26	08:20 17:00	09:33 (WEA 18-4) 17:59	07:24 17:59	06:20 18:50	06:12 20:42	05:19 21:55
27	08:19 17:02	09:35 (WEA 18-4) 18:01	07:22 18:01	06:17 18:51	06:10 20:44	05:18 21:55
28	08:17 17:04	09:37 (WEA 18-4) 18:02	07:19 18:02	06:15 18:53	06:09 20:46	05:16 21:55
29	08:16 17:06	09:40 (WEA 18-4) 18:04	07:17 18:04	06:13 18:55	06:07 20:48	05:15 21:55
30	08:15 17:08	09:44 (WEA 18-4) 18:06	07:15 18:06	06:11 18:57	06:05 20:50	05:14 21:55
31	08:13 17:10		07:13 18:08	06:09 18:59	06:03 20:52	05:13 21:55
	Sonnenscheinstunden 256					
	astr.max.mögl.Beschattung 1229					
		275	253	339	416	502

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)

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 25b - Zur Dasslage 7A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	08:51 (WEA 18-1) 09:01 (WEA 18-1)	07:23 16:59
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	08:48 (WEA 18-1) 09:04 (WEA 18-1)	07:25 16:57
4	05:11 21:53	05:50 21:17	06:41 20:12	07:31 19:01	08:45 (WEA 18-1) 09:06 (WEA 18-1)	07:27 16:55
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	08:44 (WEA 18-1) 09:08 (WEA 18-1)	07:29 16:53
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	08:42 (WEA 18-1) 09:08 (WEA 18-1)	07:30 16:51
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	08:41 (WEA 18-1) 09:09 (WEA 18-1)	07:32 16:50
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	08:40 (WEA 18-1) 09:10 (WEA 18-1)	07:34 16:48
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	08:39 (WEA 18-1) 09:10 (WEA 18-1)	07:36 16:46
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	08:38 (WEA 18-2) 09:10 (WEA 18-1)	07:38 16:45
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	08:35 (WEA 18-2) 09:10 (WEA 18-1)	07:40 16:43
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	08:35 (WEA 18-2) 09:10 (WEA 18-1)	07:41 16:41
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	08:34 (WEA 18-2) 09:09 (WEA 18-1)	07:43 16:40
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	08:34 (WEA 18-2) 09:09 (WEA 18-1)	07:45 16:38
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	08:33 (WEA 18-2) 09:09 (WEA 18-1)	07:47 16:37
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	08:33 (WEA 18-2) 09:08 (WEA 18-1)	07:49 16:35
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	08:33 (WEA 18-2) 09:06 (WEA 18-1)	07:50 16:34
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	08:33 (WEA 18-2) 09:05 (WEA 18-1)	07:52 16:33
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	08:34 (WEA 18-2) 09:04 (WEA 18-1)	07:54 16:31
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	08:35 (WEA 18-2) 09:02 (WEA 18-1)	07:56 16:30
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	08:36 (WEA 18-2) 09:00 (WEA 18-1)	07:57 16:29
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	08:38 (WEA 18-2) 08:57 (WEA 18-1)	07:59 16:27
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:41 (WEA 18-2) 08:47 (WEA 18-2)	08:01 16:26
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:02 16:25	08:02 16:25
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15	08:04 16:24	08:04 16:24
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:13	08:06 16:23	08:06 16:23
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:10	08:07 16:22	08:07 16:22
28	05:39 21:28	06:30 20:28	07:21 19:15	07:14 17:08	08:09 16:21	08:09 16:21
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:06	08:10 16:20	08:10 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	07:18 17:05	08:12 16:19	08:12 16:19
31	05:44 21:23	06:35 20:21		07:19 17:03		08:13 16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung				600	573	1625

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

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

LQ13955.2 Fürstenu-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 26a - Zur Dasslage 7/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember		
1	08:38	08:11	07:17	07:05	05:59	19:56 (WEA 17-3)	05:12	05:08	05:45	06:36	07:26	07:21	08:14	
	16:23	17:12	18:04	20:00	20:52	19	20:15 (WEA 17-3)	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	19:56 (WEA 17-3)	05:12	05:09	05:47	06:38	07:28	07:23	08:15	
	16:24	17:13	18:06	20:01	20:54	18	20:14 (WEA 17-3)	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	19:57 (WEA 17-3)	05:11	05:10	05:48	06:40	07:30	07:25	08:16	
	16:25	17:15	18:08	20:03	20:55	16	20:13 (WEA 17-3)	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	19:57 (WEA 17-3)	05:10	05:11	05:50	06:41	07:31	07:27	08:18	
	16:27	17:17	18:10	20:05	20:57	15	20:12 (WEA 17-3)	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	19:59 (WEA 17-3)	05:09	05:11	05:52	06:43	07:33	07:29	08:19	
	16:28	17:19	18:12	20:07	20:59	13	20:12 (WEA 17-3)	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:38	08:03	07:06	06:54	05:50	20:01 (WEA 17-3)	05:08	05:12	05:53	06:45	07:35	07:30	08:21	
	16:29	17:21	18:13	20:08	21:00	9	20:10 (WEA 17-3)	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	20:13 (WEA 17-3)	06:46	07:37	07:32	08:22	
	16:30	17:23	18:15	20:10	21:02	8	20:11	21:11	21:11	5	20:18 (WEA 17-3)	20:05	18:54	16:50
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	20:09 (WEA 17-3)	06:48	07:38	07:34	08:23	
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	11	20:20 (WEA 17-3)	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	20:08 (WEA 17-3)	06:50	07:40	07:36	08:24	
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	14	20:22 (WEA 17-3)	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	20:07 (WEA 17-3)	06:51	07:42	07:38	08:26	
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	15	20:22 (WEA 17-3)	20:00	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	20:06 (WEA 17-3)	06:53	07:44	07:40	08:27	
	16:36	17:30	18:23	20:17	21:09	21:49	21:48	21:04	17	20:23 (WEA 17-3)	20:00	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	20:05 (WEA 17-3)	06:55	07:45	07:41	08:28	
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	18	20:23 (WEA 17-3)	20:00	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	20:05 (WEA 17-3)	06:56	07:47	07:43	08:29	
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19	20:24 (WEA 17-3)	20:00	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	20:04 (WEA 17-3)	06:58	07:49	07:45	08:30	
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19	20:23 (WEA 17-3)	20:00	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	20:04 (WEA 17-3)	07:00	07:51	07:47	08:31	
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19	20:23 (WEA 17-3)	20:00	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	20:03 (WEA 17-3)	07:01	07:52	07:49	08:32	
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	20	20:23 (WEA 17-3)	20:00	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	20:04 (WEA 17-3)	07:03	07:54	07:50	08:32	
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19	20:23 (WEA 17-3)	20:00	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	20:05 (WEA 17-3)	07:05	07:56	07:52	08:33	
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	17	20:22 (WEA 17-3)	20:00	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	20:05 (WEA 17-3)	07:06	07:58	07:54	08:34	
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	16	20:21 (WEA 17-3)	20:00	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	20:06 (WEA 17-3)	07:08	08:00	07:56	08:35	
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	13	20:19 (WEA 17-3)	20:00	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	20:07 (WEA 17-3)	07:10	08:01	07:57	08:35	
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	10	20:17 (WEA 17-3)	20:00	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	20:10 (WEA 17-3)	07:11	08:03	07:59	08:36	
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	4	20:14 (WEA 17-3)	20:00	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	20:13 (WEA 17-3)	07:13	08:05	08:01	08:36	
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	11	20:13 (WEA 17-3)	20:00	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	20:00 (WEA 17-3)	07:15	08:07	08:02	08:37	
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	14	20:14 (WEA 17-3)	20:00	18:17	16:25	16:17
25	08:21	07:26	06:22	06:12	05:20	05:05	05:35	06:25	19:59 (WEA 17-3)	07:16	08:09	08:04	08:37	
	16:59	17:57	18:47	20:41	21:30	21:55	21:33	20:35	16	20:15 (WEA 17-3)	20:00	18:15	16:24	16:17
26	08:20	07:24	06:20	06:09	05:19	05:06	05:36	06:26	20:16 (WEA 17-3)	07:18	08:10	08:06	08:38	
	17:00	17:59	18:49	20:43	21:31	21:55	21:31	20:32	18	20:16 (WEA 17-3)	20:00	18:13	16:23	16:18
27	08:19	07:22	06:17	06:07	05:18	05:06	05:38	06:28	19:57 (WEA 17-3)	07:20	08:12	08:07	08:38	
	17:02	18:01	19:11	20:45	21:33	21:55	21:30	20:30	19	20:16 (WEA 17-3)	20:00	18:11	16:22	16:18
28	08:17	07:19	06:15	06:05	05:16	05:07	05:39	06:30	20:17 (WEA 17-3)	07:22	08:14	08:09	08:38	
	17:04	18:02	19:13	20:47	21:34	21:55	21:28	20:28	19	20:16 (WEA 17-3)	20:00	18:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	20:18 (WEA 17-3)	07:23	08:16	08:11	08:38	
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	20	20:16 (WEA 17-3)	20:00	18:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	19:56 (WEA 17-3)	07:25	08:18	08:12	08:38	
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	20	20:16 (WEA 17-3)	20:00	18:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35			07:19		08:38	
	17:10		19:58		21:38		21:23	20:21			17:03		16:22	
Sonnenscheinstunden	256	275	366	416	487	502	505	456	236	382	332	265	241	
astr.max.mögl.Beschattung				142	90									

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 26b - Zur Dasslage 7/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 16:23	09:22 (WEA 18-4) 08:11 10:32 (WEA 18-3) 17:12	07:17 18:04	07:58 (WEA 18-2) 07:05	05:59 20:52	05:12 21:39
2	08:38 16:24	09:22 (WEA 18-4) 08:10 10:33 (WEA 18-3) 17:13	07:15 18:06	07:58 (WEA 18-2) 07:03	05:57 20:54	05:12 21:40
3	08:38 16:25	09:21 (WEA 18-4) 08:08 10:32 (WEA 18-3) 17:15	07:13 18:08	07:57 (WEA 18-1) 07:01	05:55 20:55	05:11 21:41
4	08:38 16:27	09:22 (WEA 18-4) 08:07 10:33 (WEA 18-3) 17:17	07:11 18:10	07:58 (WEA 18-2) 06:58	05:53 20:57	05:10 21:42
5	08:38 16:28	09:22 (WEA 18-4) 08:05 10:34 (WEA 18-3) 17:19	07:08 18:12	07:59 (WEA 18-2) 06:56	05:52 20:59	05:09 21:43
6	08:37 16:29	09:22 (WEA 18-4) 08:03 10:34 (WEA 18-3) 17:21	07:06 18:13	08:00 (WEA 18-1) 06:54	05:50 21:00	05:08 21:44
7	08:37 16:30	09:22 (WEA 18-4) 08:01 10:35 (WEA 18-3) 17:23	07:04 18:15	08:00 (WEA 18-1) 06:52	05:48 21:02	05:08 21:45
8	08:37 16:32	09:22 (WEA 18-4) 08:00 10:35 (WEA 18-3) 17:25	07:02 18:17	08:00 (WEA 18-1) 06:49	05:46 21:04	05:07 21:46
9	08:36 16:33	09:22 (WEA 18-4) 07:58 10:35 (WEA 18-3) 17:27	06:59 18:19	08:01 (WEA 18-1) 06:47	05:44 21:05	05:07 21:47
10	08:36 16:34	09:23 (WEA 18-4) 07:56 10:35 (WEA 18-3) 17:29	06:57 18:21	08:01 (WEA 18-1) 06:45	05:42 21:07	05:06 21:48
11	08:35 16:36	09:22 (WEA 18-4) 07:54 10:35 (WEA 18-3) 17:30	06:55 18:23	08:02 (WEA 18-1) 06:42	05:41 21:09	05:06 21:49
12	08:34 16:37	09:22 (WEA 18-4) 07:52 10:35 (WEA 18-3) 17:32	06:52 18:24	08:04 (WEA 18-1) 06:40	05:39 21:10	05:05 21:50
13	08:34 16:39	09:22 (WEA 18-4) 07:50 10:35 (WEA 18-3) 17:34	06:50 18:26	08:05 (WEA 18-1) 06:38	05:37 21:12	05:05 21:51
14	08:33 16:40	09:23 (WEA 18-4) 07:49 10:35 (WEA 18-3) 17:36	06:48 18:28	08:05 (WEA 18-1) 06:36	05:36 21:13	05:05 21:52
15	08:32 16:42	09:23 (WEA 18-4) 07:47 10:35 (WEA 18-3) 17:38	06:45 18:30	08:22 (WEA 18-1) 06:33	05:34 21:15	05:05 21:53
16	08:31 16:43	09:23 (WEA 18-4) 07:45 10:35 (WEA 18-3) 17:40	06:43 18:31	08:08 (WEA 18-1) 06:31	05:32 21:17	05:04 21:54
17	08:30 16:45	09:23 (WEA 18-4) 07:43 10:35 (WEA 18-3) 17:42	06:41 18:33	08:19 (WEA 18-1) 06:29	05:31 21:18	05:04 21:55
18	08:29 16:47	09:24 (WEA 18-4) 07:41 10:35 (WEA 18-3) 17:44	06:38 18:35	08:00 (WEA 18-1) 06:27	05:29 21:20	05:04 21:56
19	08:28 16:48	09:24 (WEA 18-4) 07:39 10:34 (WEA 18-3) 17:46	06:36 18:37	08:00 (WEA 18-1) 06:24	05:28 21:21	05:04 21:57
20	08:27 16:50	09:24 (WEA 18-4) 07:37 10:33 (WEA 18-3) 17:48	06:34 18:39	08:00 (WEA 18-1) 06:22	05:27 21:23	05:04 21:58
21	08:26 16:52	09:25 (WEA 18-4) 07:34 10:32 (WEA 18-3) 17:49	06:31 18:40	08:00 (WEA 18-1) 06:20	05:25 21:24	05:04 21:59
22	08:25 16:53	09:26 (WEA 18-4) 07:32 10:31 (WEA 18-3) 17:51	6 08:08 (WEA 18-2) 06:29	08:14 (WEA 18-2) 06:18	05:24 21:26	05:05 22:00
23	08:24 16:55	09:26 (WEA 18-4) 07:30 10:29 (WEA 18-3) 17:53	14 08:19 (WEA 18-1) 06:27	08:05 (WEA 18-2) 06:16	05:23 21:27	05:05 22:01
24	08:23 16:57	09:27 (WEA 18-4) 07:28 10:27 (WEA 18-3) 17:55	22 08:25 (WEA 18-1) 06:24	08:19 (WEA 18-1) 06:14	05:22 21:29	05:05 22:02
25	08:21 16:59	09:28 (WEA 18-4) 07:26 09:50 (WEA 18-4) 17:57	26 08:26 (WEA 18-1) 06:22	08:00 (WEA 18-2) 06:12	05:21 21:30	05:05 22:03
26	08:20 17:00	09:29 (WEA 18-4) 07:24 09:29 (WEA 18-4) 17:59	28 08:28 (WEA 18-1) 19:47	08:26 (WEA 18-1) 06:09	05:20 21:31	05:06 22:04
27	08:19 17:02	09:30 (WEA 18-4) 07:22 09:49 (WEA 18-4) 18:01	31 08:30 (WEA 18-1) 19:49	07:59 (WEA 18-2) 07:20	05:19 21:32	05:06 22:05
28	08:17 17:04	09:31 (WEA 18-4) 07:19 09:48 (WEA 18-4) 18:02	32 07:59 (WEA 18-2) 19:51	08:30 (WEA 18-1) 19:49	05:18 21:33	05:07 22:06
29	08:16 17:06	09:33 (WEA 18-4) 07:17 09:46 (WEA 18-4) 18:00	34 08:31 (WEA 18-1) 19:53	07:59 (WEA 18-2) 07:17	05:17 21:34	05:07 22:07
30	08:15 17:08	09:36 (WEA 18-4) 07:15 09:44 (WEA 18-4) 18:00	07:13 19:55	08:31 (WEA 18-1) 19:53	05:16 21:35	05:07 22:08
31	08:13 17:10		07:08 19:58		05:15 21:36	05:07 22:09
	Sonnenscheinstunden 256		366		416	502
	astr.max.mögl.Beschattung 1320		193		487	502

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 26b - Zur Dasslage 7/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember		
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	08:46 (WEA 18-1) 09:01 (WEA 18-1)	07:21 17:01	08:14 16:19	09:04 (WEA 18-4) 10:17 (WEA 18-3)
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	08:42 (WEA 18-1) 09:02 (WEA 18-1)	07:23 16:59	08:15 16:18	09:05 (WEA 18-4) 10:17 (WEA 18-3)
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	08:41 (WEA 18-1) 09:04 (WEA 18-1)	07:25 16:57	08:16 16:17	09:06 (WEA 18-4) 10:19 (WEA 18-3)
4	05:11 21:53	05:50 21:17	06:41 20:12	07:31 19:01	08:39 (WEA 18-1) 09:05 (WEA 18-1)	07:27 16:55	08:18 16:17	09:06 (WEA 18-4) 10:19 (WEA 18-3)
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	08:38 (WEA 18-1) 09:06 (WEA 18-1)	07:29 16:53	08:19 16:16	09:07 (WEA 18-4) 10:20 (WEA 18-3)
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	08:37 (WEA 18-1) 09:06 (WEA 18-1)	07:30 16:51	08:21 16:16	09:07 (WEA 18-4) 10:20 (WEA 18-3)
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	08:36 (WEA 18-1) 09:06 (WEA 18-1)	07:32 16:50	08:22 16:15	09:08 (WEA 18-4) 10:20 (WEA 18-3)
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	08:35 (WEA 18-1) 09:07 (WEA 18-1)	07:34 16:48	08:23 16:15	09:09 (WEA 18-4) 10:21 (WEA 18-3)
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	08:34 (WEA 18-2) 09:07 (WEA 18-1)	07:36 16:46	08:24 16:14	09:10 (WEA 18-4) 10:21 (WEA 18-3)
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	08:33 (WEA 18-2) 09:07 (WEA 18-1)	07:38 16:45	08:26 16:14	09:11 (WEA 18-4) 10:22 (WEA 18-3)
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	08:32 (WEA 18-2) 09:06 (WEA 18-1)	07:40 16:43	08:27 16:14	09:11 (WEA 18-4) 10:22 (WEA 18-3)
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	08:31 (WEA 18-2) 09:05 (WEA 18-1)	07:41 16:41	08:28 16:14	09:13 (WEA 18-4) 10:23 (WEA 18-3)
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	08:31 (WEA 18-2) 09:05 (WEA 18-1)	07:43 16:40	08:29 16:14	09:14 (WEA 18-4) 10:24 (WEA 18-3)
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	08:31 (WEA 18-2) 09:04 (WEA 18-1)	07:45 16:38	08:30 16:14	09:15 (WEA 18-4) 10:24 (WEA 18-3)
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	08:31 (WEA 18-2) 09:04 (WEA 18-1)	07:47 16:37	08:31 16:14	09:15 (WEA 18-4) 10:24 (WEA 18-3)
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	08:31 (WEA 18-2) 09:03 (WEA 18-1)	07:49 16:35	08:32 16:14	09:16 (WEA 18-4) 10:25 (WEA 18-3)
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	08:30 (WEA 18-2) 09:00 (WEA 18-1)	07:50 16:34	08:32 16:14	09:16 (WEA 18-4) 10:25 (WEA 18-3)
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	08:31 (WEA 18-2) 08:59 (WEA 18-1)	07:52 16:33	08:33 16:14	09:17 (WEA 18-4) 10:25 (WEA 18-3)
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	08:32 (WEA 18-2) 08:57 (WEA 18-1)	07:54 16:31	08:34 16:14	09:18 (WEA 18-4) 10:26 (WEA 18-3)
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	08:34 (WEA 18-2) 08:54 (WEA 18-1)	07:56 16:30	08:35 16:15	09:18 (WEA 18-4) 10:26 (WEA 18-3)
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	08:36 (WEA 18-2) 08:47 (WEA 18-2)	07:57 16:29	08:35 16:15	09:19 (WEA 18-4) 10:27 (WEA 18-3)
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21		07:59 16:27	08:36 16:15	09:20 (WEA 18-4) 10:28 (WEA 18-3)
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19		08:01 16:26	08:36 16:16	09:20 (WEA 18-4) 10:28 (WEA 18-3)
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17		08:02 16:25	08:37 16:17	09:20 (WEA 18-4) 10:28 (WEA 18-3)
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15		08:04 16:24	08:37 16:17	09:21 (WEA 18-4) 10:29 (WEA 18-3)
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:13		08:06 16:23	08:38 16:18	09:21 (WEA 18-4) 10:29 (WEA 18-3)
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:11		08:07 16:22	08:38 16:18	09:21 (WEA 18-4) 10:30 (WEA 18-3)
28	05:39 21:28	06:30 20:28	07:21 19:15	08:14 17:08		08:09 16:21	08:38 16:19	09:21 (WEA 18-4) 10:30 (WEA 18-3)
29	05:41 21:27	06:31 20:26	07:23 19:13	08:16 17:06		08:10 16:20	08:38 16:20	09:21 (WEA 18-4) 10:30 (WEA 18-3)
30	05:42 21:25	06:33 20:23	07:25 19:11	08:18 17:05	08:50 (WEA 18-1) 08:56 (WEA 18-1)	07:18 16:19	08:38 16:21	09:22 (WEA 18-4) 10:31 (WEA 18-3)
31	05:44 21:23	06:35 20:21		07:19 17:03			08:38 16:22	09:22 (WEA 18-4) 10:31 (WEA 18-3)
Sonnenscheinstunden	505	456	382	332	265	241		
astr.max.mögl.Beschattung			6	584	675	1538		

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 27a - Zur Dasslage 7/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:54	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:23	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:41	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:21	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:00	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 27b - Zur Dasslage 8/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 16:23	09:50 (WEA 18-3) 10:24 (WEA 18-3)	08:11 17:12	07:17 18:04	07:05 20:00	05:59 20:52
2	08:38 16:24	09:51 (WEA 18-3) 10:25 (WEA 18-3)	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:54
3	08:38 16:25	09:51 (WEA 18-3) 10:25 (WEA 18-3)	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55
4	08:38 16:27	09:51 (WEA 18-3) 10:26 (WEA 18-3)	08:07 17:17	07:11 18:10	06:58 20:05	05:53 20:57
5	08:38 16:28	09:23 (WEA 18-4) 10:27 (WEA 18-3)	08:05 17:19	07:08 18:12	06:56 20:07	05:52 20:59
6	08:37 16:29	09:21 (WEA 18-4) 10:27 (WEA 18-3)	08:03 17:21	07:06 18:13	06:54 20:08	05:50 21:00
7	08:37 16:30	09:20 (WEA 18-4) 10:28 (WEA 18-3)	08:01 17:23	07:04 18:15	06:52 20:10	05:48 21:02
8	08:37 16:32	09:19 (WEA 18-4) 10:28 (WEA 18-3)	08:00 17:25	07:02 18:17	06:49 20:12	05:46 21:04
9	08:36 16:33	09:18 (WEA 18-4) 10:28 (WEA 18-3)	07:58 17:27	06:59 18:19	06:47 20:14	05:44 21:05
10	08:36 16:34	09:19 (WEA 18-4) 10:29 (WEA 18-3)	07:56 17:29	06:57 18:21	06:45 20:15	05:42 21:07
11	08:35 16:36	09:18 (WEA 18-4) 10:29 (WEA 18-3)	07:54 17:30	06:55 18:23	06:42 20:17	05:41 21:09
12	08:34 16:37	09:18 (WEA 18-4) 10:29 (WEA 18-3)	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10
13	08:34 16:39	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:50 17:34	06:50 18:26	06:38 20:21	05:37 21:12
14	08:33 16:40	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:49 17:36	06:48 18:28	06:36 20:22	05:36 21:13
15	08:32 16:42	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:47 17:38	06:45 18:30	06:33 20:24	05:34 21:15
16	08:31 16:43	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:45 17:40	06:43 18:31	06:31 20:26	05:32 21:17
17	08:30 16:45	09:17 (WEA 18-4) 10:31 (WEA 18-3)	07:43 17:42	06:41 18:33	06:29 20:28	05:31 21:18
18	08:29 16:47	09:17 (WEA 18-4) 10:31 (WEA 18-3)	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20
19	08:28 16:48	09:17 (WEA 18-4) 10:31 (WEA 18-3)	07:39 17:46	06:36 18:36	06:24 20:31	05:28 21:21
20	08:27 16:50	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:37 17:48	06:34 18:39	06:22 20:33	05:27 21:23
21	08:26 16:52	09:17 (WEA 18-4) 10:30 (WEA 18-3)	07:34 17:49	06:31 18:40	06:20 20:34	05:25 21:24
22	08:25 16:53	09:18 (WEA 18-4) 10:30 (WEA 18-3)	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26
23	08:24 16:55	09:17 (WEA 18-4) 10:29 (WEA 18-3)	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27
24	08:23 16:57	09:18 (WEA 18-4) 10:29 (WEA 18-3)	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29
25	08:21 16:59	09:19 (WEA 18-4) 10:29 (WEA 18-3)	07:26 17:57	07:22 08:00 (WEA 18-2)	06:12 20:41	05:20 21:30
26	08:20 17:00	09:19 (WEA 18-4) 10:27 (WEA 18-3)	07:24 17:59	07:20 07:56 (WEA 18-2)	06:09 20:43	05:19 21:31
27	08:19 17:02	09:20 (WEA 18-4) 10:26 (WEA 18-3)	07:22 18:01	07:17 07:54 (WEA 18-2)	06:07 20:45	05:18 21:33
28	08:17 17:04	09:20 (WEA 18-4) 10:24 (WEA 18-3)	07:19 18:02	07:15 07:52 (WEA 18-2)	06:05 20:47	05:16 21:34
29	08:16 17:06	09:20 (WEA 18-4) 10:21 (WEA 18-3)	07:13 19:54	07:13 19:54	06:03 20:48	05:15 21:35
30	08:15 17:08	09:22 (WEA 18-4) 09:44 (WEA 18-4)	07:10 19:56	07:10 19:56	06:01 20:50	05:14 21:37
31	08:13 17:10	09:22 (WEA 18-4) 09:43 (WEA 18-4)	07:08 19:58	07:08 19:58	05:13 21:38	21:54
Sonnenscheinstunden	256	275	366	416	487	502
astr.max.mögl.Beschattung	1463	95	539			

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 27b - Zur Dasslage 8/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	08:27 (WEA 18-1) 07:21 08:58 (WEA 18-1) 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	08:26 (WEA 18-1) 07:23 08:57 (WEA 18-1) 16:59	08:15 16:18
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	08:25 (WEA 18-1) 07:25 08:57 (WEA 18-1) 16:57	08:16 16:17
4	05:11 21:53	05:50 21:17	06:41 20:12	07:31 19:01	08:25 (WEA 18-1) 07:27 08:58 (WEA 18-1) 16:55	08:18 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	08:25 (WEA 18-1) 07:29 08:57 (WEA 18-1) 16:53	08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	08:24 (WEA 18-1) 07:30 08:56 (WEA 18-1) 16:51	08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	08:24 (WEA 18-1) 07:32 08:56 (WEA 18-1) 16:50	08:22 16:15
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	08:24 (WEA 18-2) 07:34 08:55 (WEA 18-1) 16:48	08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	08:24 (WEA 18-2) 07:36 08:55 (WEA 18-1) 16:46	08:24 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	08:23 (WEA 18-2) 07:38 08:54 (WEA 18-1) 16:45	08:26 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	08:23 (WEA 18-2) 07:40 08:52 (WEA 18-1) 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	08:23 (WEA 18-2) 07:41 08:50 (WEA 18-1) 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	08:23 (WEA 18-2) 07:43 08:48 (WEA 18-1) 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	08:24 (WEA 18-2) 07:45 08:46 (WEA 18-1) 16:38	08:30 16:14
15	05:22 21:45	06:08 20:56	07:00 19:46	07:51 18:36	08:25 (WEA 18-2) 07:47 08:43 (WEA 18-2) 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	08:27 (WEA 18-2) 07:49 08:42 (WEA 18-2) 16:35	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	08:28 (WEA 18-2) 07:50 08:38 (WEA 18-2) 16:34	08:32 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	08:52 (WEA 18-4) 08:33 08:52 (WEA 18-3) 16:33	08:33 16:14
19	05:27 21:41	06:15 20:48	07:06 19:37	07:58 18:27	08:52 (WEA 18-4) 08:34 08:52 (WEA 18-4) 16:31	08:34 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	08:52 (WEA 18-4) 08:35 10:04 (WEA 18-3) 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	08:53 (WEA 18-4) 08:35 10:05 (WEA 18-3) 16:29	08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	08:53 (WEA 18-4) 08:36 10:06 (WEA 18-3) 16:27	08:36 16:15
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:02 16:25	08:37 16:17
25	05:35 21:33	06:25 20:35	07:16 19:22	08:38 (WEA 18-1) 08:09 08:51 (WEA 18-1) 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:34 (WEA 18-1) 08:10 08:53 (WEA 18-1) 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:33 (WEA 18-1) 08:12 08:55 (WEA 18-1) 18:11	08:07 16:22	08:38 16:19
28	05:39 21:28	06:30 20:28	07:21 19:15	08:31 (WEA 18-1) 07:14 08:56 (WEA 18-1) 17:08	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:29 (WEA 18-1) 07:16 08:56 (WEA 18-1) 17:06	08:10 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	08:28 (WEA 18-1) 07:18 08:57 (WEA 18-1) 17:05	08:12 16:19	08:38 16:21
31	05:44 21:23	06:35 20:21		07:19 17:03		08:38 16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung			135	462	993	1154

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 28a - Hörsten 6/Südost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38	09:37 (WEA 18-2)	08:11	07:17	07:05	05:59	05:12
	16:23	59 10:52 (WEA 18-1)	17:11	18:04	20:00	20:52	21:39
2	08:38	09:38 (WEA 18-2)	08:10	07:15	07:03	05:57	05:11
	16:24	60 10:53 (WEA 18-1)	17:13	18:06	20:01	20:53	21:40
3	08:38	09:38 (WEA 18-2)	08:08	07:13	07:01	05:55	05:11
	16:25	59 10:52 (WEA 18-1)	17:15	18:08	20:03	20:55	21:41
4	08:38	09:38 (WEA 18-2)	08:07	07:11	06:58	05:53	05:10
	16:26	60 10:53 (WEA 18-1)	17:17	18:10	20:05	20:57	21:42
5	08:38	09:39 (WEA 18-2)	08:05	07:08	06:56	05:52	05:09
	16:28	60 10:54 (WEA 18-1)	17:19	18:12	20:07	20:59	21:43
6	08:37	09:39 (WEA 18-2)	08:03	07:06	06:54	05:50	05:08
	16:29	58 10:53 (WEA 18-1)	17:21	18:13	20:08	21:00	21:44
7	08:37	09:40 (WEA 18-2)	08:01	07:04	06:51	05:48	05:08
	16:30	58 10:54 (WEA 18-1)	17:23	18:15	20:10	21:02	21:45
8	08:37	09:40 (WEA 18-2)	08:00	07:02	06:49	05:46	05:07
	16:31	58 10:54 (WEA 18-1)	17:25	18:17	20:12	21:04	21:46
9	08:36	09:40 (WEA 18-2)	07:58	06:59	06:47	05:44	05:07
	16:33	56 10:53 (WEA 18-1)	17:27	18:19	20:14	21:05	21:47
10	08:36	09:42 (WEA 18-2)	07:56	06:57	06:45	05:42	05:06
	16:34	55 10:54 (WEA 18-1)	17:29	18:21	20:15	21:07	21:48
11	08:35	09:42 (WEA 18-2)	07:54	06:55	06:42	05:41	05:06
	16:36	53 10:53 (WEA 18-1)	17:30	18:22	20:17	21:09	21:49
12	08:34	09:42 (WEA 18-2)	07:52	06:52	06:40	05:39	05:05
	16:37	52 10:53 (WEA 18-1)	17:32	18:24	20:19	21:10	21:50
13	08:34	09:43 (WEA 18-2)	07:50	06:50	06:38	05:37	05:05
	16:39	50 10:53 (WEA 18-1)	17:34	18:26	20:21	21:12	21:50
14	08:33	09:43 (WEA 18-2)	07:49	06:48	06:36	05:36	05:05
	16:40	48 10:52 (WEA 18-1)	17:36	18:28	20:22	21:13	21:51
15	08:32	09:44 (WEA 18-2)	07:47	06:45	06:33	05:34	05:05
	16:42	45 10:51 (WEA 18-1)	17:38	18:30	20:24	21:15	21:51
16	08:31	09:45 (WEA 18-2)	07:45	06:43	06:31	05:32	05:04
	16:43	41 10:50 (WEA 18-1)	17:40	18:31	20:26	21:17	21:52
17	08:30	09:46 (WEA 18-2)	07:43	06:41	06:29	05:31	05:04
	16:45	37 10:49 (WEA 18-1)	17:42	18:33	20:28	21:18	21:53
18	08:29	09:47 (WEA 18-2)	07:41	06:38	06:27	05:29	05:04
	16:47	31 10:47 (WEA 18-1)	17:44	18:35	20:29	21:20	21:53
19	08:28	09:48 (WEA 18-2)	07:39	06:36	06:24	05:28	05:04
	16:48	20 10:08 (WEA 18-2)	17:46	18:37	20:31	21:21	21:53
20	08:27	09:48 (WEA 18-2)	07:37	06:34	06:22	05:26	05:04
	16:50	19 10:07 (WEA 18-2)	17:48	18:39	20:33	21:23	21:54
21	08:26	09:50 (WEA 18-2)	07:34	06:31	06:20	05:25	05:04
	16:52	16 10:06 (WEA 18-2)	17:49	18:40	20:34	21:24	21:54
22	08:25	09:52 (WEA 18-2)	07:32	06:29	06:18	05:24	05:05
	16:53	13 10:05 (WEA 18-2)	17:51	18:42	20:36	21:26	21:54
23	08:24	09:54 (WEA 18-2)	07:30	06:27	06:16	05:22	05:05
	16:55	9 10:03 (WEA 18-2)	17:53	18:44	20:38	21:27	21:54
24	08:23		07:28	06:24	06:14	05:21	05:05
	16:57		17:55	18:46	20:40	21:29	21:55
25	08:21		07:26	07:22	06:12	05:20	05:05
	16:59		17:57	19:47	20:41	21:30	21:55
26	08:20		07:24	07:20	06:09	05:19	05:06
	17:00		17:59	19:49	20:43	21:31	21:55
27	08:19		07:22	07:17	06:07	05:17	05:06
	17:02		18:01	19:51	20:45	21:33	21:55
28	08:17		07:19	07:15	06:05	05:16	05:07
	17:04		18:02	19:53	20:47	21:34	21:55
29	08:16			07:13	06:03	05:15	05:07
	17:06			19:54	20:48	21:35	21:54
30	08:15			07:10	06:01	05:14	05:08
	17:08			19:56	20:50	21:37	21:54
31	08:13			07:08		05:13	
	17:10			19:58		21:38	
Sonnenscheinstunden	256		275	366	416	487	502
astr.max.mögl.Beschattung	1017						

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:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungs-
gesellschaft mbH

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 28a - Hörsten 6/Südost

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	08:14 16:19
2	05:09 21:54	05:47 21:20	06:38 20:17	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:48 21:18	06:40 20:14	07:30 19:04	07:25 16:57	08:16 16:17
4	05:10 21:53	05:50 21:17	06:41 20:12	07:31 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	05:53 21:13	06:45 20:07	07:35 18:57	07:30 16:51	08:21 16:16
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	05:58 21:08	06:50 20:00	07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:45	08:26 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56	07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	06:55 19:53	07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:49	07:49 18:38	07:45 16:38	08:30 16:14
15	05:21 21:45	06:08 20:56	07:00 19:46	07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	07:50 16:34	08:32 16:14
18	05:25 21:42	06:13 20:50	07:05 19:39	07:56 18:29	07:52 16:32	08:33 16:14
19	05:26 21:40	06:15 20:48	07:06 19:37	07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	07:10 19:32	08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	06:20 20:41	07:11 19:30	08:03 18:21	07:59 16:27	08:36 16:15
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	07:15 19:25	08:07 18:17	08:02 16:25	08:37 16:16
25	05:35 21:33	06:25 20:35	07:16 19:22	08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:12	08:06 16:23	08:38 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:10	08:07 16:22	08:38 16:18
28	05:39 21:28	06:30 20:28	07:21 19:15	08:14 17:08	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:16 17:06	08:10 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	07:25 19:11	08:18 17:04	08:12 16:19	08:38 16:21
31	05:44 21:23	06:35 20:21		07:19 17:03		08:38 16:22
Sonnenscheinstunden	505	456	382	332	265	241
astr.max.mögl.Beschattung					328	1836

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 28b - Hörsten 6/West

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:11	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:11	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:53	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:10	05:50	06:41	07:31	07:27	08:18
	16:26	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:51	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:31	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:26
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:22	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:21	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:32	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:26	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:40	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:26	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:16
25	08:21	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:00	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:12	16:23	16:18
27	08:19	07:22	07:17	06:07	05:17	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:10	16:22	16:18
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:04	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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



Projekt:

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 29a - Zur Dasslage 6/Nordost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:11	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:53	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:26	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:31	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:25
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:30	18:22	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:21	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:40	20:47	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:26	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:16
25	08:21	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:00	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:10	16:22	16:18
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 29b - Zur Dasslage 6/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:38	09:51 (WEA 18-4)	08:11	07:17	08:03 (WEA 18-2)	07:05	05:59	05:12
	16:23	73 11:40 (WEA 18-3)	17:12	18:04	47 08:50 (WEA 18-1)	20:00	20:52	21:39
2	08:38	09:52 (WEA 18-4)	08:10	07:15	08:03 (WEA 18-2)	07:03	05:57	05:11
	16:24	73 11:41 (WEA 18-3)	17:13	18:06	49 08:52 (WEA 18-1)	20:01	20:53	21:40
3	08:38	09:52 (WEA 18-4)	08:08	07:13	08:02 (WEA 18-2)	07:01	05:55	05:11
	16:25	72 11:40 (WEA 18-3)	17:15	18:08	50 08:52 (WEA 18-1)	20:03	20:55	21:41
4	08:38	09:52 (WEA 18-4)	08:07	07:11	08:02 (WEA 18-2)	06:58	05:53	05:10
	16:26	73 11:41 (WEA 18-3)	17:17	18:10	51 08:53 (WEA 18-1)	20:05	20:57	21:42
5	08:38	09:53 (WEA 18-4)	08:05	07:08	08:02 (WEA 18-2)	06:56	05:52	05:09
	16:28	73 11:42 (WEA 18-3)	17:19	18:12	51 08:53 (WEA 18-1)	20:07	20:59	21:43
6	08:37	09:53 (WEA 18-4)	08:03	07:06	08:02 (WEA 18-2)	06:54	05:50	05:08
	16:29	71 11:41 (WEA 18-3)	17:21	18:13	52 08:54 (WEA 18-1)	20:08	21:00	21:44
7	08:37	09:54 (WEA 18-4)	08:01	07:04	08:02 (WEA 18-2)	06:52	05:48	05:08
	16:30	71 11:42 (WEA 18-3)	17:23	18:15	52 08:54 (WEA 18-1)	20:10	21:02	21:45
8	08:37	09:54 (WEA 18-4)	08:00	07:02	08:03 (WEA 18-2)	06:49	05:46	05:07
	16:31	70 11:42 (WEA 18-3)	17:25	18:17	51 08:54 (WEA 18-1)	20:12	21:04	21:46
9	08:36	09:54 (WEA 18-4)	07:58	06:59	08:04 (WEA 18-2)	06:47	05:44	05:07
	16:33	69 11:41 (WEA 18-3)	17:27	18:19	50 08:54 (WEA 18-1)	20:14	21:05	21:47
10	08:36	09:55 (WEA 18-4)	07:56	06:57	08:04 (WEA 18-2)	06:45	05:42	05:06
	16:34	68 11:42 (WEA 18-3)	17:29	18:21	49 08:53 (WEA 18-1)	20:15	21:07	21:48
11	08:35	09:56 (WEA 18-4)	07:54	06:55	08:05 (WEA 18-2)	06:42	05:41	05:06
	16:36	68 11:42 (WEA 18-3)	17:30	18:22	48 08:53 (WEA 18-1)	20:17	21:09	21:49
12	08:34	09:56 (WEA 18-4)	07:52	06:52	08:06 (WEA 18-2)	06:40	05:39	05:05
	16:37	66 11:41 (WEA 18-3)	17:32	18:24	46 08:52 (WEA 18-1)	20:19	21:10	21:50
13	08:34	09:56 (WEA 18-4)	07:50	06:50	08:07 (WEA 18-2)	06:38	05:37	05:05
	16:39	65 11:41 (WEA 18-3)	17:34	18:26	45 08:52 (WEA 18-1)	20:21	21:12	21:50
14	08:33	09:57 (WEA 18-4)	07:49	06:48	08:07 (WEA 18-2)	06:36	05:36	05:05
	16:40	62 11:40 (WEA 18-3)	17:36	18:28	45 08:52 (WEA 18-1)	20:22	21:13	21:51
15	08:32	09:58 (WEA 18-4)	07:47	06:45	08:07 (WEA 18-2)	06:33	05:34	05:05
	16:42	60 11:40 (WEA 18-3)	17:38	18:30	43 08:50 (WEA 18-1)	20:24	21:15	21:51
16	08:31	09:58 (WEA 18-4)	07:45	06:43	08:07 (WEA 18-2)	06:31	05:32	05:04
	16:43	57 11:39 (WEA 18-3)	17:40	18:31	43 08:50 (WEA 18-1)	20:26	21:17	21:52
17	08:30	09:59 (WEA 18-4)	07:43	06:41	08:08 (WEA 18-2)	06:29	05:31	05:04
	16:45	54 11:38 (WEA 18-3)	17:42	18:33	41 08:49 (WEA 18-1)	20:27	21:18	21:53
18	08:29	10:00 (WEA 18-4)	07:41	06:38	08:08 (WEA 18-2)	06:27	05:29	05:04
	16:47	50 11:37 (WEA 18-3)	17:44	18:35	39 08:47 (WEA 18-1)	20:29	21:20	21:53
19	08:28	10:01 (WEA 18-4)	07:39	06:36	08:09 (WEA 18-2)	06:24	05:28	05:04
	16:48	45 11:36 (WEA 18-3)	17:46	18:37	37 08:46 (WEA 18-1)	20:31	21:21	21:53
20	08:27	10:01 (WEA 18-4)	07:37	06:34	08:11 (WEA 18-2)	06:22	05:26	05:04
	16:50	39 11:33 (WEA 18-3)	17:48	18:39	34 08:45 (WEA 18-1)	20:33	21:23	21:54
21	08:26	10:03 (WEA 18-4)	07:34	06:31	08:11 (WEA 18-2)	06:20	05:25	05:04
	16:52	25 10:28 (WEA 18-4)	17:49	18:40	31 08:42 (WEA 18-1)	20:34	21:24	21:54
22	08:25	10:04 (WEA 18-4)	07:32	06:29	08:13 (WEA 18-2)	06:18	05:24	05:05
	16:53	23 10:27 (WEA 18-4)	17:51	18:42	27 08:40 (WEA 18-1)	20:36	21:26	21:54
23	08:24	10:05 (WEA 18-4)	07:30	06:27	08:15 (WEA 18-2)	06:16	05:22	05:05
	16:55	21 10:26 (WEA 18-4)	17:53	18:44	21 08:36 (WEA 18-1)	20:38	21:27	21:54
24	08:23	10:07 (WEA 18-4)	07:28	06:24	08:18 (WEA 18-2)	06:14	05:21	05:05
	16:57	18 10:25 (WEA 18-4)	17:55	18:46	15 08:33 (WEA 18-1)	20:40	21:29	21:55
25	08:21	10:09 (WEA 18-4)	07:26	07:22	08:07 (WEA 18-2)	06:12	05:20	05:05
	16:59	15 10:24 (WEA 18-4)	17:57	19:47	36 08:43 (WEA 18-1)	20:41	21:30	21:55
26	08:20	10:12 (WEA 18-4)	07:24	07:20	08:06 (WEA 18-2)	06:09	05:19	05:06
	17:00	9 10:21 (WEA 18-4)	17:59	19:49	40 08:46 (WEA 18-1)	20:43	21:31	21:55
27	08:19		07:22	07:17	08:05 (WEA 18-2)	06:07	05:18	05:06
	17:02		18:01	19:51	43 08:48 (WEA 18-1)	20:45	21:33	21:55
28	08:17		07:19	07:15	08:04 (WEA 18-2)	06:05	05:16	05:07
	17:04		18:02	19:53	45 08:49 (WEA 18-1)	20:47	21:34	21:55
29	08:16			07:13		06:03	05:15	05:07
	17:06			19:54		20:48	21:35	21:54
30	08:14			07:10		06:01	05:14	05:08
	17:08			19:56		20:50	21:37	21:54
31	08:13			07:08			05:13	
	17:10			19:58			21:38	
	Sonnenscheinstunden	256		366		416	487	502
	astr.max.mögl.Beschattung	1390	223	1017				

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	Schattenanfang (WEA mit erstem Schatten)	Schattende (WEA mit letztem Schatten)
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Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 29b - Zur Dasslage 6/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September		Oktober		November		Dezember		
1	05:08	05:45	06:36		07:26		08:47 (WEA 18-1) 07:21		08:14	09:38 (WEA 18-4)	
	21:54	21:22	20:19		19:08	45	09:32 (WEA 18-1) 17:01		16:19	66 09:38 (WEA 18-3)	
2	05:09	05:47	06:38		07:28		08:45 (WEA 18-1) 07:23		08:15	09:38 (WEA 18-4)	
	21:54	21:20	20:17		19:06	46	09:31 (WEA 18-1) 16:59		16:18	67 11:24 (WEA 18-3)	
3	05:10	05:48	06:40		07:30		08:44 (WEA 18-2) 07:25		08:16	09:38 (WEA 18-4)	
	21:53	21:18	20:14		19:04	47	09:31 (WEA 18-1) 16:57		16:17	69 11:25 (WEA 18-3)	
4	05:11	05:50	06:41		07:31		08:42 (WEA 18-2) 07:27		08:18	09:38 (WEA 18-4)	
	21:53	21:17	20:12		19:01	49	09:31 (WEA 18-1) 16:55		16:17	69 11:25 (WEA 18-3)	
5	05:11	05:52	06:43		07:33		08:41 (WEA 18-2) 07:29		08:19	09:39 (WEA 18-4)	
	21:52	21:15	20:10		18:59	50	09:31 (WEA 18-1) 16:53		16:16	70 11:27 (WEA 18-3)	
6	05:12	05:53	06:45		07:35		08:39 (WEA 18-2) 07:30		08:21	09:39 (WEA 18-4)	
	21:52	21:13	20:07		18:57	51	09:30 (WEA 18-1) 16:51		16:16	70 11:27 (WEA 18-3)	
7	05:13	05:55	06:46		07:37		08:38 (WEA 18-2) 07:32		08:22	09:39 (WEA 18-4)	
	21:51	21:11	20:05		18:54	52	09:30 (WEA 18-1) 16:50		16:15	72 11:27 (WEA 18-3)	
8	05:14	05:56	06:48		07:38		08:38 (WEA 18-2) 07:34		08:23	09:40 (WEA 18-4)	
	21:51	21:09	20:03		18:52	51	09:29 (WEA 18-1) 16:48		16:15	73 11:29 (WEA 18-3)	
9	05:15	05:58	06:50		07:40		08:37 (WEA 18-2) 07:36		08:24	09:40 (WEA 18-4)	
	21:50	21:08	20:00		18:50	52	09:29 (WEA 18-1) 16:46		16:14	73 11:29 (WEA 18-3)	
10	05:16	06:00	06:51		07:42		08:37 (WEA 18-2) 07:38		08:25	09:41 (WEA 18-4)	
	21:49	21:06	19:58		18:47	51	09:28 (WEA 18-1) 16:45		16:14	73 11:30 (WEA 18-3)	
11	05:17	06:01	06:53		07:44		08:36 (WEA 18-2) 07:40		08:27	09:41 (WEA 18-4)	
	21:48	21:04	19:56		18:45	50	09:26 (WEA 18-1) 16:43		16:14	73 11:30 (WEA 18-3)	
12	05:18	06:03	06:55		07:45		08:36 (WEA 18-2) 07:41		08:28	09:42 (WEA 18-4)	
	21:48	21:02	19:53		18:43	49	09:25 (WEA 18-1) 16:41		16:14	73 11:31 (WEA 18-3)	
13	05:19	06:05	06:56		07:47		08:36 (WEA 18-2) 07:43		08:29	09:43 (WEA 18-4)	
	21:47	21:00	19:51		18:41	48	09:24 (WEA 18-1) 16:40		16:14	73 11:32 (WEA 18-3)	
14	05:20	06:06	06:58		07:49		08:36 (WEA 18-2) 07:45		08:30	09:43 (WEA 18-4)	
	21:46	20:58	19:49		18:38	47	09:23 (WEA 18-1) 16:38		16:14	74 11:33 (WEA 18-3)	
15	05:21	06:08	07:00		07:51		08:37 (WEA 18-2) 07:47		08:31	09:44 (WEA 18-4)	
	21:45	20:56	19:46		18:36	44	09:21 (WEA 18-1) 16:37		16:14	74 11:33 (WEA 18-3)	
16	05:23	06:10	07:01		07:52		08:38 (WEA 18-2) 07:49		08:32	09:43 (WEA 18-4)	
	21:44	20:54	19:44		18:34	42	09:20 (WEA 18-1) 16:35		16:14	74 11:33 (WEA 18-3)	
17	05:24	06:11	07:03		07:54		08:37 (WEA 18-2) 07:50	09:45 (WEA 18-4)	08:32	09:44 (WEA 18-4)	
	21:43	20:52	19:41		18:32	39	09:16 (WEA 18-1) 16:34	9 09:54 (WEA 18-4)	16:14	74 11:33 (WEA 18-3)	
18	05:25	06:13	07:05		07:56		08:39 (WEA 18-2) 07:52	09:42 (WEA 18-4)	08:33	09:45 (WEA 18-4)	
	21:42	20:50	19:39		18:29	34	09:13 (WEA 18-1) 16:32	15 09:57 (WEA 18-4)	16:14	73 11:34 (WEA 18-3)	
19	05:27	06:15	07:06		07:58		08:40 (WEA 18-2) 07:54	09:41 (WEA 18-4)	08:34	09:46 (WEA 18-4)	
	21:40	20:47	19:37		18:27	27	09:08 (WEA 18-1) 16:31	18 09:59 (WEA 18-4)	16:14	73 11:35 (WEA 18-3)	
20	05:28	06:16	07:08	09:06 (WEA 18-1)	08:00		08:42 (WEA 18-2) 07:56	09:40 (WEA 18-4)	08:35	09:45 (WEA 18-4)	
	21:39	20:45	19:34	12 09:18 (WEA 18-1)	18:25	16	08:58 (WEA 18-2) 16:30	21 10:01 (WEA 18-4)	16:15	74 11:35 (WEA 18-3)	
21	05:29	06:18	07:10	09:02 (WEA 18-1)	08:01		08:46 (WEA 18-2) 07:57	09:39 (WEA 18-4)	08:35	09:46 (WEA 18-4)	
	21:38	20:43	19:32	20 09:22 (WEA 18-1)	18:23	8	08:54 (WEA 18-2) 16:29	23 10:02 (WEA 18-4)	16:15	75 11:36 (WEA 18-3)	
22	05:31	06:20	07:11	08:59 (WEA 18-1)	08:03			07:59	08:36	09:47 (WEA 18-4)	
	21:37	20:41	19:30	26 09:25 (WEA 18-1)	18:21			16:27	25 10:04 (WEA 18-4)	16:15	75 11:37 (WEA 18-3)
23	05:32	06:21	07:13	08:56 (WEA 18-1)	08:05			08:01	09:38 (WEA 18-4)	08:36	09:47 (WEA 18-4)
	21:35	20:39	19:27	30 09:26 (WEA 18-1)	18:19			16:26	39 11:10 (WEA 18-3)	16:16	75 11:37 (WEA 18-3)
24	05:33	06:23	07:15	08:55 (WEA 18-1)	08:07			08:02	09:38 (WEA 18-4)	08:37	09:47 (WEA 18-4)
	21:34	20:37	19:25	33 09:28 (WEA 18-1)	18:17			16:25	45 11:13 (WEA 18-3)	16:16	75 11:37 (WEA 18-3)
25	05:35	06:25	07:16	08:53 (WEA 18-1)	08:09			08:04	09:37 (WEA 18-4)	08:37	09:48 (WEA 18-4)
	21:33	20:35	19:22	36 09:29 (WEA 18-1)	18:15			16:24	50 11:14 (WEA 18-3)	16:17	74 11:38 (WEA 18-3)
26	05:36	06:26	07:18	08:51 (WEA 18-1)	08:10			08:06	09:37 (WEA 18-4)	08:38	09:49 (WEA 18-4)
	21:31	20:32	19:20	38 09:29 (WEA 18-1)	18:13			16:23	54 11:16 (WEA 18-3)	16:18	73 11:38 (WEA 18-3)
27	05:38	06:28	07:20	08:50 (WEA 18-1)	08:12			08:07	09:37 (WEA 18-4)	08:38	09:49 (WEA 18-4)
	21:30	20:30	19:18	40 09:30 (WEA 18-1)	18:10			16:22	57 11:18 (WEA 18-3)	16:18	74 11:38 (WEA 18-3)
28	05:39	06:30	07:21	08:49 (WEA 18-1)	07:14			08:09	09:38 (WEA 18-4)	08:38	09:49 (WEA 18-4)
	21:28	20:28	19:15	42 09:31 (WEA 18-1)	17:08			16:21	60 11:20 (WEA 18-3)	16:19	74 11:39 (WEA 18-3)
29	05:41	06:31	07:23	08:48 (WEA 18-1)	07:16			08:10	09:37 (WEA 18-4)	08:38	09:50 (WEA 18-4)
	21:27	20:26	19:13	43 09:31 (WEA 18-1)	17:06			16:20	62 11:20 (WEA 18-3)	16:20	73 11:39 (WEA 18-3)
30	05:42	06:33	07:25	08:47 (WEA 18-1)	07:18			08:12	09:38 (WEA 18-4)	08:38	09:50 (WEA 18-4)
	21:25	20:23	19:11	44 09:31 (WEA 18-1)	17:05			16:19	64 11:22 (WEA 18-3)	16:21	73 11:39 (WEA 18-3)
31	05:44	06:35			07:19					08:38	09:50 (WEA 18-4)
	21:23	20:21			17:03					16:22	74 11:40 (WEA 18-3)
Sonnenscheinstunden	505	456	382		332		265		241		
astr.max.mögl.Beschattung			364		898		542		2252		

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 30a - Zur Dasslage 11/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 16:23	08:11 17:12	09:01 (WEA 18-4) 07:17 10:30 (WEA 18-3) 18:04	07:05 20:00	07:58 (WEA 18-1) 05:59 08:36 (WEA 18-1) 20:52	05:12 21:39
2	08:38 16:24	08:10 17:13	09:02 (WEA 18-4) 07:15 10:31 (WEA 18-3) 18:06	07:03 20:01	07:58 (WEA 18-1) 05:57 08:36 (WEA 18-1) 20:53	05:12 21:40
3	08:38 16:25	09:57 (WEA 18-3) 08:08 09:59 (WEA 18-3) 17:15	09:01 (WEA 18-4) 07:13 10:30 (WEA 18-3) 18:08	07:01 20:03	07:58 (WEA 18-1) 05:55 08:36 (WEA 18-1) 20:55	05:11 21:41
4	08:38 16:27	09:54 (WEA 18-3) 08:07 10:03 (WEA 18-3) 17:17	09:01 (WEA 18-4) 07:11 10:30 (WEA 18-3) 18:10	06:58 20:05	07:57 (WEA 18-1) 05:53 08:35 (WEA 18-1) 20:57	05:10 21:42
5	08:38 16:28	09:53 (WEA 18-3) 08:05 10:06 (WEA 18-3) 17:19	09:00 (WEA 18-4) 07:08 10:30 (WEA 18-3) 18:12	06:56 20:07	07:57 (WEA 18-1) 05:52 08:35 (WEA 18-1) 20:59	05:09 21:43
6	08:37 16:29	09:51 (WEA 18-3) 08:03 10:07 (WEA 18-3) 17:21	09:00 (WEA 18-4) 07:06 10:29 (WEA 18-3) 18:13	06:54 20:08	07:58 (WEA 18-1) 05:50 08:34 (WEA 18-1) 21:00	05:08 21:44
7	08:37 16:30	09:51 (WEA 18-3) 08:01 10:09 (WEA 18-3) 17:23	09:00 (WEA 18-4) 07:04 10:28 (WEA 18-3) 18:15	06:52 20:10	07:57 (WEA 18-1) 05:48 08:33 (WEA 18-1) 21:02	05:08 21:45
8	08:37 16:32	09:50 (WEA 18-3) 08:00 10:10 (WEA 18-3) 17:25	09:01 (WEA 18-4) 07:02 10:29 (WEA 18-3) 18:17	06:49 20:12	07:58 (WEA 18-1) 05:46 08:32 (WEA 18-1) 21:04	05:07 21:46
9	08:36 16:33	09:49 (WEA 18-3) 07:58 10:12 (WEA 18-3) 17:27	09:01 (WEA 18-4) 06:59 10:28 (WEA 18-3) 18:19	06:47 20:14	07:58 (WEA 18-1) 05:44 08:31 (WEA 18-1) 21:05	05:07 21:47
10	08:36 16:34	09:49 (WEA 18-3) 07:56 10:14 (WEA 18-3) 17:29	09:02 (WEA 18-4) 06:57 10:27 (WEA 18-3) 18:21	06:45 20:15	07:59 (WEA 18-1) 05:42 08:30 (WEA 18-1) 21:07	05:06 21:48
11	08:35 16:36	09:48 (WEA 18-3) 07:54 10:15 (WEA 18-3) 17:30	09:02 (WEA 18-4) 06:55 10:26 (WEA 18-3) 18:23	06:42 20:17	07:59 (WEA 18-1) 05:41 08:28 (WEA 18-1) 21:09	05:06 21:49
12	08:34 16:37	09:47 (WEA 18-3) 07:52 10:16 (WEA 18-3) 17:32	09:03 (WEA 18-4) 06:52 10:25 (WEA 18-3) 18:24	06:40 20:19	08:01 (WEA 18-1) 05:39 08:26 (WEA 18-1) 21:10	05:05 21:50
13	08:34 16:39	09:47 (WEA 18-3) 07:50 10:17 (WEA 18-3) 17:34	09:04 (WEA 18-4) 06:50 10:23 (WEA 18-3) 18:26	07:26 (WEA 18-2) 06:38 07:33 (WEA 18-2) 20:21	08:03 (WEA 18-1) 05:37 08:24 (WEA 18-1) 21:12	05:05 21:50
14	08:33 16:40	09:46 (WEA 18-3) 07:49 10:18 (WEA 18-3) 17:36	09:05 (WEA 18-4) 06:48 10:22 (WEA 18-3) 18:28	07:22 (WEA 18-2) 06:36 07:37 (WEA 18-2) 20:22	08:05 (WEA 18-1) 05:36 08:22 (WEA 18-1) 21:13	05:05 21:51
15	08:32 16:42	09:46 (WEA 18-3) 07:47 10:19 (WEA 18-3) 17:38	09:06 (WEA 18-4) 06:45 10:19 (WEA 18-3) 18:30	07:19 (WEA 18-2) 06:33 07:38 (WEA 18-2) 20:24	08:09 (WEA 18-1) 05:34 08:18 (WEA 18-1) 21:15	05:05 21:51
16	08:31 16:43	09:46 (WEA 18-3) 07:45 10:20 (WEA 18-3) 17:40	09:07 (WEA 18-4) 06:43 10:16 (WEA 18-3) 18:31	07:18 (WEA 18-2) 06:31 07:39 (WEA 18-2) 20:26	08:09 (WEA 18-1) 05:33 08:24 (WEA 18-1) 21:17	05:04 21:52
17	08:30 16:45	09:45 (WEA 18-3) 07:43 10:22 (WEA 18-3) 17:42	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:17 (WEA 18-2) 06:29 07:41 (WEA 18-2) 20:28	08:01 (WEA 18-1) 05:32 08:25 (WEA 18-1) 21:18	05:04 21:53
18	08:29 16:47	09:45 (WEA 18-3) 07:41 10:23 (WEA 18-3) 17:44	09:12 (WEA 18-4) 06:38 09:21 (WEA 18-4) 18:35	07:15 (WEA 18-2) 06:27 07:40 (WEA 18-2) 20:29	08:00 (WEA 18-1) 05:31 08:26 (WEA 18-1) 21:19	05:04 21:53
19	08:28 16:48	09:45 (WEA 18-3) 07:39 10:24 (WEA 18-3) 17:46	09:21 (WEA 18-4) 18:35 09:07 (WEA 18-4) 06:43	07:15 (WEA 18-2) 06:24 07:41 (WEA 18-2) 20:31	08:00 (WEA 18-1) 05:30 08:26 (WEA 18-1) 21:20	05:04 21:53
20	08:27 16:50	09:44 (WEA 18-3) 07:37 10:24 (WEA 18-3) 17:48	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:14 (WEA 18-2) 06:22 07:42 (WEA 18-2) 20:33	08:00 (WEA 18-1) 05:29 08:26 (WEA 18-1) 21:21	05:04 21:53
21	08:26 16:52	09:44 (WEA 18-3) 07:34 10:25 (WEA 18-3) 17:49	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:13 (WEA 18-2) 06:20 07:41 (WEA 18-2) 20:34	08:00 (WEA 18-1) 05:28 08:26 (WEA 18-1) 21:22	05:04 21:54
22	08:25 16:53	09:44 (WEA 18-3) 07:32 10:26 (WEA 18-3) 17:51	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:13 (WEA 18-2) 06:18 07:41 (WEA 18-2) 20:36	08:00 (WEA 18-1) 05:27 08:26 (WEA 18-1) 21:23	05:04 21:54
23	08:24 16:55	09:44 (WEA 18-3) 07:30 10:26 (WEA 18-3) 17:53	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:11 (WEA 18-2) 06:16 07:40 (WEA 18-2) 20:38	08:00 (WEA 18-1) 05:26 08:26 (WEA 18-1) 21:24	05:04 21:54
24	08:23 16:57	09:44 (WEA 18-3) 07:28 10:27 (WEA 18-3) 17:55	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	07:11 (WEA 18-2) 06:14 07:39 (WEA 18-2) 20:40	08:00 (WEA 18-1) 05:25 08:26 (WEA 18-1) 21:25	05:04 21:54
25	08:21 16:59	09:09 (WEA 18-4) 07:26 10:28 (WEA 18-3) 17:57	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:07 (WEA 18-1) 06:12 08:39 (WEA 18-2) 20:41	08:00 (WEA 18-1) 05:24 08:26 (WEA 18-1) 21:26	05:04 21:54
26	08:20 17:00	09:06 (WEA 18-4) 07:24 10:28 (WEA 18-3) 17:59	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:04 (WEA 18-1) 06:09 08:37 (WEA 18-2) 20:43	08:00 (WEA 18-1) 05:23 08:26 (WEA 18-1) 21:27	05:04 21:54
27	08:19 17:02	09:06 (WEA 18-4) 07:22 10:29 (WEA 18-3) 18:01	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:03 (WEA 18-1) 06:07 08:36 (WEA 18-2) 20:45	08:00 (WEA 18-1) 05:22 08:26 (WEA 18-1) 21:28	05:04 21:54
28	08:17 17:04	09:04 (WEA 18-4) 07:19 10:29 (WEA 18-3) 18:02	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:02 (WEA 18-1) 06:05 08:36 (WEA 18-1) 20:47	08:00 (WEA 18-1) 05:21 08:26 (WEA 18-1) 21:29	05:04 21:54
29	08:16 17:06	09:03 (WEA 18-4) 07:17 10:29 (WEA 18-3) 18:01	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:01 (WEA 18-1) 06:03 08:36 (WEA 18-1) 20:48	08:00 (WEA 18-1) 05:20 08:26 (WEA 18-1) 21:30	05:04 21:54
30	08:15 17:08	09:03 (WEA 18-4) 07:15 10:30 (WEA 18-3) 18:01	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:00 (WEA 18-1) 06:01 08:36 (WEA 18-1) 20:50	08:00 (WEA 18-1) 05:19 08:26 (WEA 18-1) 21:31	05:04 21:54
31	08:13 17:10	09:02 (WEA 18-4) 07:13 10:30 (WEA 18-3) 18:01	09:09 (WEA 18-4) 06:41 10:10 (WEA 18-3) 18:33	08:00 (WEA 18-1) 06:01 08:36 (WEA 18-1) 20:50	08:00 (WEA 18-1) 05:18 08:26 (WEA 18-1) 21:32	05:04 21:54
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 1109	275 1100	366 520	416 461	487 502

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 30a - Zur Dasslage 11/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember				
1	05:08 21:54	05:45 21:22	06:36 20:19	08:01 (WEA 18-1) 08:26 (WEA 18-1)	07:26 19:08	08:04 (WEA 18-2) 08:15 (WEA 18-2)	07:21 17:01	08:32 (WEA 18-4) 09:56 (WEA 18-3)	08:14 16:19	09:29 (WEA 18-3) 09:58 (WEA 18-3)
2	05:09 21:54	05:47 21:20	06:38 20:17	08:28 (WEA 18-1) 08:27 (WEA 18-1)	07:28 19:06	08:15 (WEA 18-2) 08:31 (WEA 18-3)	07:23 16:59	09:57 (WEA 18-3) 08:31 (WEA 18-4)	08:15 16:18	09:30 (WEA 18-3) 09:57 (WEA 18-3)
3	05:10 21:53	05:48 21:18	06:40 20:14	08:28 (WEA 18-1) 07:57 (WEA 18-1)	07:30 19:04	08:31 (WEA 18-3) 09:58 (WEA 18-3)	07:25 16:57	08:31 (WEA 18-4) 09:58 (WEA 18-3)	08:16 16:17	09:32 (WEA 18-3) 09:57 (WEA 18-3)
4	05:11 21:53	05:50 21:17	06:41 20:12	08:28 (WEA 18-1) 07:55 (WEA 18-1)	07:31 19:01	08:31 (WEA 18-3) 09:59 (WEA 18-3)	07:27 16:55	08:31 (WEA 18-4) 09:59 (WEA 18-3)	08:18 16:17	09:33 (WEA 18-3) 09:56 (WEA 18-3)
5	05:11 21:52	05:52 21:15	06:43 20:10	08:29 (WEA 18-1) 07:55 (WEA 18-1)	07:33 18:59	08:31 (WEA 18-3) 09:59 (WEA 18-3)	07:29 16:53	08:31 (WEA 18-4) 09:59 (WEA 18-3)	08:19 16:16	09:35 (WEA 18-3) 09:56 (WEA 18-3)
6	05:12 21:52	05:53 21:13	06:45 20:07	08:30 (WEA 18-1) 07:54 (WEA 18-1)	07:35 18:57	08:31 (WEA 18-3) 10:00 (WEA 18-3)	07:30 16:51	08:31 (WEA 18-4) 10:00 (WEA 18-3)	08:21 16:16	09:36 (WEA 18-3) 09:54 (WEA 18-3)
7	05:13 21:51	05:55 21:11	06:46 20:05	08:29 (WEA 18-1) 07:53 (WEA 18-1)	07:37 18:54	08:31 (WEA 18-3) 10:00 (WEA 18-3)	07:32 16:50	08:31 (WEA 18-4) 10:00 (WEA 18-3)	08:22 16:15	09:37 (WEA 18-3) 09:53 (WEA 18-3)
8	05:14 21:51	05:56 21:09	06:48 20:03	08:30 (WEA 18-1) 07:52 (WEA 18-1)	07:38 18:52	08:32 (WEA 18-4) 10:01 (WEA 18-3)	07:34 16:48	08:32 (WEA 18-4) 10:01 (WEA 18-3)	08:23 16:15	09:40 (WEA 18-3) 09:53 (WEA 18-3)
9	05:15 21:50	05:58 21:08	06:50 20:00	08:29 (WEA 18-1) 07:51 (WEA 18-1)	07:40 18:50	08:32 (WEA 18-4) 10:01 (WEA 18-3)	07:36 16:46	08:32 (WEA 18-4) 10:01 (WEA 18-3)	08:24 16:14	09:42 (WEA 18-3) 09:51 (WEA 18-3)
10	05:16 21:49	06:00 21:06	06:51 19:58	08:29 (WEA 18-1) 07:51 (WEA 18-1)	07:42 18:47	08:32 (WEA 18-4) 10:01 (WEA 18-3)	07:38 16:45	08:32 (WEA 18-4) 10:01 (WEA 18-3)	08:25 16:14	09:45 (WEA 18-3) 09:48 (WEA 18-3)
11	05:17 21:48	06:01 21:04	06:53 19:56	08:29 (WEA 18-1) 07:51 (WEA 18-1)	07:44 18:45	08:33 (WEA 18-4) 10:02 (WEA 18-3)	07:40 16:43	08:33 (WEA 18-4) 10:02 (WEA 18-3)	08:27 16:14	09:46 (WEA 18-3) 09:48 (WEA 18-3)
12	05:18 21:48	06:03 21:02	06:55 19:53	08:28 (WEA 18-1) 07:51 (WEA 18-1)	07:45 18:43	08:34 (WEA 18-4) 10:02 (WEA 18-3)	07:41 16:41	08:34 (WEA 18-4) 10:02 (WEA 18-3)	08:28 16:14	09:47 (WEA 18-3) 09:48 (WEA 18-3)
13	05:19 21:47	06:05 21:00	06:56 19:51	08:28 (WEA 18-1) 07:51 (WEA 18-1)	07:47 18:41	08:35 (WEA 18-4) 10:02 (WEA 18-3)	07:43 16:40	08:35 (WEA 18-4) 10:02 (WEA 18-3)	08:29 16:14	09:48 (WEA 18-3) 09:48 (WEA 18-3)
14	05:20 21:46	06:06 20:58	06:58 19:49	08:27 (WEA 18-1) 07:50 (WEA 18-1)	07:49 18:38	08:35 (WEA 18-4) 10:01 (WEA 18-3)	07:45 16:38	08:35 (WEA 18-4) 10:01 (WEA 18-3)	08:30 16:14	09:49 (WEA 18-3) 09:48 (WEA 18-3)
15	05:22 21:45	06:08 20:56	07:00 19:46	08:26 (WEA 18-1) 07:51 (WEA 18-1)	07:51 18:36	08:36 (WEA 18-4) 10:01 (WEA 18-3)	07:47 16:37	08:36 (WEA 18-4) 10:01 (WEA 18-3)	08:31 16:14	09:50 (WEA 18-3) 09:48 (WEA 18-3)
16	05:23 21:44	06:10 20:54	07:01 19:44	08:26 (WEA 18-1) 07:52 (WEA 18-1)	07:52 18:34	08:37 (WEA 18-4) 10:01 (WEA 18-3)	07:49 16:35	08:37 (WEA 18-4) 10:01 (WEA 18-3)	08:32 16:14	09:51 (WEA 18-3) 09:48 (WEA 18-3)
17	05:24 21:43	06:11 20:52	07:03 19:41	08:25 (WEA 18-1) 07:51 (WEA 18-1)	07:54 18:32	08:38 (WEA 18-4) 10:01 (WEA 18-3)	07:50 16:34	08:38 (WEA 18-4) 10:01 (WEA 18-3)	08:32 16:14	09:52 (WEA 18-3) 09:48 (WEA 18-3)
18	05:25 21:42	06:13 20:50	07:05 19:39	08:24 (WEA 18-1) 07:53 (WEA 18-1)	07:56 18:29	08:39 (WEA 18-4) 10:01 (WEA 18-3)	07:52 16:33	08:42 (WEA 18-4) 10:01 (WEA 18-3)	08:33 16:14	09:53 (WEA 18-3) 09:48 (WEA 18-3)
19	05:27 21:40	06:15 20:48	07:06 19:37	08:25 (WEA 18-2) 07:54 (WEA 18-1)	18:29 07:58	08:40 (WEA 18-4) 10:01 (WEA 18-3)	16:33 07:54	08:41 (WEA 18-4) 10:01 (WEA 18-3)	16:14 08:34	09:54 (WEA 18-3) 09:48 (WEA 18-3)
20	05:28 21:39	06:16 20:46	07:08 19:35	08:26 (WEA 18-2) 07:55 (WEA 18-1)	18:27 08:00	08:41 (WEA 18-4) 10:01 (WEA 18-3)	16:31 07:56	08:42 (WEA 18-4) 10:01 (WEA 18-3)	16:14 08:35	09:55 (WEA 18-3) 09:48 (WEA 18-3)
21	05:29 21:38	06:18 20:43	07:10 19:34	08:26 (WEA 18-2) 07:57 (WEA 18-1)	18:25 08:01	08:42 (WEA 18-4) 10:01 (WEA 18-3)	16:30 07:57	08:43 (WEA 18-4) 10:01 (WEA 18-3)	16:15 08:35	09:56 (WEA 18-3) 09:48 (WEA 18-3)
22	05:31 21:37	06:20 20:41	07:11 19:32	08:26 (WEA 18-2) 07:59 (WEA 18-2)	18:23 08:03	08:43 (WEA 18-4) 10:02 (WEA 18-3)	16:29 07:59	08:44 (WEA 18-4) 10:02 (WEA 18-3)	16:15 08:36	09:57 (WEA 18-3) 09:48 (WEA 18-3)
23	05:32 21:35	06:21 20:39	07:13 19:30	08:26 (WEA 18-2) 07:58 (WEA 18-2)	18:21 08:05	08:44 (WEA 18-4) 10:02 (WEA 18-3)	16:27 08:01	08:45 (WEA 18-4) 10:02 (WEA 18-3)	16:15 08:36	09:58 (WEA 18-3) 09:48 (WEA 18-3)
24	05:33 21:34	06:23 20:37	07:15 19:27	08:25 (WEA 18-2) 07:58 (WEA 18-2)	18:19 08:07	08:45 (WEA 18-4) 10:02 (WEA 18-3)	16:26 08:02	08:46 (WEA 18-4) 10:02 (WEA 18-3)	16:16 08:37	09:59 (WEA 18-3) 09:48 (WEA 18-3)
25	05:35 21:33	06:25 20:35	07:16 19:25	08:25 (WEA 18-2) 07:58 (WEA 18-2)	18:17 08:09	08:46 (WEA 18-4) 10:03 (WEA 18-3)	16:25 08:04	08:47 (WEA 18-4) 10:03 (WEA 18-3)	16:17 08:37	09:59 (WEA 18-3) 09:48 (WEA 18-3)
26	05:36 21:31	06:26 20:32	07:18 19:22	08:25 (WEA 18-2) 07:58 (WEA 18-2)	18:15 08:10	08:47 (WEA 18-4) 10:04 (WEA 18-3)	16:24 08:06	08:48 (WEA 18-4) 10:04 (WEA 18-3)	16:17 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
27	05:38 21:30	06:28 20:30	07:20 19:18	08:23 (WEA 18-2) 07:58 (WEA 18-2)	18:12 18:11	08:48 (WEA 18-4) 10:05 (WEA 18-3)	16:23 08:07	08:49 (WEA 18-4) 10:05 (WEA 18-3)	16:18 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
28	05:39 21:28	06:30 20:28	07:21 19:15	08:23 (WEA 18-2) 07:59 (WEA 18-2)	17:14 17:08	08:49 (WEA 18-4) 10:06 (WEA 18-3)	16:22 08:09	08:50 (WEA 18-4) 10:06 (WEA 18-3)	16:19 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
29	05:41 21:27	06:31 20:26	07:23 19:13	08:22 (WEA 18-2) 07:59 (WEA 18-2)	17:06 17:06	08:50 (WEA 18-4) 10:07 (WEA 18-3)	16:21 08:10	08:51 (WEA 18-4) 10:07 (WEA 18-3)	16:19 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
30	05:42 21:25	06:33 20:23	07:25 19:11	08:21 (WEA 18-2) 08:17 (WEA 18-2)	17:18 17:05	08:51 (WEA 18-4) 10:08 (WEA 18-3)	16:20 08:12	08:52 (WEA 18-4) 10:08 (WEA 18-3)	16:20 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
31	05:44 21:23	06:35 20:21	07:27 19:09	08:20 (WEA 18-2) 08:16 (WEA 18-2)	17:19 17:03	08:52 (WEA 18-4) 10:09 (WEA 18-3)	16:19 08:13	08:53 (WEA 18-4) 10:09 (WEA 18-3)	16:21 08:38	09:59 (WEA 18-3) 09:48 (WEA 18-3)
Sonnenscheinstunden		505	456	382	332	265	217	1737	184	
astr.max.mögl.Beschattung			50	929	316					

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)

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 30b - Zur Dasslage 11/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:53	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:25
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
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12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
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	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:32	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:40	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
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	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
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	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
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	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:06	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 31a - Zur Dasslage 13/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:05	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:14
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:53	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:48	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:58	05:53	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:08	05:12	05:53	06:45	07:35	07:30	08:21
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:56	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:42	05:06	05:16	06:00	06:51	07:42	07:38	08:25
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
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	16:36	17:30	18:23	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:05	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:50	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:04	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:28	21:18	21:53	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:29	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:40	20:48	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	08:00	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:04	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:15
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:55	21:34	20:37	19:25	18:17	16:25	16:17
25	08:21	07:26	07:22	06:12	05:20	05:05	05:35	06:25	07:16	08:09	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:09	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:02	19:53	20:47	21:34	21:55	21:28	20:28	19:15	17:08	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:15		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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

Projekt:

LQ13955.2 Fürstenau-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

Schattenwurf-Untersuchung zum
Genehmigungsverfahren für die Errichtung
von 4 Windenergieanlagen in Hollenstede

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 31b - Zur Dasslage 13/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38	08:11	07:17	08:24 (WEA 18-4) 07:05	07:43 (WEA 18-2) 05:59	07:26 (WEA 18-1) 05:12	
	16:23	17:12	18:04	09:35 (WEA 18-3) 20:00	08:08 (WEA 18-2) 20:52	07:38 (WEA 18-1) 21:39	
2	08:38	08:10	07:15	08:25 (WEA 18-4) 07:03	07:42 (WEA 18-2) 05:57		05:12
	16:24	17:13	18:06	09:34 (WEA 18-3) 20:01	08:08 (WEA 18-2) 20:53		21:40
3	08:38	08:08	07:13	08:26 (WEA 18-4) 07:01	07:42 (WEA 18-2) 05:55		05:11
	16:25	17:15	18:08	09:32 (WEA 18-3) 20:03	08:08 (WEA 18-2) 20:55		21:41
4	08:38	08:07	07:11	08:28 (WEA 18-4) 06:58	07:41 (WEA 18-2) 05:53		05:10
	16:27	17:17	18:10	09:31 (WEA 18-3) 20:05	08:07 (WEA 18-2) 20:57		21:42
5	08:38	08:05	07:08	08:31 (WEA 18-4) 06:56	07:42 (WEA 18-2) 05:52		05:09
	16:28	17:19	18:12	09:30 (WEA 18-3) 20:07	08:07 (WEA 18-2) 20:59		21:43
6	08:37	08:03	07:06	08:55 (WEA 18-3) 06:54	07:42 (WEA 18-2) 05:50		05:08
	16:29	17:21	18:13	09:29 (WEA 18-3) 20:08	08:06 (WEA 18-2) 21:00		21:44
7	08:37	08:01	07:04	08:55 (WEA 18-3) 06:52	07:42 (WEA 18-2) 05:48		05:08
	16:30	17:23	18:15	09:26 (WEA 18-3) 20:10	08:04 (WEA 18-2) 21:02		21:45
8	08:37	08:00	07:02	08:57 (WEA 18-3) 06:49	07:31 (WEA 18-1) 05:46		05:07
	16:32	17:25	18:17	09:24 (WEA 18-3) 20:12	08:03 (WEA 18-2) 21:04		21:46
9	08:36	07:58	06:59	09:00 (WEA 18-3) 06:47	07:28 (WEA 18-1) 05:44		05:07
	16:33	17:27	18:19	09:21 (WEA 18-3) 20:14	08:02 (WEA 18-2) 21:05		21:47
10	08:36	07:56	06:57	09:03 (WEA 18-3) 06:45	07:26 (WEA 18-1) 05:42		05:06
	16:34	17:29	18:21	09:16 (WEA 18-3) 20:15	07:59 (WEA 18-1) 21:07		21:48
11	08:35	07:54	06:55		07:23 (WEA 18-1) 05:41		05:06
	16:36	17:30	18:23		07:54 (WEA 18-2) 21:09		21:49
12	08:34	07:52	06:52		07:22 (WEA 18-1) 05:39		05:05
	16:37	17:32	18:24		07:51 (WEA 18-1) 21:10		21:50
13	08:34	07:50	06:50		07:21 (WEA 18-1) 05:37		05:05
	16:39	17:34	18:26		07:52 (WEA 18-1) 21:12		21:50
14	08:33	07:49	06:48		07:20 (WEA 18-1) 05:36		05:05
	16:40	17:36	18:28		07:52 (WEA 18-1) 21:13		21:51
15	08:32	07:47	06:45		07:20 (WEA 18-1) 05:34		05:05
	16:42	17:38	18:30		07:53 (WEA 18-1) 21:15		21:51
16	08:31	07:45	06:43		07:18 (WEA 18-1) 05:33		05:04
	16:43	17:40	18:31		07:52 (WEA 18-1) 21:17		21:52
17	08:30	07:43	06:41		07:18 (WEA 18-1) 05:31		05:04
	16:45	17:42	18:33		07:52 (WEA 18-1) 21:18		21:53
18	08:29	07:41	06:38		07:18 (WEA 18-1) 05:29		05:04
	16:47	17:44	18:35		07:52 (WEA 18-1) 21:20		21:53
19	08:28	07:39	06:36		07:17 (WEA 18-1) 05:28		05:04
	16:48	17:46	18:37		07:52 (WEA 18-1) 21:21		21:53
20	08:27	07:37	06:34		07:17 (WEA 18-1) 05:27		05:04
	16:50	17:48	18:39		07:52 (WEA 18-1) 21:23		21:54
21	08:26	07:34	06:31		07:17 (WEA 18-1) 05:25		05:04
	16:52	17:49	18:40		07:52 (WEA 18-1) 21:24		21:54
22	08:25	07:32	06:29		07:17 (WEA 18-1) 05:24		05:05
	16:53	17:51	18:42		07:51 (WEA 18-1) 21:26		21:54
23	08:24	07:30	06:27		07:18 (WEA 18-1) 05:22		05:05
	16:55	17:53	18:44		07:51 (WEA 18-1) 21:27		21:54
24	08:23	07:28	06:24		07:18 (WEA 18-1) 05:21		05:05
	16:57	17:55	18:46		07:50 (WEA 18-1) 21:29		21:55
25	08:21	07:26	06:22		07:19 (WEA 18-1) 05:20		05:05
	16:59	17:57	19:47		07:49 (WEA 18-1) 21:30		21:55
26	08:20	07:24	06:20		07:19 (WEA 18-1) 05:19		05:06
	17:01	17:59	19:49	11 07:52 (WEA 18-2) 06:09	07:48 (WEA 18-1) 21:31		21:55
27	08:19	07:22	06:17	16 07:49 (WEA 18-2) 06:07	07:20 (WEA 18-1) 05:18		05:06
	17:02	18:01	19:51	16 08:05 (WEA 18-2) 20:45	07:47 (WEA 18-1) 21:33		21:55
28	08:17	07:19	06:15	19 07:48 (WEA 18-2) 06:05	07:21 (WEA 18-1) 05:16		05:07
	17:04	18:02	19:53	19 08:07 (WEA 18-2) 20:47	07:45 (WEA 18-1) 21:34		21:55
29	08:16		07:13	22 07:45 (WEA 18-2) 06:03	07:22 (WEA 18-1) 05:15		05:07
	17:06		19:54	22 08:07 (WEA 18-2) 20:48	07:43 (WEA 18-1) 21:35		21:54
30	08:15		07:10	23 07:45 (WEA 18-2) 06:01	07:24 (WEA 18-1) 05:14		05:08
	17:08		19:56	23 08:08 (WEA 18-2) 20:50	07:41 (WEA 18-1) 21:37		21:54
31	08:13		07:08	25 07:44 (WEA 18-2)		05:13	
	17:10		19:58	25 08:09 (WEA 18-2)		21:38	
Sonnenscheinstunden	256	275	366	416	487		502
astr.max.mögl.Beschattung		1269	552	883	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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 31b - Zur Dasslage 13/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Jul	August	September	Oktober	November	Dezember	
1	05:08 21:54	05:45 21:22	06:36 20:19	07:22 (WEA 18-1) 07:26 07:51 (WEA 18-1) 19:08	07:21 17:01	08:28 (WEA 18-3) 08:14 09:00 (WEA 18-3) 16:19	
2	05:09 21:54	05:47 21:20	06:38 20:17	07:22 (WEA 18-1) 07:28 07:53 (WEA 18-2) 19:06	07:23 16:59	08:30 (WEA 18-3) 08:15 08:58 (WEA 18-3) 16:18	
3	05:10 21:53	05:48 21:18	06:40 20:14	07:24 (WEA 18-1) 07:30 07:57 (WEA 18-2) 19:04	07:25 16:57	08:32 (WEA 18-3) 08:16 08:56 (WEA 18-3) 16:17	
4	05:11 21:53	05:50 21:17	06:41 20:12	07:25 (WEA 18-1) 07:31 07:59 (WEA 18-2) 19:01	09:45 (WEA 18-3) 07:27 09:50 (WEA 18-3) 16:55	08:35 (WEA 18-3) 08:18 08:54 (WEA 18-3) 16:17	
5	05:11 21:52	05:52 21:15	06:43 20:10	07:28 (WEA 18-1) 07:33 08:00 (WEA 18-2) 18:59	09:39 (WEA 18-3) 07:29 09:56 (WEA 18-3) 16:53	08:38 (WEA 18-3) 08:19 08:50 (WEA 18-3) 16:16	
6	05:12 21:52	05:53 21:13	06:45 20:07	07:34 (WEA 18-1) 07:35 08:01 (WEA 18-2) 18:57	09:34 (WEA 18-3) 07:30 09:58 (WEA 18-3) 16:51	08:21 16:16 08:22	
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 (WEA 18-2) 07:37 08:01 (WEA 18-2) 18:54	09:32 (WEA 18-3) 07:32 10:01 (WEA 18-3) 16:50	08:22 16:15 08:23	
8	05:14 21:51	05:56 21:09	06:48 20:03	07:37 (WEA 18-2) 07:38 08:02 (WEA 18-2) 18:52	09:30 (WEA 18-3) 07:34 10:03 (WEA 18-3) 16:48	08:23 16:15 08:24	
9	05:15 21:50	05:58 21:08	06:50 20:00	07:36 (WEA 18-2) 07:40 08:01 (WEA 18-2) 18:50	09:08 (WEA 18-4) 07:36 10:04 (WEA 18-3) 16:46	08:24 16:14 08:25	
10	05:16 21:49	06:00 21:06	06:51 19:58	07:35 (WEA 18-2) 07:42 08:01 (WEA 18-2) 18:47	09:04 (WEA 18-4) 07:38 10:06 (WEA 18-3) 16:45	08:25 16:14 08:27	
11	05:17 21:48	06:01 21:04	06:53 19:56	07:36 (WEA 18-2) 07:44 08:01 (WEA 18-2) 18:45	09:01 (WEA 18-4) 07:40 10:06 (WEA 18-3) 16:43	08:27 16:14 08:28	
12	05:18 21:48	06:03 21:02	07:38 (WEA 18-1) 06:55 07:43 (WEA 18-1) 19:53	07:35 (WEA 18-2) 07:45 08:00 (WEA 18-2) 18:43	08:59 (WEA 18-4) 07:41 10:07 (WEA 18-3) 16:41	08:28 16:14 08:29	
13	05:19 21:47	06:05 21:00	07:34 (WEA 18-1) 06:56 07:47 (WEA 18-1) 19:51	07:35 (WEA 18-2) 07:47 08:00 (WEA 18-2) 18:41	08:58 (WEA 18-4) 07:43 10:07 (WEA 18-3) 16:40	08:29 16:14 08:30	
14	05:20 21:46	06:06 20:58	07:31 (WEA 18-1) 06:58 07:49 (WEA 18-1) 19:49	07:35 (WEA 18-2) 07:49 07:58 (WEA 18-2) 18:38	08:57 (WEA 18-4) 07:45 10:08 (WEA 18-3) 16:38	08:30 16:14 08:31	
15	05:22 21:45	06:08 20:56	07:29 (WEA 18-1) 07:00 07:51 (WEA 18-1) 19:46	07:36 (WEA 18-2) 07:51 07:58 (WEA 18-2) 18:36	08:56 (WEA 18-4) 07:47 10:09 (WEA 18-3) 16:37	08:31 16:14 08:32	
16	05:23 21:44	06:10 20:54	07:27 (WEA 18-1) 07:01 07:52 (WEA 18-1) 19:44	07:37 (WEA 18-2) 07:52 07:56 (WEA 18-2) 18:34	08:56 (WEA 18-4) 07:49 10:09 (WEA 18-3) 16:35	08:32 16:14 08:32	
17	05:24 21:43	06:11 20:52	07:26 (WEA 18-1) 07:03 07:53 (WEA 18-1) 19:41	07:37 (WEA 18-2) 07:54 07:54 (WEA 18-2) 18:32	08:54 (WEA 18-4) 07:50 10:08 (WEA 18-3) 16:34	08:32 16:14 08:33	
18	05:25 21:42	06:13 20:50	07:26 (WEA 18-1) 07:05 07:55 (WEA 18-1) 19:39	07:40 (WEA 18-2) 07:56 07:51 (WEA 18-2) 18:29	08:54 (WEA 18-4) 07:52 10:08 (WEA 18-3) 16:33	08:33 16:14 08:34	
19	05:27 21:40	06:15 20:48	07:24 (WEA 18-1) 07:06 07:55 (WEA 18-1) 19:37	07:58 (WEA 18-2) 18:27 08:00 18:25	08:54 (WEA 18-4) 07:54 10:08 (WEA 18-3) 16:31	08:34 16:14 08:35	
20	05:28 21:39	06:16 20:45	07:24 (WEA 18-1) 07:08 07:56 (WEA 18-1) 19:34	08:00 18:25	08:54 (WEA 18-4) 07:56 10:08 (WEA 18-3) 16:30	08:35 16:15 08:35	
21	05:29 21:38	06:18 20:43	07:22 (WEA 18-1) 07:10 07:55 (WEA 18-1) 19:32	08:01 18:23	08:54 (WEA 18-4) 07:57 10:08 (WEA 18-3) 16:29	08:35 16:15 08:36	
22	05:31 21:37	06:20 20:41	07:22 (WEA 18-1) 07:11 07:56 (WEA 18-1) 19:30	08:03 18:21	08:54 (WEA 18-4) 07:59 10:08 (WEA 18-3) 16:27	08:36 16:15 08:36	
23	05:32 21:35	06:21 20:39	07:21 (WEA 18-1) 07:13 07:55 (WEA 18-1) 19:27	08:05 18:19	08:54 (WEA 18-4) 08:01 10:08 (WEA 18-3) 16:26	08:36 16:16 08:37	
24	05:33 21:34	06:23 20:37	07:21 (WEA 18-1) 07:15 07:56 (WEA 18-1) 19:25	08:07 18:17	08:55 (WEA 18-4) 08:02 10:07 (WEA 18-3) 16:25	08:37 16:17 08:37	
25	05:35 21:33	06:25 20:35	07:21 (WEA 18-1) 07:16 07:56 (WEA 18-1) 19:22	08:09 18:15	08:56 (WEA 18-4) 08:04 10:07 (WEA 18-3) 16:24	08:37 16:17 08:38	
26	05:36 21:31	06:26 20:32	07:20 (WEA 18-1) 07:18 07:55 (WEA 18-1) 19:20	08:10 18:13	08:57 (WEA 18-4) 08:06 10:06 (WEA 18-3) 16:23	08:38 16:18 08:38	
27	05:38 21:30	06:28 20:30	07:21 (WEA 18-1) 07:20 07:55 (WEA 18-1) 19:18	08:12 18:11	08:58 (WEA 18-4) 08:07 10:05 (WEA 18-3) 16:22	08:38 16:19 08:38	
28	05:39 21:28	06:30 20:28	07:20 (WEA 18-1) 07:21 07:54 (WEA 18-1) 19:15	07:14 17:08	09:00 (WEA 18-4) 08:09 09:05 (WEA 18-3) 16:21	08:38 16:19 08:38	
29	05:41 21:27	06:31 20:26	07:21 (WEA 18-1) 07:23 07:54 (WEA 18-1) 19:13	07:16 17:07	08:01 (WEA 18-4) 08:10 09:04 (WEA 18-3) 16:20	08:38 16:20 08:38	
30	05:42 21:25	06:33 20:23	07:20 (WEA 18-1) 07:25 07:52 (WEA 18-1) 19:11	07:18 17:05	08:04 (WEA 18-4) 08:12 09:03 (WEA 18-3) 16:19	08:38 16:21 08:38	
31	05:44 21:23	06:35 20:21	07:21 (WEA 18-1) 07:26 07:52 (WEA 18-1) 19:11	07:19 17:03	08:27 (WEA 18-3) 16:19 09:01 (WEA 18-3) 16:19	08:38 16:22 241	
Sonnenscheinstunden		505	456	382	332	265	241
astr.max.mögl.Beschattung				450	1613	115	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 32 - Große Harr 13

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April		Mai		Juni			
1	08:38	08:11	07:17		07:06		07:47 (WEA 18-4)	05:59	06:43 (WEA 18-2)	05:12	06:21 (WEA 18-1)	
	16:23	17:12	18:04		20:00	27	08:14 (WEA 18-4)	20:52	07:01 (WEA 18-2)	21:39	14	06:35 (WEA 18-1)
2	08:38	08:10	07:15		07:03		07:47 (WEA 18-4)	05:57	06:44 (WEA 18-2)	05:12		06:22 (WEA 18-1)
	16:24	17:13	18:06		20:01	27	08:14 (WEA 18-4)	20:53	07:00 (WEA 18-2)	21:40	11	06:33 (WEA 18-1)
3	08:38	08:08	07:13		07:01		07:47 (WEA 18-4)	05:55	06:45 (WEA 18-2)	05:11		06:23 (WEA 18-1)
	16:25	17:15	18:08		20:03	27	08:14 (WEA 18-4)	20:55	06:58 (WEA 18-2)	21:41	9	06:32 (WEA 18-1)
4	08:38	08:07	07:11		06:59		07:46 (WEA 18-4)	05:54	06:48 (WEA 18-2)	05:10		06:25 (WEA 18-1)
	16:27	17:17	18:10		20:05	26	08:12 (WEA 18-4)	20:57	06:57 (WEA 18-2)	21:42	6	06:31 (WEA 18-1)
5	08:38	08:05	07:08		06:56		07:42 (WEA 18-3)	05:52		05:09		
	16:28	17:19	18:12		20:07	30	08:12 (WEA 18-4)	20:59		21:43		
6	08:37	08:03	07:06		06:54		07:40 (WEA 18-3)	05:50		05:09		
	16:29	17:21	18:14		20:08	31	08:11 (WEA 18-4)	21:00		21:44		
7	08:37	08:01	07:04		06:52		07:37 (WEA 18-3)	05:48	06:21 (WEA 18-1)	05:08		
	16:30	17:23	18:15		20:10	32	08:09 (WEA 18-4)	21:02	06:31 (WEA 18-1)	21:45		
8	08:37	08:00	07:02		06:49		07:35 (WEA 18-3)	05:46	06:20 (WEA 18-1)	05:07		
	16:32	17:25	18:17		20:12	32	08:07 (WEA 18-4)	21:04	06:34 (WEA 18-1)	21:46		
9	08:36	07:58	06:59		06:47		07:34 (WEA 18-3)	05:44	06:18 (WEA 18-1)	05:07		
	16:33	17:27	18:19		20:14	31	08:05 (WEA 18-3)	21:05	06:35 (WEA 18-1)	21:47		
10	08:36	07:56	06:57		06:45		07:33 (WEA 18-3)	05:43	06:16 (WEA 18-1)	05:06		
	16:34	17:29	18:21		20:15	33	08:06 (WEA 18-3)	21:07	06:36 (WEA 18-1)	21:48		
11	08:35	07:54	06:55		06:42		07:31 (WEA 18-3)	05:41	06:16 (WEA 18-1)	05:06		
	16:36	17:31	18:23		20:17	35	08:06 (WEA 18-3)	21:09	06:37 (WEA 18-1)	21:49		
12	08:34	07:52	06:52		06:40		07:30 (WEA 18-3)	05:39	06:15 (WEA 18-1)	05:05		
	16:37	17:32	18:24		20:19	36	08:06 (WEA 18-3)	21:10	06:37 (WEA 18-1)	21:50		
13	08:34	07:50	06:50		06:38		07:30 (WEA 18-3)	05:37	06:15 (WEA 18-1)	05:05		
	16:39	17:34	18:26		20:21	37	08:07 (WEA 18-3)	21:12	06:38 (WEA 18-1)	21:50		
14	08:33	07:49	06:48		06:36		07:29 (WEA 18-3)	05:36	06:14 (WEA 18-1)	05:05		
	16:40	17:36	18:28		20:22	38	08:07 (WEA 18-3)	21:13	06:38 (WEA 18-1)	21:51		
15	08:32	07:47	06:45		06:33		07:29 (WEA 18-3)	05:34	06:14 (WEA 18-1)	05:05		
	16:42	17:38	18:30		20:24	38	08:07 (WEA 18-3)	21:15	06:39 (WEA 18-1)	21:51		
16	08:31	07:45	06:43		06:31		07:27 (WEA 18-3)	05:33	06:13 (WEA 18-1)	05:05		
	16:43	17:40	18:31		20:26	39	08:06 (WEA 18-3)	21:17	06:38 (WEA 18-1)	21:52		
17	08:30	07:43	06:41		06:29		07:27 (WEA 18-3)	05:31	06:13 (WEA 18-1)	05:04		
	16:45	17:42	18:33		20:28	39	08:06 (WEA 18-3)	21:18	06:39 (WEA 18-1)	21:53		
18	08:29	07:41	06:38		06:27		07:27 (WEA 18-3)	05:29	06:13 (WEA 18-1)	05:04		
	16:47	17:44	18:35		20:29	39	08:06 (WEA 18-3)	21:20	06:38 (WEA 18-1)	21:53		
19	08:28	07:39	06:36		06:24		07:27 (WEA 18-3)	05:28	06:13 (WEA 18-1)	05:04		
	16:48	17:46	18:37		20:31	38	08:05 (WEA 18-3)	21:21	06:39 (WEA 18-1)	21:53		
20	08:27	07:37	06:34		06:22		06:50 (WEA 18-2)	05:27	06:14 (WEA 18-1)	05:04		
	16:50	17:48	18:39		20:33	47	08:05 (WEA 18-3)	21:23	06:39 (WEA 18-1)	21:54		
21	08:26	07:34	06:31		06:20		06:47 (WEA 18-2)	05:25	06:14 (WEA 18-1)	05:05		
	16:52	17:49	18:40		20:34	50	08:04 (WEA 18-3)	21:24	06:39 (WEA 18-1)	21:54		
22	08:25	07:32	06:29		06:18		06:46 (WEA 18-2)	05:24	06:13 (WEA 18-1)	05:05		
	16:53	17:51	18:42		20:36	52	08:04 (WEA 18-3)	21:26	06:38 (WEA 18-1)	21:54		
23	08:24	07:30	06:27		06:16		06:45 (WEA 18-2)	05:22	06:14 (WEA 18-1)	05:05		
	16:55	17:53	18:44		20:38	52	08:03 (WEA 18-3)	21:27	06:38 (WEA 18-1)	21:54		
24	08:23	07:28	06:24	06:59 (WEA 18-4)	06:14		06:44 (WEA 18-2)	05:21	06:15 (WEA 18-1)	05:05		
	16:57	17:55	18:46	8	07:07 (WEA 18-4)	20:40	08:02 (WEA 18-3)	21:29	06:38 (WEA 18-1)	21:55		
25	08:21	07:26	06:22	07:56 (WEA 18-4)	06:12		06:44 (WEA 18-2)	05:20	06:15 (WEA 18-1)	05:05		
	16:59	17:57	19:47	14	08:10 (WEA 18-4)	20:41	08:01 (WEA 18-3)	21:30	06:38 (WEA 18-1)	21:55		
26	08:20	07:24	06:20	07:53 (WEA 18-4)	06:10		06:43 (WEA 18-2)	05:19	06:16 (WEA 18-1)	05:06		
	17:01	17:59	19:49	18	08:11 (WEA 18-4)	20:43	07:59 (WEA 18-3)	21:31	06:37 (WEA 18-1)	21:55		
27	08:19	07:22	06:17	07:51 (WEA 18-4)	06:07		06:43 (WEA 18-2)	05:18	06:16 (WEA 18-1)	05:06		
	17:02	18:01	19:51	22	08:13 (WEA 18-4)	20:45	07:58 (WEA 18-3)	21:33	06:37 (WEA 18-1)	21:55		
28	08:17	07:19	06:15	07:50 (WEA 18-4)	06:05		06:43 (WEA 18-2)	05:16	06:17 (WEA 18-1)	05:07		
	17:04	18:03	19:53	24	08:14 (WEA 18-4)	20:47	07:56 (WEA 18-3)	21:34	06:37 (WEA 18-1)	21:55		
29	08:16		07:13	07:49 (WEA 18-4)	06:03		06:43 (WEA 18-2)	05:15	06:18 (WEA 18-1)	05:07		
	17:06		19:54	25	08:14 (WEA 18-4)	20:48	07:54 (WEA 18-3)	21:35	06:36 (WEA 18-1)	21:54		
30	08:15		07:10	07:48 (WEA 18-4)	06:01		06:43 (WEA 18-2)	05:14	06:18 (WEA 18-1)	05:08		
	17:08		19:56	26	08:14 (WEA 18-4)	20:50	07:51 (WEA 18-3)	21:37	06:35 (WEA 18-1)	21:54		
31	08:13		07:08	07:48 (WEA 18-4)				05:13	06:19 (WEA 18-1)			
	17:10		19:58	27	08:15 (WEA 18-4)			21:38	06:34 (WEA 18-1)			
	Sonnenscheinstunden	256	275	366	416			487		502		
	astr.max.mögl.Beschattung			164	1151			591		40		

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 32 - Große Harr 13

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Juli		August		September		Oktober		November		Dezember	
1	05:08	05:45	06:25 (WEA 18-1)	06:36	07:30 (WEA 18-3)	07:26	07:21	08:14			
	21:54	21:22	06:48 (WEA 18-1)	20:19	08:06 (WEA 18-3)	19:08	17:01	16:19			
2	05:09	05:47	06:25 (WEA 18-1)	06:38	07:30 (WEA 18-3)	07:28	07:23	08:15			
	21:54	21:20	06:47 (WEA 18-1)	20:17	08:05 (WEA 18-3)	19:06	16:59	16:18			
3	05:10	05:49	06:27 (WEA 18-1)	06:40	07:31 (WEA 18-3)	07:30	07:25	08:16			
	21:53	21:18	06:47 (WEA 18-1)	20:14	08:04 (WEA 18-3)	19:04	16:57	16:17			
4	05:11	05:50	06:27 (WEA 18-1)	06:41	07:31 (WEA 18-3)	07:32	07:27	08:18			
	21:53	21:17	06:46 (WEA 18-1)	20:12	08:02 (WEA 18-3)	19:01	16:55	16:17			
5	05:11	05:52	06:29 (WEA 18-1)	06:43	07:32 (WEA 18-3)	07:33	07:29	08:19			
	21:52	21:15	06:45 (WEA 18-1)	20:10	08:04 (WEA 18-4)	18:59	16:53	16:16			
6	05:12	05:53	06:30 (WEA 18-1)	06:45	07:34 (WEA 18-3)	07:35	07:30	08:21			
	21:52	21:13	06:43 (WEA 18-1)	20:07	08:06 (WEA 18-4)	18:57	16:51	16:16			
7	05:13	05:55	06:33 (WEA 18-1)	06:46	07:35 (WEA 18-3)	07:37	07:32	08:22			
	21:51	21:11	06:40 (WEA 18-1)	20:05	08:06 (WEA 18-4)	18:54	16:50	16:15			
8	05:14	05:57		06:48	07:37 (WEA 18-3)	07:38	07:34	08:23			
	21:51	21:09		20:03	08:07 (WEA 18-4)	18:52	16:48	16:15			
9	05:15	06:32 (WEA 18-1)	05:58	06:59 (WEA 18-2)	06:50	07:40 (WEA 18-4)	07:40	07:36	08:24		
	21:50	4 06:36 (WEA 18-1)	21:08	5 07:04 (WEA 18-2)	20:00	08:06 (WEA 18-4)	18:50	16:46	16:14		
10	05:16	06:31 (WEA 18-1)	06:00	06:55 (WEA 18-2)	06:51	07:40 (WEA 18-4)	07:42	07:38	08:25		
	21:49	8 06:39 (WEA 18-1)	21:06	11 07:06 (WEA 18-2)	19:58	08:07 (WEA 18-4)	18:47	16:45	16:14		
11	05:17	06:29 (WEA 18-1)	06:01	06:54 (WEA 18-2)	06:53	07:40 (WEA 18-4)	07:44	07:40	08:27		
	21:48	11 06:40 (WEA 18-1)	21:04	14 07:08 (WEA 18-2)	19:56	08:07 (WEA 18-4)	18:45	16:43	16:14		
12	05:18	06:28 (WEA 18-1)	06:03	06:52 (WEA 18-2)	06:55	07:39 (WEA 18-4)	07:45	07:41	08:28		
	21:48	13 06:41 (WEA 18-1)	21:02	17 07:09 (WEA 18-2)	19:53	08:06 (WEA 18-4)	18:43	16:41	16:14		
13	05:19	06:28 (WEA 18-1)	06:05	06:52 (WEA 18-2)	06:56	07:39 (WEA 18-4)	07:47	07:43	08:29		
	21:47	15 06:43 (WEA 18-1)	21:00	26 07:56 (WEA 18-2)	19:51	08:06 (WEA 18-4)	18:41	16:40	16:14		
14	05:20	06:27 (WEA 18-1)	06:06	06:50 (WEA 18-2)	06:58	07:38 (WEA 18-4)	07:49	07:45	08:30		
	21:46	16 06:43 (WEA 18-1)	20:58	35 07:59 (WEA 18-3)	19:49	08:05 (WEA 18-4)	18:38	16:38	16:14		
15	05:22	06:26 (WEA 18-1)	06:08	06:50 (WEA 18-2)	07:00	07:39 (WEA 18-4)	07:51	07:47	08:31		
	21:45	18 06:44 (WEA 18-1)	20:56	40 08:02 (WEA 18-3)	19:46	08:04 (WEA 18-4)	18:36	16:37	16:14		
16	05:23	06:27 (WEA 18-1)	06:10	06:49 (WEA 18-2)	07:01	07:40 (WEA 18-4)	07:52	07:49	08:32		
	21:44	19 06:46 (WEA 18-1)	20:54	45 08:03 (WEA 18-3)	19:44	08:03 (WEA 18-4)	18:34	16:35	16:14		
17	05:24	06:26 (WEA 18-1)	06:11	06:49 (WEA 18-2)	07:03	07:40 (WEA 18-4)	07:54	07:50	08:32		
	21:43	20 06:46 (WEA 18-1)	20:52	48 08:05 (WEA 18-3)	19:41	08:01 (WEA 18-4)	18:32	16:34	16:14		
18	05:25	06:25 (WEA 18-1)	06:13	06:50 (WEA 18-2)	07:05	07:41 (WEA 18-4)	07:56	07:52	08:33		
	21:42	22 06:47 (WEA 18-1)	20:50	49 08:06 (WEA 18-3)	19:39	08:00 (WEA 18-4)	18:30	16:33	16:14		
19	05:27	06:25 (WEA 18-1)	06:15	06:49 (WEA 18-2)	07:06	07:43 (WEA 18-4)	07:58	07:54	08:34		
	21:40	22 06:47 (WEA 18-1)	20:48	51 08:06 (WEA 18-3)	19:37	07:58 (WEA 18-4)	18:27	16:31	16:14		
20	05:28	06:24 (WEA 18-1)	06:16	06:50 (WEA 18-2)	07:08	07:45 (WEA 18-4)	08:00	07:56	08:35		
	21:39	23 06:47 (WEA 18-1)	20:45	52 08:08 (WEA 18-3)	19:34	07:54 (WEA 18-4)	18:25	16:30	16:15		
21	05:29	06:25 (WEA 18-1)	06:18	06:50 (WEA 18-2)	07:10		08:01	07:57	08:35		
	21:38	24 06:49 (WEA 18-1)	20:43	53 08:08 (WEA 18-3)	19:32		18:23	16:29	16:15		
22	05:31	06:24 (WEA 18-1)	06:20	06:51 (WEA 18-2)	07:11		08:03	07:59	08:36		
	21:37	25 06:49 (WEA 18-1)	20:41	51 08:08 (WEA 18-3)	19:30		18:21	16:27	16:16		
23	05:32	06:24 (WEA 18-1)	06:21	06:51 (WEA 18-2)	07:13		08:05	08:01	08:36		
	21:35	25 06:49 (WEA 18-1)	20:39	51 08:08 (WEA 18-3)	19:27		18:19	16:26	16:16		
24	05:33	06:24 (WEA 18-1)	06:23	06:54 (WEA 18-2)	07:15		08:07	08:02	08:37		
	21:34	26 06:50 (WEA 18-1)	20:37	47 08:09 (WEA 18-3)	19:25		18:17	16:25	16:17		
25	05:35	06:24 (WEA 18-1)	06:25	07:31 (WEA 18-3)	07:16		08:09	08:04	08:37		
	21:33	25 06:49 (WEA 18-1)	20:35	38 08:09 (WEA 18-3)	19:22		18:15	16:24	16:17		
26	05:36	06:23 (WEA 18-1)	06:26	07:30 (WEA 18-3)	07:18		08:10	08:06	08:38		
	21:31	26 06:49 (WEA 18-1)	20:32	39 08:09 (WEA 18-3)	19:20		18:13	16:23	16:18		
27	05:38	06:24 (WEA 18-1)	06:28	07:30 (WEA 18-3)	07:20		08:12	08:07	08:38		
	21:30	26 06:50 (WEA 18-1)	20:30	39 08:09 (WEA 18-3)	19:18		18:11	16:22	16:19		
28	05:39	06:24 (WEA 18-1)	06:30	07:29 (WEA 18-3)	07:21		07:14	08:09	08:38		
	21:28	25 06:49 (WEA 18-1)	20:28	39 08:08 (WEA 18-3)	19:15		17:09	16:21	16:19		
29	05:41	06:24 (WEA 18-1)	06:31	07:30 (WEA 18-3)	07:23		07:16	08:10	08:38		
	21:27	25 06:49 (WEA 18-1)	20:26	38 08:08 (WEA 18-3)	19:13		17:07	16:20	16:20		
30	05:42	06:24 (WEA 18-1)	06:33	07:29 (WEA 18-3)	07:25		07:18	08:12	08:38		
	21:25	25 06:49 (WEA 18-1)	20:23	38 08:07 (WEA 18-3)	19:11		17:05	16:19	16:21		
31	05:44	06:24 (WEA 18-1)	06:35	07:29 (WEA 18-3)			07:19		08:38		
	21:23	24 06:48 (WEA 18-1)	20:21	37 08:06 (WEA 18-3)			17:03		16:22		
Sonnenscheinstunden	505	456		382	533	332	265	241			
astr.max.mögl.Beschattung	467	983									

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)	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 33a - Große Haar 15/Nordost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni			
1	08:38 16:23	08:11 17:12	07:17 18:04	07:06 20:00		05:59 20:52	10	07:24 (WEA 18-4) 07:34 (WEA 18-4)	05:12 21:39	51	06:40 (WEA 18-3) 06:40 (WEA 18-3)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01		05:57 20:53			05:12 21:40	51	07:31 (WEA 18-3) 06:40 (WEA 18-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03		05:55 20:55	7	07:01 (WEA 18-3) 07:08 (WEA 18-3)	05:11 21:41	50	06:40 (WEA 18-3) 07:30 (WEA 18-3)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	17	06:57 (WEA 18-3) 07:14 (WEA 18-3)	05:10 21:42	50	06:41 (WEA 18-3) 07:31 (WEA 18-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07		05:52 20:59	22	06:54 (WEA 18-3) 07:16 (WEA 18-3)	05:09 21:43	51	06:40 (WEA 18-3) 07:31 (WEA 18-3)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08		05:50 21:00	37	06:21 (WEA 18-2) 07:18 (WEA 18-3)	05:09 21:44	50	06:40 (WEA 18-3) 07:30 (WEA 18-3)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:52 20:10		05:48 21:02	45	06:19 (WEA 18-2) 07:20 (WEA 18-3)	05:08 21:45	50	06:41 (WEA 18-3) 06:40 (WEA 18-3)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	51	06:18 (WEA 18-2) 07:22 (WEA 18-3)	05:07 21:46	50	05:52 (WEA 18-1) 07:30 (WEA 18-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	4	05:44 21:05	54	06:17 (WEA 18-2) 07:22 (WEA 18-3)	05:07 21:47	57	05:50 (WEA 18-1) 07:31 (WEA 18-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	14	05:43 21:07	58	06:16 (WEA 18-2) 07:23 (WEA 18-3)	05:06 21:48	58	05:49 (WEA 18-1) 07:31 (WEA 18-3)
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	20	05:41 21:09	62	06:15 (WEA 18-2) 07:25 (WEA 18-3)	05:05 21:49	60	05:48 (WEA 18-1) 07:31 (WEA 18-3)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	23	05:39 21:10	64	06:15 (WEA 18-2) 07:25 (WEA 18-3)	05:05 21:49	62	05:47 (WEA 18-1) 07:31 (WEA 18-3)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:21	26	05:37 21:12	66	06:15 (WEA 18-2) 07:26 (WEA 18-3)	05:05 21:50	62	05:47 (WEA 18-1) 07:31 (WEA 18-3)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	28	05:36 21:13	67	06:14 (WEA 18-2) 07:26 (WEA 18-3)	05:05 21:51	64	05:47 (WEA 18-1) 07:32 (WEA 18-3)
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	29	05:34 21:15	69	06:14 (WEA 18-2) 07:27 (WEA 18-3)	05:05 21:51	63	05:47 (WEA 18-1) 07:32 (WEA 18-3)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	31	05:33 21:17	69	06:14 (WEA 18-2) 07:27 (WEA 18-3)	05:05 21:52	64	05:46 (WEA 18-1) 07:31 (WEA 18-3)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	32	05:31 21:18	71	06:14 (WEA 18-2) 07:28 (WEA 18-3)	05:04 21:52	64	05:46 (WEA 18-1) 07:31 (WEA 18-3)
18	08:29 16:47	07:41 17:44	06:38 18:35	06:27 20:29	33	05:29 21:20	71	06:14 (WEA 18-2) 07:28 (WEA 18-3)	05:04 21:53	66	05:46 (WEA 18-1) 07:32 (WEA 18-3)
19	08:28 16:48	07:39 17:46	06:36 18:37	06:24 20:31	34	05:28 21:21	71	06:14 (WEA 18-2) 07:28 (WEA 18-3)	05:04 21:53	65	05:47 (WEA 18-1) 07:33 (WEA 18-3)
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	34	05:27 21:23	71	06:15 (WEA 18-2) 07:29 (WEA 18-3)	05:04 21:54	65	05:47 (WEA 18-1) 07:33 (WEA 18-3)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	33	05:25 21:24	70	06:16 (WEA 18-2) 07:29 (WEA 18-3)	05:05 21:54	65	05:47 (WEA 18-1) 07:33 (WEA 18-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	33	05:24 21:26	71	06:15 (WEA 18-2) 07:29 (WEA 18-3)	05:05 21:54	65	05:47 (WEA 18-1) 07:33 (WEA 18-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	33	05:22 21:27	69	06:16 (WEA 18-2) 07:29 (WEA 18-3)	05:05 21:54	65	05:47 (WEA 18-1) 07:33 (WEA 18-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	32	05:21 21:29	69	06:17 (WEA 18-2) 07:30 (WEA 18-3)	05:05 21:55	65	05:48 (WEA 18-1) 07:34 (WEA 18-3)
25	08:21 16:59	07:26 17:57	06:22 19:47	06:12 20:41	30	05:20 21:30	67	06:18 (WEA 18-2) 07:30 (WEA 18-3)	05:05 21:55	65	05:48 (WEA 18-1) 07:34 (WEA 18-3)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	29	05:19 21:31	66	06:19 (WEA 18-2) 07:30 (WEA 18-3)	05:06 21:55	65	05:49 (WEA 18-1) 07:33 (WEA 18-3)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	27	05:18 21:33	64	06:20 (WEA 18-2) 07:30 (WEA 18-3)	05:06 21:55	64	05:49 (WEA 18-1) 07:34 (WEA 18-3)
28	08:17 17:04	07:19 18:03	06:15 19:53	06:05 20:47	26	05:16 21:34	62	06:21 (WEA 18-2) 07:30 (WEA 18-3)	05:07 21:54	64	05:49 (WEA 18-1) 07:34 (WEA 18-3)
29	08:16 17:06		06:13 19:54	06:03 20:48	24	05:15 21:35	58	06:23 (WEA 18-2) 07:30 (WEA 18-3)	05:07 21:54	64	05:50 (WEA 18-1) 07:35 (WEA 18-3)
30	08:14 17:08		06:10 19:56	06:01 20:50	20	05:14 21:37	51	06:39 (WEA 18-3) 07:30 (WEA 18-3)	05:08 21:54	63	05:50 (WEA 18-1) 07:35 (WEA 18-3)
31	08:13 17:10		07:08 19:58		17	05:13 21:38	51	06:39 (WEA 18-3) 07:30 (WEA 18-3)			
	Sonnenscheinstunden	256	275	366	416	487	6180		502	1798	
	astr.max.mögl.Beschattung				612						

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 33a - Große Haar 15/Nordost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember			
1	05:08 21:54	05:51 (WEA 18-1) 07:35 (WEA 18-3)	05:45 21:22	06:25 (WEA 18-2) 07:36 (WEA 18-3)	06:36 20:19	07:21 (WEA 18-4) 07:46 (WEA 18-4)	07:26 19:08	07:21 17:01	08:13 16:19
2	05:09 21:54	05:52 (WEA 18-1) 07:36 (WEA 18-3)	05:47 21:20	06:25 (WEA 18-2) 07:35 (WEA 18-3)	06:38 20:17	07:21 (WEA 18-4) 07:44 (WEA 18-4)	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:53 (WEA 18-1) 07:36 (WEA 18-3)	05:49 21:18	06:26 (WEA 18-2) 07:35 (WEA 18-3)	06:40 20:14	07:23 (WEA 18-4) 07:42 (WEA 18-4)	07:30 19:04	07:25 16:57	08:16 16:17
4	05:11 21:53	05:54 (WEA 18-1) 07:36 (WEA 18-3)	05:50 21:17	06:26 (WEA 18-2) 07:33 (WEA 18-3)	06:41 20:12	07:25 (WEA 18-4) 07:39 (WEA 18-4)	07:31 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	05:56 (WEA 18-1) 07:37 (WEA 18-3)	05:52 21:15	06:28 (WEA 18-2) 07:32 (WEA 18-3)	06:43 20:10	07:30 (WEA 18-4) 07:34 (WEA 18-4)	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	06:47 (WEA 18-3) 07:37 (WEA 18-3)	05:53 21:13	06:28 (WEA 18-2) 07:30 (WEA 18-3)	06:45 20:07		07:35 18:57	07:30 16:51	08:21 16:16
7	05:13 21:51	06:47 (WEA 18-3) 07:37 (WEA 18-3)	05:55 21:11	06:30 (WEA 18-2) 07:29 (WEA 18-3)	06:46 20:05		07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	06:47 (WEA 18-3) 07:37 (WEA 18-3)	05:57 21:09	06:32 (WEA 18-2) 07:27 (WEA 18-3)	06:48 20:03		07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	06:47 (WEA 18-3) 07:37 (WEA 18-3)	05:58 21:08	07:04 (WEA 18-3) 07:25 (WEA 18-3)	06:50 20:00		07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	06:47 (WEA 18-3) 07:38 (WEA 18-3)	06:00 21:06	07:07 (WEA 18-3) 07:21 (WEA 18-3)	06:51 19:58		07:42 18:47	07:38 16:45	08:25 16:14
11	05:17 21:48	06:47 (WEA 18-3) 07:38 (WEA 18-3)	06:01 21:04		06:53 19:56		07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:47 (WEA 18-3) 07:38 (WEA 18-3)	06:03 21:02	07:36 (WEA 18-4) 07:38 (WEA 18-4)	06:55 19:53		07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	06:47 (WEA 18-3) 07:38 (WEA 18-3)	06:05 21:00	07:31 (WEA 18-4) 07:44 (WEA 18-4)	06:56 19:51		07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	06:47 (WEA 18-3) 07:38 (WEA 18-3)	06:06 20:58	07:28 (WEA 18-4) 07:46 (WEA 18-4)	06:58 19:49		07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	06:33 (WEA 18-2) 07:39 (WEA 18-3)	06:08 20:56	07:27 (WEA 18-4) 07:48 (WEA 18-4)	07:00 19:46		07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:31 (WEA 18-2) 07:40 (WEA 18-3)	06:10 20:54	07:25 (WEA 18-4) 07:48 (WEA 18-4)	07:01 19:44		07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	06:30 (WEA 18-2) 07:40 (WEA 18-3)	06:11 20:52	07:24 (WEA 18-4) 07:50 (WEA 18-4)	07:03 19:41		07:54 18:32	07:50 16:34	08:32 16:14
18	05:25 21:42	06:29 (WEA 18-2) 07:39 (WEA 18-3)	06:13 20:50	07:23 (WEA 18-4) 07:51 (WEA 18-4)	07:05 19:39		07:56 18:30	07:52 16:33	08:33 16:14
19	05:27 21:40	06:28 (WEA 18-2) 07:39 (WEA 18-3)	06:15 20:47	07:22 (WEA 18-4) 07:51 (WEA 18-4)	07:06 19:37		07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:27 (WEA 18-2) 07:39 (WEA 18-3)	06:16 20:45	07:21 (WEA 18-4) 07:52 (WEA 18-4)	07:08 19:34		08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	06:27 (WEA 18-2) 07:40 (WEA 18-3)	06:18 20:43	07:20 (WEA 18-4) 07:52 (WEA 18-4)	07:10 19:32		08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	06:26 (WEA 18-2) 07:40 (WEA 18-3)	06:20 20:41	07:20 (WEA 18-4) 07:52 (WEA 18-4)	07:11 19:30		08:03 18:21	07:59 16:27	08:36 16:16
23	05:32 21:35	06:26 (WEA 18-2) 07:39 (WEA 18-3)	06:21 20:39	07:19 (WEA 18-4) 07:52 (WEA 18-4)	07:13 19:27		08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:26 (WEA 18-2) 07:40 (WEA 18-3)	06:23 20:37	07:19 (WEA 18-4) 07:52 (WEA 18-4)	07:15 19:25		08:07 18:17	08:02 16:25	08:37 16:17
25	05:35 21:33	06:25 (WEA 18-2) 07:39 (WEA 18-3)	06:25 20:35	07:19 (WEA 18-4) 07:52 (WEA 18-4)	07:16 19:22		08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	06:25 (WEA 18-2) 07:39 (WEA 18-3)	06:26 20:32	07:18 (WEA 18-4) 07:51 (WEA 18-4)	07:18 19:20		08:10 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	06:25 (WEA 18-2) 07:39 (WEA 18-3)	06:28 20:30	07:19 (WEA 18-4) 07:51 (WEA 18-4)	07:20 19:18		08:12 18:11	08:07 16:22	08:38 16:19
28	05:39 21:28	06:25 (WEA 18-2) 07:38 (WEA 18-3)	06:30 20:28	07:18 (WEA 18-4) 07:50 (WEA 18-4)	07:21 19:15		07:14 17:09	08:09 16:21	08:38 16:19
29	05:41 21:27	06:24 (WEA 18-2) 07:37 (WEA 18-3)	06:31 20:26	07:19 (WEA 18-4) 07:50 (WEA 18-4)	07:23 19:13		07:16 17:07	08:10 16:20	08:38 16:20
30	05:42 21:25	06:25 (WEA 18-2) 07:37 (WEA 18-3)	06:33 20:23	07:19 (WEA 18-4) 07:48 (WEA 18-4)	07:25 19:11		07:18 17:05	08:12 16:19	08:38 16:21
31	05:44 21:23	06:25 (WEA 18-2) 07:36 (WEA 18-3)	06:35 20:21	07:20 (WEA 18-4) 07:47 (WEA 18-4)	19:11		07:19 17:03	08:12 16:22	08:38 16:22
	Sonnenscheinstunden	505	456		382		332	265	241
	astr.max.mögl.Beschattung	1904	995		85				

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 33b - Große Haar 15A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni		
1	08:38 16:23	08:11 17:12	07:17 18:04	07:06 20:00		05:59 20:52	14	07:21 (WEA 18-4) 05:12 07:35 (WEA 18-4) 21:39	52	06:38 (WEA 18-3)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01		05:57 20:53	6	07:25 (WEA 18-4) 05:12 07:31 (WEA 18-4) 21:40	51	06:38 (WEA 18-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03		05:55 20:55		05:11 21:41	51	06:38 (WEA 18-3)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	10	06:59 (WEA 18-3) 05:10 07:09 (WEA 18-3) 21:42	51	06:39 (WEA 18-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07		05:52 20:59	18	06:55 (WEA 18-3) 05:09 07:13 (WEA 18-3) 21:43	51	06:39 (WEA 18-3)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08		05:50 21:00	31	06:22 (WEA 18-2) 05:09 07:15 (WEA 18-3) 21:44	50	06:39 (WEA 18-3)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:52 20:10		05:48 21:02	41	06:19 (WEA 18-2) 05:08 07:17 (WEA 18-3) 21:45	51	06:39 (WEA 18-3)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	47	06:18 (WEA 18-2) 05:07 07:19 (WEA 18-3) 21:46	50	06:39 (WEA 18-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14	10	05:44 07:29 (WEA 18-4) 21:05	51	06:17 (WEA 18-2) 05:07 07:20 (WEA 18-3) 21:47	50	06:40 (WEA 18-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	18	05:43 07:25 (WEA 18-4) 21:07	56	06:15 (WEA 18-2) 05:06 07:21 (WEA 18-3) 21:48	56	06:40 (WEA 18-3)
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17	22	05:41 07:22 (WEA 18-4) 21:09	59	06:14 (WEA 18-2) 05:05 07:22 (WEA 18-3) 21:49	59	06:40 (WEA 18-3)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	24	05:39 07:21 (WEA 18-4) 21:10	62	06:14 (WEA 18-2) 05:05 07:23 (WEA 18-3) 21:49	59	06:40 (WEA 18-3)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:21	27	05:37 07:19 (WEA 18-4) 21:12	65	06:14 (WEA 18-2) 05:05 07:24 (WEA 18-3) 21:50	61	06:40 (WEA 18-3)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	29	05:36 07:18 (WEA 18-4) 21:13	66	06:14 (WEA 18-2) 05:05 07:24 (WEA 18-3) 21:51	63	06:40 (WEA 18-3)
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	31	05:34 07:17 (WEA 18-4) 21:15	67	06:14 (WEA 18-2) 05:05 07:25 (WEA 18-3) 21:51	63	06:40 (WEA 18-3)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	31	05:33 07:16 (WEA 18-4) 21:17	69	06:13 (WEA 18-2) 05:05 07:25 (WEA 18-3) 21:52	63	06:40 (WEA 18-3)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	33	05:31 07:15 (WEA 18-4) 21:18	69	06:14 (WEA 18-2) 05:04 07:26 (WEA 18-3) 21:52	64	06:40 (WEA 18-3)
18	08:29 16:47	07:41 17:44	06:38 18:35	06:27 20:29	33	05:29 07:15 (WEA 18-4) 21:20	70	06:13 (WEA 18-2) 05:04 07:26 (WEA 18-3) 21:53	64	06:40 (WEA 18-3)
19	08:28 16:48	07:39 17:46	06:36 18:37	06:24 20:31	34	05:28 07:14 (WEA 18-4) 21:21	72	06:14 (WEA 18-2) 05:04 07:27 (WEA 18-3) 21:53	65	06:40 (WEA 18-3)
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	34	05:27 07:14 (WEA 18-4) 21:23	72	06:14 (WEA 18-2) 05:04 07:27 (WEA 18-3) 21:54	65	06:40 (WEA 18-3)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	33	05:25 07:14 (WEA 18-4) 21:24	72	06:15 (WEA 18-2) 05:05 07:28 (WEA 18-3) 21:54	65	06:40 (WEA 18-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	33	05:24 07:14 (WEA 18-4) 21:26	69	06:15 (WEA 18-2) 05:05 07:27 (WEA 18-3) 21:54	65	06:40 (WEA 18-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	32	05:22 07:14 (WEA 18-4) 21:27	70	06:15 (WEA 18-2) 05:05 07:28 (WEA 18-3) 21:54	65	06:40 (WEA 18-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	31	05:21 07:15 (WEA 18-4) 21:29	69	06:16 (WEA 18-2) 05:05 07:28 (WEA 18-3) 21:55	65	06:40 (WEA 18-3)
25	08:21 16:59	07:26 17:57	06:22 19:47	06:12 20:41	30	05:20 07:15 (WEA 18-4) 21:30	67	06:17 (WEA 18-2) 05:05 07:28 (WEA 18-3) 21:55	64	06:40 (WEA 18-3)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	29	05:19 07:15 (WEA 18-4) 21:31	67	06:18 (WEA 18-2) 05:06 07:29 (WEA 18-3) 21:55	63	06:40 (WEA 18-3)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	27	05:18 07:16 (WEA 18-4) 21:33	65	06:19 (WEA 18-2) 05:06 07:29 (WEA 18-3) 21:55	64	06:40 (WEA 18-3)
28	08:17 17:04	07:19 18:03	06:15 19:53	06:05 20:47	24	05:16 07:17 (WEA 18-4) 21:34	63	06:20 (WEA 18-2) 05:07 07:29 (WEA 18-3) 21:54	63	06:40 (WEA 18-3)
29	08:16 17:06	07:18 18:03	06:13 19:54	06:03 20:48	22	05:15 07:18 (WEA 18-4) 21:35	60	06:21 (WEA 18-2) 05:07 07:29 (WEA 18-3) 21:54	62	06:40 (WEA 18-3)
30	08:14 17:08	07:16 19:56	06:10 19:56	06:01 20:50	19	05:14 07:19 (WEA 18-4) 21:37	56	06:23 (WEA 18-2) 05:08 07:29 (WEA 18-3) 21:54	62	06:40 (WEA 18-3)
31	08:13 17:10	07:15 19:58	06:08 19:58	05:59 20:51		05:13 21:38	51	06:38 (WEA 18-3) 05:09 07:29 (WEA 18-3) 21:54		06:40 (WEA 18-3)
	Sonnenscheinstunden	256	275	366	416	606	487	1654	502	1777
	astr.max.mögl.Beschattung									

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 33b - Große Haar 15A/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli	August	September	Oktober	November	Dezember
1	05:08 21:54	05:52 (WEA 18-1) 07:34 (WEA 18-3)	05:45 21:22	06:25 (WEA 18-2) 07:34 (WEA 18-3)	07:20 (WEA 18-4) 07:45 (WEA 18-4)	07:26 19:08
2	05:09 21:54	05:53 (WEA 18-1) 07:35 (WEA 18-3)	05:47 21:20	06:25 (WEA 18-2) 07:33 (WEA 18-3)	07:21 (WEA 18-4) 07:42 (WEA 18-4)	07:28 19:06
3	05:10 21:53	05:53 (WEA 18-1) 07:34 (WEA 18-3)	05:49 21:18	06:26 (WEA 18-2) 07:32 (WEA 18-3)	07:23 (WEA 18-4) 07:40 (WEA 18-4)	07:30 19:04
4	05:11 21:53	05:56 (WEA 18-1) 07:35 (WEA 18-3)	05:50 21:17	06:26 (WEA 18-2) 07:31 (WEA 18-3)	07:26 (WEA 18-4) 07:36 (WEA 18-4)	07:31 19:01
5	05:11 21:52	06:45 (WEA 18-3) 07:36 (WEA 18-3)	05:52 21:15	06:27 (WEA 18-2) 07:30 (WEA 18-3)	07:28 (WEA 18-3) 20:10	06:43 20:10
6	05:12 21:52	06:46 (WEA 18-3) 07:36 (WEA 18-3)	05:53 21:13	06:28 (WEA 18-2) 07:28 (WEA 18-3)	06:45 20:07	06:45 20:07
7	05:13 21:51	06:45 (WEA 18-3) 07:35 (WEA 18-3)	05:55 21:11	06:30 (WEA 18-2) 07:26 (WEA 18-3)	06:46 20:05	06:46 20:05
8	05:14 21:51	06:45 (WEA 18-3) 07:36 (WEA 18-3)	05:57 21:09	06:33 (WEA 18-2) 07:24 (WEA 18-3)	06:48 20:03	06:48 20:03
9	05:15 21:50	06:45 (WEA 18-3) 07:36 (WEA 18-3)	05:58 21:08	07:05 (WEA 18-3) 07:21 (WEA 18-3)	06:50 20:00	06:50 20:00
10	05:16 21:49	06:46 (WEA 18-3) 07:36 (WEA 18-3)	06:00 21:06	07:11 (WEA 18-3) 07:13 (WEA 18-3)	06:51 19:58	06:51 19:58
11	05:17 21:48	06:46 (WEA 18-3) 07:37 (WEA 18-3)	06:01 21:04	06:53 19:56	06:53 19:56	06:53 19:56
12	05:18 21:48	06:46 (WEA 18-3) 07:37 (WEA 18-3)	06:03 21:02	07:31 (WEA 18-4) 07:41 (WEA 18-4)	06:55 19:53	06:55 19:53
13	05:19 21:47	06:46 (WEA 18-3) 07:37 (WEA 18-3)	06:05 21:00	07:29 (WEA 18-4) 07:45 (WEA 18-4)	06:56 19:51	06:56 19:51
14	05:20 21:46	06:33 (WEA 18-2) 07:37 (WEA 18-3)	06:06 20:58	07:26 (WEA 18-4) 07:46 (WEA 18-4)	06:58 19:49	06:58 19:49
15	05:22 21:45	06:30 (WEA 18-2) 07:37 (WEA 18-3)	06:08 20:56	07:25 (WEA 18-4) 07:48 (WEA 18-4)	07:00 19:46	07:00 19:46
16	05:23 21:44	06:30 (WEA 18-2) 07:38 (WEA 18-3)	06:10 20:54	07:23 (WEA 18-4) 07:48 (WEA 18-4)	07:01 19:44	07:01 19:44
17	05:24 21:43	06:29 (WEA 18-2) 07:38 (WEA 18-3)	06:11 20:52	07:22 (WEA 18-4) 07:50 (WEA 18-4)	07:03 19:41	07:03 19:41
18	05:25 21:42	06:28 (WEA 18-2) 07:38 (WEA 18-3)	06:13 20:50	07:22 (WEA 18-4) 07:51 (WEA 18-4)	07:05 19:39	07:05 19:39
19	05:27 21:40	06:27 (WEA 18-2) 07:38 (WEA 18-3)	06:15 20:47	07:20 (WEA 18-4) 07:51 (WEA 18-4)	07:06 19:37	07:06 19:37
20	05:28 21:39	06:26 (WEA 18-2) 07:38 (WEA 18-3)	06:16 20:45	07:20 (WEA 18-4) 07:51 (WEA 18-4)	07:08 19:34	07:08 19:34
21	05:29 21:38	06:26 (WEA 18-2) 07:38 (WEA 18-3)	06:18 20:43	07:19 (WEA 18-4) 07:51 (WEA 18-4)	07:10 19:32	07:10 19:32
22	05:31 21:37	06:25 (WEA 18-2) 07:38 (WEA 18-3)	06:20 20:41	07:19 (WEA 18-4) 07:52 (WEA 18-4)	07:11 19:30	07:11 19:30
23	05:32 21:35	06:25 (WEA 18-2) 07:38 (WEA 18-3)	06:21 20:39	07:18 (WEA 18-4) 07:51 (WEA 18-4)	07:13 19:27	07:13 19:27
24	05:33 21:34	06:25 (WEA 18-2) 07:38 (WEA 18-3)	06:23 20:37	07:18 (WEA 18-4) 07:51 (WEA 18-4)	07:15 19:25	07:15 19:25
25	05:35 21:33	06:24 (WEA 18-2) 07:37 (WEA 18-3)	06:25 20:35	07:18 (WEA 18-4) 07:51 (WEA 18-4)	07:16 19:22	07:16 19:22
26	05:36 21:31	06:24 (WEA 18-2) 07:37 (WEA 18-3)	06:26 20:32	07:17 (WEA 18-4) 07:50 (WEA 18-4)	07:18 19:20	07:18 19:20
27	05:38 21:30	06:24 (WEA 18-2) 07:37 (WEA 18-3)	06:28 20:30	07:18 (WEA 18-4) 07:50 (WEA 18-4)	07:20 19:18	07:20 19:18
28	05:39 21:28	06:24 (WEA 18-2) 07:36 (WEA 18-3)	06:30 20:28	07:17 (WEA 18-4) 07:49 (WEA 18-4)	07:21 19:15	07:21 19:15
29	05:41 21:27	06:24 (WEA 18-2) 07:35 (WEA 18-3)	06:31 20:26	07:18 (WEA 18-4) 07:49 (WEA 18-4)	07:23 19:13	07:23 19:13
30	05:42 21:25	06:24 (WEA 18-2) 07:35 (WEA 18-3)	06:33 20:23	07:18 (WEA 18-4) 07:47 (WEA 18-4)	07:25 19:11	07:25 19:11
31	05:44 21:23	06:24 (WEA 18-2) 07:34 (WEA 18-3)	06:35 20:21	07:19 (WEA 18-4) 07:46 (WEA 18-4)	19:11 19:11	19:11 19:11
	Sonnenscheinstunden	505	456	382	73	332
	astr.max.mögl.Beschattung	1889	973	73		265

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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
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SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 34a - Große Haar 15/Nordost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni	
1	08:38 16:23	08:11 17:12	07:17 18:04	07:06 20:00		05:59 20:52	07:10 (WEA 18-4) 07:35 (WEA 18-4)	05:12 21:39	06:17 (WEA 18-2) 07:20 (WEA 18-3)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01		05:57 20:53	07:11 (WEA 18-4) 07:34 (WEA 18-4)	05:12 21:40	06:18 (WEA 18-2) 07:20 (WEA 18-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03		05:55 20:55	07:12 (WEA 18-4) 07:32 (WEA 18-4)	05:11 21:41	06:19 (WEA 18-2) 07:20 (WEA 18-3)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	07:14 (WEA 18-4) 07:31 (WEA 18-4)	05:10 21:42	06:22 (WEA 18-2) 07:21 (WEA 18-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07		05:52 20:59	07:16 (WEA 18-4) 07:28 (WEA 18-4)	05:09 21:43	06:30 (WEA 18-3) 07:21 (WEA 18-3)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08		05:50 21:00	07:21 (WEA 18-4) 07:22 (WEA 18-4)	05:09 21:44	06:30 (WEA 18-3) 07:20 (WEA 18-3)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:52 20:10		05:48 21:02		05:08 21:45	06:30 (WEA 18-3) 07:21 (WEA 18-3)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	06:19 (WEA 18-2) 06:24 (WEA 18-2)	05:07 21:46	06:30 (WEA 18-3) 07:21 (WEA 18-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05	06:16 (WEA 18-2) 06:56 (WEA 18-3)	05:07 21:47	06:30 (WEA 18-3) 07:21 (WEA 18-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:43 21:07	06:14 (WEA 18-2) 07:01 (WEA 18-3)	05:06 21:48	06:31 (WEA 18-3) 07:21 (WEA 18-3)
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17		05:41 21:09	06:13 (WEA 18-2) 07:04 (WEA 18-3)	05:06 21:49	06:30 (WEA 18-3) 07:21 (WEA 18-3)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	11	05:39 21:10	07:21 (WEA 18-4) 07:32 (WEA 18-4)	05:05 21:49	06:31 (WEA 18-3) 07:22 (WEA 18-3)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:21	17	05:37 21:12	07:18 (WEA 18-4) 07:35 (WEA 18-4)	05:05 21:50	06:31 (WEA 18-3) 07:22 (WEA 18-3)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	21	05:36 21:13	07:16 (WEA 18-4) 07:37 (WEA 18-4)	05:05 21:51	06:32 (WEA 18-3) 07:23 (WEA 18-3)
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	25	05:34 21:15	07:14 (WEA 18-4) 07:39 (WEA 18-4)	05:05 21:51	06:32 (WEA 18-3) 07:23 (WEA 18-3)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	27	05:33 21:17	07:12 (WEA 18-4) 07:39 (WEA 18-4)	05:05 21:52	06:31 (WEA 18-3) 07:22 (WEA 18-3)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	29	05:31 21:18	07:11 (WEA 18-4) 07:40 (WEA 18-4)	05:04 21:52	06:32 (WEA 18-3) 07:23 (WEA 18-3)
18	08:29 16:47	07:41 17:44	06:38 18:35	06:27 20:29	30	05:29 21:20	07:10 (WEA 18-4) 07:40 (WEA 18-4)	05:04 21:53	06:32 (WEA 18-3) 07:23 (WEA 18-3)
19	08:28 16:48	07:39 17:46	06:36 18:37	06:24 20:31	32	05:28 21:21	07:09 (WEA 18-4) 07:41 (WEA 18-4)	05:04 21:53	06:33 (WEA 18-3) 07:24 (WEA 18-3)
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	32	05:27 21:23	07:09 (WEA 18-4) 07:41 (WEA 18-4)	05:04 21:54	06:33 (WEA 18-3) 07:24 (WEA 18-3)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	33	05:25 21:24	07:08 (WEA 18-4) 07:41 (WEA 18-4)	05:05 21:54	06:33 (WEA 18-3) 07:24 (WEA 18-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	33	05:24 21:26	07:08 (WEA 18-4) 07:41 (WEA 18-4)	05:05 21:54	06:33 (WEA 18-3) 07:24 (WEA 18-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	33	05:22 21:27	07:08 (WEA 18-4) 07:41 (WEA 18-4)	05:05 21:54	06:33 (WEA 18-3) 07:24 (WEA 18-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	33	05:21 21:29	07:08 (WEA 18-4) 07:41 (WEA 18-4)	05:05 21:55	06:34 (WEA 18-3) 07:25 (WEA 18-3)
25	08:21 16:59	07:26 17:57	06:22 19:47	06:12 20:41	33	05:20 21:30	07:08 (WEA 18-4) 07:41 (WEA 18-4)	05:05 21:55	06:34 (WEA 18-3) 07:25 (WEA 18-3)
26	08:20 17:01	07:24 17:59	06:20 19:49	06:10 20:43	32	05:19 21:31	07:08 (WEA 18-4) 07:40 (WEA 18-4)	05:06 21:55	06:34 (WEA 18-3) 07:25 (WEA 18-3)
27	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	31	05:18 21:33	07:08 (WEA 18-4) 07:39 (WEA 18-4)	05:06 21:55	06:34 (WEA 18-3) 07:25 (WEA 18-3)
28	08:17 17:04	07:19 18:03	06:15 19:53	06:05 20:47	31	05:16 21:34	07:08 (WEA 18-4) 07:39 (WEA 18-4)	05:07 21:54	06:34 (WEA 18-3) 07:25 (WEA 18-3)
29	08:16 17:06		06:13 19:54	06:03 20:48	29	05:15 21:35	07:09 (WEA 18-4) 07:38 (WEA 18-4)	05:07 21:54	06:35 (WEA 18-3) 07:26 (WEA 18-3)
30	08:14 17:08		06:10 19:56	06:01 20:50	28	05:14 21:37	07:09 (WEA 18-4) 07:37 (WEA 18-4)	05:08 21:54	06:34 (WEA 18-3) 07:25 (WEA 18-3)
31	08:13 17:10		07:08 19:58			05:13 21:38			
	Sonnenscheinstunden	256	275	366	416	487		502	1558
	astr.max.mögl.Beschattung				540	1424			

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 34a - Große Haar 15/Nordost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober	November	Dezember			
1	05:08 21:54	06:35 (WEA 18-3) 07:26 (WEA 18-3)	05:45 21:22	06:22 (WEA 18-2) 07:18 (WEA 18-3)	06:36 20:19	07:21 (WEA 18-4) 07:32 (WEA 18-4)	07:26 19:08	07:21 17:01	08:13 16:19
2	05:09 21:54	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:47 21:20	48 06:22 (WEA 18-2) 07:16 (WEA 18-3)	06:38 20:17	11 07:32 (WEA 18-4)	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	51 06:35 (WEA 18-3) 07:26 (WEA 18-3)	05:49 21:18	42 06:24 (WEA 18-2) 07:14 (WEA 18-3)	06:40 20:14		07:30 19:04	07:25 16:57	08:16 16:17
4	05:11 21:53	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:50 21:17	36 06:25 (WEA 18-2) 07:10 (WEA 18-3)	06:41 20:12		07:31 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:52 21:15	26 06:27 (WEA 18-2) 06:36 (WEA 18-2)	06:43 20:10		07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:53 21:13	9 06:36 (WEA 18-2)	06:45 20:07		07:35 18:57	07:30 16:51	08:21 16:16
7	05:13 21:51	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:55 21:11		06:46 20:05		07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:57 21:09	8 07:27 (WEA 18-4) 07:35 (WEA 18-4)	06:48 20:03		07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	51 06:36 (WEA 18-3) 07:27 (WEA 18-3)	05:58 21:08	14 07:25 (WEA 18-4) 07:39 (WEA 18-4)	06:50 20:00		07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	56 06:27 (WEA 18-2) 07:27 (WEA 18-3)	06:00 21:06	18 07:22 (WEA 18-4) 07:40 (WEA 18-4)	06:51 19:58		07:42 18:47	07:38 16:45	08:25 16:14
11	05:17 21:48	58 06:26 (WEA 18-2) 07:27 (WEA 18-3)	06:01 21:04	21 07:21 (WEA 18-4) 07:42 (WEA 18-4)	06:53 19:56		07:44 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	62 06:24 (WEA 18-2) 07:27 (WEA 18-3)	06:03 21:02	24 07:19 (WEA 18-4) 07:43 (WEA 18-4)	06:55 19:53		07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	63 06:24 (WEA 18-2) 07:27 (WEA 18-3)	06:05 21:00	26 07:18 (WEA 18-4) 07:44 (WEA 18-4)	06:56 19:51		07:47 18:41	07:43 16:40	08:29 16:14
14	05:20 21:46	64 06:23 (WEA 18-2) 07:27 (WEA 18-3)	06:06 20:58	28 07:16 (WEA 18-4) 07:44 (WEA 18-4)	06:58 19:49		07:49 18:38	07:45 16:38	08:30 16:14
15	05:22 21:45	65 06:22 (WEA 18-2) 07:27 (WEA 18-3)	06:08 20:56	29 07:16 (WEA 18-4) 07:45 (WEA 18-4)	07:00 19:46		07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	65 06:23 (WEA 18-2) 07:28 (WEA 18-3)	06:10 20:54	30 07:15 (WEA 18-4) 07:45 (WEA 18-4)	07:01 19:44		07:52 18:34	07:49 16:35	08:32 16:14
17	05:24 21:43	66 06:22 (WEA 18-2) 07:28 (WEA 18-3)	06:11 20:52	32 07:14 (WEA 18-4) 07:46 (WEA 18-4)	07:03 19:41		07:54 18:32	07:50 16:34	08:32 16:14
18	05:25 21:42	66 06:21 (WEA 18-2) 07:27 (WEA 18-3)	06:13 20:50	33 07:14 (WEA 18-4) 07:47 (WEA 18-4)	07:05 19:39		07:56 18:30	07:52 16:33	08:33 16:14
19	05:27 21:40	66 06:21 (WEA 18-2) 07:27 (WEA 18-3)	06:15 20:47	33 07:13 (WEA 18-4) 07:46 (WEA 18-4)	07:06 19:37		07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	67 06:20 (WEA 18-2) 07:27 (WEA 18-3)	06:16 20:45	34 07:13 (WEA 18-4) 07:47 (WEA 18-4)	07:08 19:34		08:00 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	66 06:21 (WEA 18-2) 07:27 (WEA 18-3)	06:18 20:43	34 07:12 (WEA 18-4) 07:46 (WEA 18-4)	07:10 19:32		08:01 18:23	07:57 16:29	08:35 16:15
22	05:31 21:37	66 06:20 (WEA 18-2) 07:26 (WEA 18-3)	06:20 20:41	33 07:13 (WEA 18-4) 07:46 (WEA 18-4)	07:11 19:30		08:03 18:21	07:59 16:27	08:36 16:16
23	05:32 21:35	66 06:20 (WEA 18-2) 07:26 (WEA 18-3)	06:21 20:39	33 07:12 (WEA 18-4) 07:45 (WEA 18-4)	07:13 19:27		08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	66 06:20 (WEA 18-2) 07:26 (WEA 18-3)	06:23 20:37	32 07:13 (WEA 18-4) 07:45 (WEA 18-4)	07:15 19:25		08:07 18:17	08:02 16:25	08:37 16:17
25	05:35 21:33	65 06:20 (WEA 18-2) 07:25 (WEA 18-3)	06:25 20:35	31 07:13 (WEA 18-4) 07:44 (WEA 18-4)	07:16 19:22		08:09 18:15	08:04 16:24	08:37 16:17
26	05:36 21:31	64 06:20 (WEA 18-2) 07:24 (WEA 18-3)	06:26 20:32	30 07:13 (WEA 18-4) 07:43 (WEA 18-4)	07:18 19:20		08:10 18:13	08:06 16:23	08:38 16:18
27	05:38 21:30	63 06:20 (WEA 18-2) 07:24 (WEA 18-3)	06:28 20:30	28 07:14 (WEA 18-4) 07:42 (WEA 18-4)	07:20 19:18		08:12 18:11	08:07 16:22	08:38 16:19
28	05:39 21:28	61 06:20 (WEA 18-2) 07:23 (WEA 18-3)	06:30 20:28	27 07:14 (WEA 18-4) 07:41 (WEA 18-4)	07:21 19:15		07:14 17:09	08:09 16:21	08:38 16:19
29	05:41 21:27	57 06:20 (WEA 18-2) 07:21 (WEA 18-3)	06:31 20:26	24 07:15 (WEA 18-4) 07:39 (WEA 18-4)	07:23 19:13		07:16 17:07	08:10 16:20	08:38 16:20
30	05:42 21:25	55 06:21 (WEA 18-2) 07:21 (WEA 18-3)	06:33 20:23	21 07:16 (WEA 18-4) 07:37 (WEA 18-4)	07:25 19:11		07:18 17:05	08:12 16:19	08:38 16:21
31	05:44 21:23	52 06:21 (WEA 18-2) 07:19 (WEA 18-3)	06:35 20:21	17 07:18 (WEA 18-4) 07:35 (WEA 18-4)			07:19 17:03		08:38 16:22
	Sonnenscheinstunden	505	456		382		332	265	241
	astr.max.mögl.Beschattung	1838	801		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)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattende (WEA mit letztem Schatten)
	Sonnenuntergang (SS:MM)			

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 34b - Große Haar 15/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April		Mai		Juni		
1	08:38 16:23	08:11 17:12	07:17 18:04	07:06 20:00		05:59 20:52	26	07:09 (WEA 18-4) 05:12 07:35 (WEA 18-4) 21:39	63	06:16 (WEA 18-2) 06:17 (WEA 18-2)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01		05:57 20:53	24	07:10 (WEA 18-4) 05:12 07:34 (WEA 18-4) 21:40	61	06:18 (WEA 18-2) 06:19 (WEA 18-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03		05:55 20:55	21	07:11 (WEA 18-4) 05:11 07:32 (WEA 18-4) 21:41	59	06:20 (WEA 18-2) 06:21 (WEA 18-3)
4	08:38 16:27	08:07 17:17	07:11 18:10	06:59 20:05		05:54 20:57	18	07:13 (WEA 18-4) 05:10 07:31 (WEA 18-4) 21:42	57	06:22 (WEA 18-2) 06:23 (WEA 18-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:07		05:52 20:59	15	07:14 (WEA 18-4) 05:09 07:29 (WEA 18-4) 21:43	51	06:24 (WEA 18-2) 06:25 (WEA 18-3)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08		05:50 21:00	8	07:17 (WEA 18-4) 05:09 07:25 (WEA 18-4) 21:44	51	06:26 (WEA 18-2) 06:27 (WEA 18-3)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:52 20:10		05:48 21:02		05:08 21:45	52	06:28 (WEA 18-2) 06:29 (WEA 18-3)
8	08:37 16:32	08:00 17:25	07:02 18:17	06:49 20:12		05:46 21:04	2	06:20 (WEA 18-2) 05:07 06:22 (WEA 18-2) 21:46	51	06:30 (WEA 18-2) 06:31 (WEA 18-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:14		05:44 21:05	10	06:16 (WEA 18-2) 05:07 06:26 (WEA 18-2) 21:47	51	06:32 (WEA 18-2) 06:33 (WEA 18-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15		05:43 21:07	25	06:14 (WEA 18-2) 05:06 06:58 (WEA 18-3) 21:48	51	06:34 (WEA 18-2) 06:35 (WEA 18-3)
11	08:35 16:36	07:54 17:30	06:55 18:23	06:42 20:17		05:41 21:09	34	06:13 (WEA 18-2) 05:06 07:02 (WEA 18-3) 21:49	51	06:36 (WEA 18-2) 06:37 (WEA 18-3)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	9	07:22 (WEA 18-4) 05:39 07:31 (WEA 18-4) 21:10	42	06:11 (WEA 18-2) 05:05 07:04 (WEA 18-3) 21:49	51	06:38 (WEA 18-2) 06:39 (WEA 18-3)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:21	17	07:18 (WEA 18-4) 05:37 07:35 (WEA 18-4) 21:12	47	06:11 (WEA 18-2) 05:05 07:07 (WEA 18-3) 21:50	52	06:40 (WEA 18-2) 06:41 (WEA 18-3)
14	08:33 16:40	07:49 17:36	06:48 18:28	06:36 20:22	21	07:16 (WEA 18-4) 05:36 07:37 (WEA 18-4) 21:13	51	06:10 (WEA 18-2) 05:05 07:08 (WEA 18-3) 21:51	51	06:42 (WEA 18-2) 06:43 (WEA 18-3)
15	08:32 16:42	07:47 17:38	06:45 18:30	06:33 20:24	24	07:14 (WEA 18-4) 05:34 07:38 (WEA 18-4) 21:15	55	06:10 (WEA 18-2) 05:05 07:10 (WEA 18-3) 21:51	52	06:44 (WEA 18-2) 06:45 (WEA 18-3)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	26	07:12 (WEA 18-4) 05:33 07:38 (WEA 18-4) 21:17	58	06:09 (WEA 18-2) 05:05 07:10 (WEA 18-3) 21:52	52	06:46 (WEA 18-2) 06:47 (WEA 18-3)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:28	28	07:11 (WEA 18-4) 05:31 07:39 (WEA 18-4) 21:18	61	06:09 (WEA 18-2) 05:04 07:12 (WEA 18-3) 21:52	51	06:48 (WEA 18-2) 06:49 (WEA 18-3)
18	08:29 16:47	07:41 17:44	06:38 18:35	06:27 20:29	30	07:10 (WEA 18-4) 05:29 07:40 (WEA 18-4) 21:20	62	06:09 (WEA 18-2) 05:04 07:12 (WEA 18-3) 21:53	51	06:50 (WEA 18-2) 06:51 (WEA 18-3)
19	08:28 16:48	07:39 17:46	06:36 18:37	06:24 20:31	31	07:09 (WEA 18-4) 05:28 07:40 (WEA 18-4) 21:21	64	06:09 (WEA 18-2) 05:04 07:13 (WEA 18-3) 21:53	51	06:52 (WEA 18-2) 06:53 (WEA 18-3)
20	08:27 16:50	07:37 17:48	06:34 18:39	06:22 20:33	33	07:08 (WEA 18-4) 05:27 07:41 (WEA 18-4) 21:23	65	06:09 (WEA 18-2) 05:04 07:14 (WEA 18-3) 21:54	52	06:54 (WEA 18-2) 06:55 (WEA 18-3)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	33	07:08 (WEA 18-4) 05:25 07:41 (WEA 18-4) 21:24	65	06:10 (WEA 18-2) 05:05 07:15 (WEA 18-3) 21:54	52	06:56 (WEA 18-2) 06:57 (WEA 18-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	33	07:08 (WEA 18-4) 05:24 07:41 (WEA 18-4) 21:26	66	06:09 (WEA 18-2) 05:05 07:15 (WEA 18-3) 21:54	52	06:58 (WEA 18-2) 06:59 (WEA 18-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	34	07:07 (WEA 18-4) 05:22 07:41 (WEA 18-4) 21:27	65	06:10 (WEA 18-2) 05:05 07:15 (WEA 18-3) 21:54	52	06:60 (WEA 18-2) 06:61 (WEA 18-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	34	07:07 (WEA 18-4) 05:21 07:41 (WEA 18-4) 21:29	66	06:10 (WEA 18-2) 05:05 07:16 (WEA 18-3) 21:55	51	06:62 (WEA 18-2) 06:63 (WEA 18-3)
25	08:21 16:59	07:26 17:57	07:22 19:47	06:12 20:41	33	07:07 (WEA 18-4) 05:20 07:40 (WEA 18-4) 21:30	67	06:10 (WEA 18-2) 05:05 07:17 (WEA 18-3) 21:55	51	06:64 (WEA 18-2) 06:65 (WEA 18-3)
26	08:20 17:01	07:24 17:59	07:20 19:49	06:10 20:43	33	07:07 (WEA 18-4) 05:19 07:40 (WEA 18-4) 21:31	66	06:11 (WEA 18-2) 05:06 07:17 (WEA 18-3) 21:55	51	06:66 (WEA 18-2) 06:67 (WEA 18-3)
27	08:19 17:02	07:22 18:01	07:17 19:51	06:07 20:45	32	07:07 (WEA 18-4) 05:18 07:39 (WEA 18-4) 21:33	65	06:12 (WEA 18-2) 05:06 07:17 (WEA 18-3) 21:55	51	06:68 (WEA 18-2) 06:69 (WEA 18-3)
28	08:17 17:04	07:19 18:03	07:15 19:53	06:05 20:47	32	07:07 (WEA 18-4) 05:16 07:39 (WEA 18-4) 21:34	66	06:12 (WEA 18-2) 05:07 07:18 (WEA 18-3) 21:54	52	06:70 (WEA 18-2) 06:71 (WEA 18-3)
29	08:16 17:06	07:18 18:03	07:13 19:54	06:03 20:48	30	07:08 (WEA 18-4) 05:15 07:38 (WEA 18-4) 21:35	65	06:13 (WEA 18-2) 05:07 07:18 (WEA 18-3) 21:54	51	06:72 (WEA 18-2) 06:73 (WEA 18-3)
30	08:14 17:08	07:16 19:56	07:10 19:56	06:01 20:50	29	07:08 (WEA 18-4) 05:14 07:37 (WEA 18-4) 21:37	65	06:13 (WEA 18-2) 05:08 07:18 (WEA 18-3) 21:54	51	06:74 (WEA 18-2) 06:75 (WEA 18-3)
31	08:13 17:10	07:15 19:58	07:08 19:58	05:59 20:51		05:13 21:38	64	06:14 (WEA 18-2) 05:08 07:18 (WEA 18-3) 21:54		
	Sonnenscheinstunden	256	275	366	416	487	1408	502	1575	
	astr.max.mögl.Beschattung									

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

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

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 34b - Große Haar 15/Südost
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	05:08	06:34 (WEA 18-3)	05:45	06:22 (WEA 18-2)	06:36	07:22 (WEA 18-4)	07:26	07:21	08:13			
	21:54	52 07:26 (WEA 18-3)	21:22	44 07:16 (WEA 18-3)	20:19	9 07:31 (WEA 18-4)	19:08	17:01	16:19			
2	05:09	06:35 (WEA 18-3)	05:47	06:22 (WEA 18-2)	06:38		07:28	07:23	08:15			
	21:54	51 07:26 (WEA 18-3)	21:20	40 07:14 (WEA 18-3)	20:17		19:06	16:59	16:18			
3	05:10	06:34 (WEA 18-3)	05:49	06:24 (WEA 18-2)	06:40		07:30	07:25	08:16			
	21:53	52 07:26 (WEA 18-3)	21:18	30 07:11 (WEA 18-3)	20:14		19:04	16:57	16:17			
4	05:11	06:35 (WEA 18-3)	05:50	06:25 (WEA 18-2)	06:41		07:31	07:27	08:18			
	21:53	51 07:26 (WEA 18-3)	21:17	18 07:06 (WEA 18-3)	20:12		19:01	16:55	16:17			
5	05:11	06:35 (WEA 18-3)	05:52	06:27 (WEA 18-2)	06:43		07:33	07:29	08:19			
	21:52	51 07:26 (WEA 18-3)	21:15	8 06:35 (WEA 18-2)	20:10		18:59	16:53	16:16			
6	05:12	06:36 (WEA 18-3)	05:53		06:45		07:35	07:30	08:21			
	21:52	51 07:27 (WEA 18-3)	21:13		20:07		18:57	16:51	16:16			
7	05:13	06:35 (WEA 18-3)	05:55		06:46		07:37	07:32	08:22			
	21:51	51 07:26 (WEA 18-3)	21:11		20:05		18:54	16:50	16:15			
8	05:14	06:35 (WEA 18-3)	05:57	07:25 (WEA 18-4)	06:48		07:38	07:34	08:23			
	21:51	51 07:26 (WEA 18-3)	21:09	11 07:36 (WEA 18-4)	20:03		18:52	16:48	16:15			
9	05:15	06:27 (WEA 18-2)	05:58	07:23 (WEA 18-4)	06:50		07:40	07:36	08:24			
	21:50	55 07:27 (WEA 18-3)	21:08	16 07:39 (WEA 18-4)	20:00		18:50	16:46	16:14			
10	05:16	06:26 (WEA 18-2)	06:00	07:21 (WEA 18-4)	06:51		07:42	07:38	08:25			
	21:49	58 07:27 (WEA 18-3)	21:06	19 07:40 (WEA 18-4)	19:58		18:47	16:45	16:14			
11	05:17	06:24 (WEA 18-2)	06:01	07:20 (WEA 18-4)	06:53		07:44	07:40	08:27			
	21:48	62 07:27 (WEA 18-3)	21:04	22 07:42 (WEA 18-4)	19:56		18:45	16:43	16:14			
12	05:18	06:24 (WEA 18-2)	06:03	07:18 (WEA 18-4)	06:55		07:45	07:41	08:28			
	21:48	62 07:27 (WEA 18-3)	21:02	25 07:43 (WEA 18-4)	19:53		18:43	16:41	16:14			
13	05:19	06:23 (WEA 18-2)	06:05	07:17 (WEA 18-4)	06:56		07:47	07:43	08:29			
	21:47	64 07:27 (WEA 18-3)	21:00	27 07:44 (WEA 18-4)	19:51		18:41	16:40	16:14			
14	05:20	06:22 (WEA 18-2)	06:06	07:16 (WEA 18-4)	06:58		07:49	07:45	08:30			
	21:46	65 07:27 (WEA 18-3)	20:58	28 07:44 (WEA 18-4)	19:49		18:38	16:38	16:14			
15	05:22	06:21 (WEA 18-2)	06:08	07:15 (WEA 18-4)	07:00		07:51	07:47	08:31			
	21:45	66 07:27 (WEA 18-3)	20:56	30 07:45 (WEA 18-4)	19:46		18:36	16:37	16:14			
16	05:23	06:22 (WEA 18-2)	06:10	07:14 (WEA 18-4)	07:01		07:52	07:49	08:32			
	21:44	65 07:27 (WEA 18-3)	20:54	31 07:45 (WEA 18-4)	19:44		18:34	16:35	16:14			
17	05:24	06:21 (WEA 18-2)	06:11	07:14 (WEA 18-4)	07:03		07:54	07:50	08:32			
	21:43	66 07:27 (WEA 18-3)	20:52	32 07:46 (WEA 18-4)	19:41		18:32	16:34	16:14			
18	05:25	06:21 (WEA 18-2)	06:13	07:14 (WEA 18-4)	07:05		07:56	07:52	08:33			
	21:42	66 07:27 (WEA 18-3)	20:50	32 07:46 (WEA 18-4)	19:39		18:30	16:33	16:14			
19	05:27	06:20 (WEA 18-2)	06:15	07:13 (WEA 18-4)	07:06		07:58	07:54	08:34			
	21:40	66 07:26 (WEA 18-3)	20:47	33 07:46 (WEA 18-4)	19:37		18:27	16:31	16:14			
20	05:28	06:20 (WEA 18-2)	06:16	07:13 (WEA 18-4)	07:08		08:00	07:56	08:35			
	21:39	66 07:26 (WEA 18-3)	20:45	33 07:46 (WEA 18-4)	19:34		18:25	16:30	16:15			
21	05:29	06:20 (WEA 18-2)	06:18	07:12 (WEA 18-4)	07:10		08:01	07:57	08:35			
	21:38	66 07:26 (WEA 18-3)	20:43	34 07:46 (WEA 18-4)	19:32		18:23	16:29	16:15			
22	05:31	06:20 (WEA 18-2)	06:20	07:12 (WEA 18-4)	07:11		08:03	07:59	08:36			
	21:37	65 07:25 (WEA 18-3)	20:41	34 07:46 (WEA 18-4)	19:30		18:21	16:27	16:16			
23	05:32	06:19 (WEA 18-2)	06:21	07:12 (WEA 18-4)	07:13		08:05	08:01	08:36			
	21:35	66 07:25 (WEA 18-3)	20:39	33 07:45 (WEA 18-4)	19:27		18:19	16:26	16:16			
24	05:33	06:20 (WEA 18-2)	06:23	07:12 (WEA 18-4)	07:15		08:07	08:02	08:37			
	21:34	65 07:25 (WEA 18-3)	20:37	32 07:44 (WEA 18-4)	19:25		18:17	16:25	16:17			
25	05:35	06:20 (WEA 18-2)	06:25	07:13 (WEA 18-4)	07:16		08:09	08:04	08:37			
	21:33	64 07:24 (WEA 18-3)	20:35	31 07:44 (WEA 18-4)	19:22		18:15	16:24	16:17			
26	05:36	06:19 (WEA 18-2)	06:26	07:13 (WEA 18-4)	07:18		08:10	08:06	08:38			
	21:31	64 07:23 (WEA 18-3)	20:32	30 07:43 (WEA 18-4)	19:20		18:13	16:23	16:18			
27	05:38	06:20 (WEA 18-2)	06:28	07:13 (WEA 18-4)	07:20		08:12	08:07	08:38			
	21:30	61 07:23 (WEA 18-3)	20:30	29 07:42 (WEA 18-4)	19:18		18:11	16:22	16:19			
28	05:39	06:20 (WEA 18-2)	06:30	07:14 (WEA 18-4)	07:21		07:14	08:09	08:38			
	21:28	59 07:21 (WEA 18-3)	20:28	26 07:40 (WEA 18-4)	19:15		17:09	16:21	16:19			
29	05:41	06:20 (WEA 18-2)	06:31	07:15 (WEA 18-4)	07:23		07:16	08:10	08:38			
	21:27	56 07:20 (WEA 18-3)	20:26	24 07:39 (WEA 18-4)	19:13		17:07	16:20	16:20			
30	05:42	06:21 (WEA 18-2)	06:33	07:16 (WEA 18-4)	07:25		07:18	08:12	08:38			
	21:25	52 07:19 (WEA 18-3)	20:23	20 07:36 (WEA 18-4)	19:11		17:05	16:19	16:21			
31	05:44	06:21 (WEA 18-2)	06:35	07:18 (WEA 18-4)			07:19		08:38			
	21:23	48 07:17 (WEA 18-3)	20:21	16 07:34 (WEA 18-4)			17:03		16:22			
	Sonnenscheinstunden	505	456		382		332	265	241			
	astr.max.mögl.Beschattung	1837	788		9							

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

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

LQ13955.2 Fürstenua-Hollenstede 18

Beschreibung:

Windenergie Hollenstede 18 Planungsgesellschaft mbH

Schattenwurf-Untersuchung zum Genehmigungsverfahren für die Errichtung von 4 Windenergieanlagen in Hollenstede

Lizenzierter Anwender:

ZECH Ingenieurgesellschaft mbH
Hessenweg 38
DE-49809 Lingen (Ems)
0049 591 800 1634
Thomas Wihard / wihard@zechgmbh.de
Berechnet:
18.12.2018 11:19/3.0.654

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 35 - Pius 24

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:38	08:11	07:17	07:06	05:59	05:12	05:08	05:45	06:36	07:26	07:21	08:13
	16:23	17:12	18:04	20:00	20:52	21:39	21:54	21:22	20:19	19:08	17:01	16:19
2	08:38	08:10	07:15	07:03	05:57	05:12	05:09	05:47	06:38	07:28	07:23	08:15
	16:24	17:13	18:06	20:01	20:53	21:40	21:54	21:20	20:17	19:06	16:59	16:18
3	08:38	08:08	07:13	07:01	05:55	05:11	05:10	05:49	06:40	07:30	07:25	08:16
	16:25	17:15	18:08	20:03	20:55	21:41	21:53	21:18	20:14	19:04	16:57	16:17
4	08:38	08:07	07:11	06:59	05:54	05:10	05:11	05:50	06:41	07:31	07:27	08:18
	16:27	17:17	18:10	20:05	20:57	21:42	21:53	21:17	20:12	19:01	16:55	16:17
5	08:38	08:05	07:08	06:56	05:52	05:09	05:11	05:52	06:43	07:33	07:29	08:19
	16:28	17:19	18:12	20:07	20:59	21:43	21:52	21:15	20:10	18:59	16:53	16:16
6	08:37	08:03	07:06	06:54	05:50	05:09	05:12	05:53	06:45	07:35	07:30	08:20
	16:29	17:21	18:13	20:08	21:00	21:44	21:52	21:13	20:07	18:57	16:51	16:16
7	08:37	08:01	07:04	06:52	05:48	05:08	05:13	05:55	06:46	07:37	07:32	08:22
	16:30	17:23	18:15	20:10	21:02	21:45	21:51	21:11	20:05	18:54	16:50	16:15
8	08:37	08:00	07:02	06:49	05:46	05:07	05:14	05:57	06:48	07:38	07:34	08:23
	16:32	17:25	18:17	20:12	21:04	21:46	21:51	21:09	20:03	18:52	16:48	16:15
9	08:36	07:58	06:59	06:47	05:44	05:07	05:15	05:58	06:50	07:40	07:36	08:24
	16:33	17:27	18:19	20:14	21:05	21:47	21:50	21:08	20:00	18:50	16:46	16:14
10	08:36	07:56	06:57	06:45	05:43	05:06	05:16	06:00	06:51	07:42	07:38	08:25
	16:34	17:29	18:21	20:15	21:07	21:48	21:49	21:06	19:58	18:47	16:45	16:14
11	08:35	07:54	06:55	06:42	05:41	05:06	05:17	06:01	06:53	07:44	07:40	08:27
	16:36	17:31	18:23	20:17	21:09	21:49	21:48	21:04	19:56	18:45	16:43	16:14
12	08:34	07:52	06:52	06:40	05:39	05:06	05:18	06:03	06:55	07:45	07:41	08:28
	16:37	17:32	18:24	20:19	21:10	21:49	21:48	21:02	19:53	18:43	16:41	16:14
13	08:34	07:50	06:50	06:38	05:37	05:05	05:19	06:05	06:56	07:47	07:43	08:29
	16:39	17:34	18:26	20:21	21:12	21:50	21:47	21:00	19:51	18:41	16:40	16:14
14	08:33	07:49	06:48	06:36	05:36	05:05	05:20	06:06	06:58	07:49	07:45	08:30
	16:40	17:36	18:28	20:22	21:13	21:51	21:46	20:58	19:49	18:38	16:38	16:14
15	08:32	07:47	06:45	06:33	05:34	05:05	05:22	06:08	07:00	07:51	07:47	08:31
	16:42	17:38	18:30	20:24	21:15	21:51	21:45	20:56	19:46	18:36	16:37	16:14
16	08:31	07:45	06:43	06:31	05:33	05:05	05:23	06:10	07:01	07:52	07:49	08:32
	16:43	17:40	18:31	20:26	21:17	21:52	21:44	20:54	19:44	18:34	16:35	16:14
17	08:30	07:43	06:41	06:29	05:31	05:04	05:24	06:11	07:03	07:54	07:50	08:32
	16:45	17:42	18:33	20:27	21:18	21:52	21:43	20:52	19:41	18:32	16:34	16:14
18	08:29	07:41	06:38	06:27	05:29	05:04	05:25	06:13	07:05	07:56	07:52	08:33
	16:47	17:44	18:35	20:29	21:20	21:53	21:42	20:50	19:39	18:30	16:33	16:14
19	08:28	07:39	06:36	06:24	05:28	05:04	05:27	06:15	07:06	07:58	07:54	08:34
	16:48	17:46	18:37	20:31	21:21	21:53	21:40	20:47	19:37	18:27	16:31	16:14
20	08:27	07:37	06:34	06:22	05:27	05:04	05:28	06:16	07:08	07:59	07:56	08:35
	16:50	17:48	18:39	20:33	21:23	21:54	21:39	20:45	19:34	18:25	16:30	16:15
21	08:26	07:34	06:31	06:20	05:25	05:05	05:29	06:18	07:10	08:01	07:57	08:35
	16:52	17:49	18:40	20:34	21:24	21:54	21:38	20:43	19:32	18:23	16:29	16:15
22	08:25	07:32	06:29	06:18	05:24	05:05	05:31	06:20	07:11	08:03	07:59	08:36
	16:53	17:51	18:42	20:36	21:26	21:54	21:37	20:41	19:30	18:21	16:27	16:16
23	08:24	07:30	06:27	06:16	05:22	05:05	05:32	06:21	07:13	08:05	08:01	08:36
	16:55	17:53	18:44	20:38	21:27	21:54	21:35	20:39	19:27	18:19	16:26	16:16
24	08:23	07:28	06:24	06:14	05:21	05:05	05:33	06:23	07:15	08:07	08:02	08:37
	16:57	17:55	18:46	20:40	21:29	21:54	21:34	20:37	19:25	18:17	16:25	16:17
25	08:21	07:26	07:22	06:12	05:20	05:06	05:35	06:25	07:16	08:08	08:04	08:37
	16:59	17:57	19:47	20:41	21:30	21:55	21:33	20:35	19:22	18:15	16:24	16:17
26	08:20	07:24	07:20	06:10	05:19	05:06	05:36	06:26	07:18	08:10	08:06	08:38
	17:01	17:59	19:49	20:43	21:31	21:55	21:31	20:32	19:20	18:13	16:23	16:18
27	08:19	07:22	07:17	06:07	05:18	05:06	05:38	06:28	07:20	08:12	08:07	08:38
	17:02	18:01	19:51	20:45	21:33	21:55	21:30	20:30	19:18	18:11	16:22	16:19
28	08:17	07:19	07:15	06:05	05:16	05:07	05:39	06:30	07:21	07:14	08:09	08:38
	17:04	18:03	19:53	20:47	21:34	21:54	21:28	20:28	19:15	17:09	16:21	16:19
29	08:16		07:13	06:03	05:15	05:07	05:41	06:31	07:23	07:16	08:10	08:38
	17:06		19:54	20:48	21:35	21:54	21:27	20:26	19:13	17:07	16:20	16:20
30	08:14		07:10	06:01	05:14	05:08	05:42	06:33	07:25	07:18	08:12	08:38
	17:08		19:56	20:50	21:37	21:54	21:25	20:23	19:11	17:05	16:19	16:21
31	08:13		07:08		05:13		05:44	06:35		07:19		08:38
	17:10		19:58		21:38		21:23	20:21		17:03		16:22
Sonnenscheinstunden	256	275	366	416	487	502	505	456	382	332	265	241
astr.max.mögl.Beschattung												

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

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



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 36 - Bruchstraße 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender **2018**

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinstrahlung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai		Juni
1	08:38 16:23	08:11 17:12	07:17 18:04	07:05 20:00	05:59 20:52		05:12 21:39 20:13 (WEA 18-3)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	05:57 20:53		05:11 21:40 34 20:47 (WEA 18-3)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	05:55 20:55		05:11 21:41 34 20:47 (WEA 18-3)
4	08:38 16:26	08:07 17:17	07:11 18:10	06:58 20:05	05:53 20:57		05:10 21:42 35 20:47 (WEA 18-3)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:06	05:52 20:58		05:09 21:43 35 20:48 (WEA 18-3)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08	05:50 21:00		05:08 21:44 36 20:48 (WEA 18-3)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:51 20:10	05:48 21:02		05:08 21:45 36 20:49 (WEA 18-3)
8	08:37 16:31	08:00 17:25	07:01 18:17	06:49 20:12	05:46 21:04		05:07 21:46 37 20:49 (WEA 18-3)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:13	05:44 21:05		05:07 21:47 36 20:49 (WEA 18-3)
10	08:36 16:34	07:56 17:29	06:57 18:21	06:45 20:15	05:42 21:07		05:06 21:48 37 20:50 (WEA 18-3)
11	08:35 16:36	07:54 17:30	06:55 18:22	06:42 20:17	05:41 21:08		05:06 21:49 37 20:50 (WEA 18-3)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	05:39 21:10		05:05 21:49 37 20:50 (WEA 18-3)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:20	05:37 21:12		05:05 21:50 37 20:51 (WEA 18-3)
14	08:33 16:40	07:48 17:36	06:48 18:28	06:35 20:22	05:36 21:13		05:05 21:51 37 20:51 (WEA 18-3)
15	08:32 16:42	07:46 17:38	06:45 18:30	06:33 20:24	05:34 21:15		05:05 21:51 38 20:51 (WEA 18-3)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	05:32 21:17		05:04 21:52 38 20:51 (WEA 18-3)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:27	05:31 21:18		05:04 21:52 37 20:51 (WEA 18-3)
18	08:29 16:47	07:41 17:44	06:38 18:35	06:27 20:29	05:29 21:20		05:04 21:53 37 20:51 (WEA 18-3)
19	08:28 16:48	07:38 17:46	06:36 18:37	06:24 20:31	05:28 21:21	20:26 (WEA 18-3)	05:04 21:53 38 20:52 (WEA 18-3)
20	08:27 16:50	07:36 17:47	06:34 18:38	06:22 20:33	05:26 21:23	5 20:22 (WEA 18-3)	05:04 21:54 38 20:53 (WEA 18-3)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	05:25 21:24	13 20:35 (WEA 18-3)	05:04 21:54 38 20:53 (WEA 18-3)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	05:24 21:26	20 20:38 (WEA 18-3)	05:05 21:54 38 20:53 (WEA 18-3)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	05:22 21:27	20 20:38 (WEA 18-3)	05:05 21:54 38 20:53 (WEA 18-3)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	05:21 21:29	23 20:40 (WEA 18-3)	05:05 21:54 38 20:53 (WEA 18-3)
25	08:21 17:00	07:26 17:59	06:22 19:49	06:12 20:43	05:20 21:31	25 20:41 (WEA 18-3)	05:05 21:54 38 20:53 (WEA 18-3)
26	08:19 17:02	07:22 18:01	06:17 19:51	06:07 20:45	05:18 21:33	26 20:42 (WEA 18-3)	05:06 21:54 37 20:53 (WEA 18-3)
27	08:17 17:04	07:19 18:02	06:15 19:53	06:05 20:47	05:16 21:34	28 20:43 (WEA 18-3)	05:07 21:54 38 20:54 (WEA 18-3)
28	08:16 17:06		06:12 19:54	06:03 20:48	05:15 21:35	29 20:44 (WEA 18-3)	05:07 21:54 38 20:54 (WEA 18-3)
29	08:14 17:08		06:10 19:56	06:01 20:50	05:14 21:36	30 20:44 (WEA 18-3)	05:08 21:54 37 20:54 (WEA 18-3)
30	08:13 17:10		06:08 19:58		05:13 21:38	31 20:45 (WEA 18-3)	05:08 21:54 37 20:54 (WEA 18-3)
31						33 20:46 (WEA 18-3)	
Sonnenscheinstunden	256	275	366	416	487		502
astr.max.mögl.Beschattung						312	1104

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

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

Berechnung: Windenergie Hollenstede 2018-12**Schattenrezeptor:** IP 36 - Bruchstraße 6

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

	Juli	August	September	Oktober	November	Dezember	
1	05:08	20:17 (WEA 18-3)	05:45	06:36	07:26	07:21	08:13
	21:54	37 20:54 (WEA 18-3)	21:22	20:19	19:08	17:01	16:19
2	05:09	20:18 (WEA 18-3)	05:47	06:38	07:28	07:23	08:15
	21:53	37 20:55 (WEA 18-3)	21:20	20:16	19:06	16:59	16:18
3	05:10	20:17 (WEA 18-3)	05:48	06:40	07:30	07:25	08:16
	21:53	37 20:54 (WEA 18-3)	21:18	20:14	19:03	16:57	16:17
4	05:11	20:18 (WEA 18-3)	05:50	06:41	07:31	07:27	08:18
	21:53	37 20:55 (WEA 18-3)	21:17	20:12	19:01	16:55	16:17
5	05:11	20:19 (WEA 18-3)	05:52	06:43	07:33	07:29	08:19
	21:52	36 20:55 (WEA 18-3)	21:15	20:10	18:59	16:53	16:16
6	05:12	20:19 (WEA 18-3)	05:53	06:45	07:35	07:30	08:20
	21:52	36 20:55 (WEA 18-3)	21:13	20:07	18:56	16:51	16:16
7	05:13	20:18 (WEA 18-3)	05:55	06:46	07:37	07:32	08:22
	21:51	36 20:54 (WEA 18-3)	21:11	20:05	18:54	16:50	16:15
8	05:14	20:19 (WEA 18-3)	05:56	06:48	07:38	07:34	08:23
	21:51	36 20:55 (WEA 18-3)	21:09	20:03	18:52	16:48	16:15
9	05:15	20:19 (WEA 18-3)	05:58	06:49	07:40	07:36	08:24
	21:50	36 20:55 (WEA 18-3)	21:07	20:00	18:50	16:46	16:14
10	05:16	20:20 (WEA 18-3)	06:00	06:51	07:42	07:38	08:25
	21:49	35 20:55 (WEA 18-3)	21:06	19:58	18:47	16:45	16:14
11	05:17	20:20 (WEA 18-3)	06:01	06:53	07:44	07:40	08:27
	21:48	35 20:55 (WEA 18-3)	21:04	19:56	18:45	16:43	16:14
12	05:18	20:21 (WEA 18-3)	06:03	06:54	07:45	07:41	08:28
	21:47	33 20:54 (WEA 18-3)	21:02	19:53	18:43	16:41	16:14
13	05:19	20:21 (WEA 18-3)	06:05	06:56	07:47	07:43	08:29
	21:47	33 20:54 (WEA 18-3)	21:00	19:51	18:41	16:40	16:14
14	05:20	20:21 (WEA 18-3)	06:06	06:58	07:49	07:45	08:30
	21:46	33 20:54 (WEA 18-3)	20:58	19:48	18:38	16:38	16:14
15	05:21	20:22 (WEA 18-3)	06:08	06:59	07:51	07:47	08:31
	21:45	31 20:53 (WEA 18-3)	20:56	19:46	18:36	16:37	16:14
16	05:23	20:22 (WEA 18-3)	06:10	07:01	07:52	07:49	08:31
	21:44	31 20:53 (WEA 18-3)	20:54	19:44	18:34	16:35	16:14
17	05:24	20:24 (WEA 18-3)	06:11	07:03	07:54	07:50	08:32
	21:43	29 20:53 (WEA 18-3)	20:52	19:41	18:32	16:34	16:14
18	05:25	20:24 (WEA 18-3)	06:13	07:04	07:56	07:52	08:33
	21:42	29 20:53 (WEA 18-3)	20:50	19:39	18:29	16:32	16:14
19	05:27	20:25 (WEA 18-3)	06:15	07:06	07:58	07:54	08:34
	21:40	27 20:52 (WEA 18-3)	20:47	19:37	18:27	16:31	16:14
20	05:28	20:25 (WEA 18-3)	06:16	07:08	07:59	07:56	08:35
	21:39	26 20:51 (WEA 18-3)	20:45	19:34	18:25	16:30	16:15
21	05:29	20:27 (WEA 18-3)	06:18	07:09	08:01	07:57	08:35
	21:38	24 20:51 (WEA 18-3)	20:43	19:32	18:23	16:29	16:15
22	05:31	20:28 (WEA 18-3)	06:20	07:11	08:03	07:59	08:36
	21:37	21 20:49 (WEA 18-3)	20:41	19:29	18:21	16:27	16:15
23	05:32	20:29 (WEA 18-3)	06:21	07:13	08:05	08:01	08:36
	21:35	19 20:48 (WEA 18-3)	20:39	19:27	18:19	16:26	16:16
24	05:33	20:31 (WEA 18-3)	06:23	07:14	08:07	08:02	08:37
	21:34	15 20:46 (WEA 18-3)	20:37	19:25	18:17	16:25	16:16
25	05:35	20:34 (WEA 18-3)	06:25	07:16	08:08	08:04	08:37
	21:33	10 20:44 (WEA 18-3)	20:34	19:22	18:15	16:24	16:17
26	05:36		06:26	07:18	08:10	08:06	08:37
	21:31		20:32	19:20	18:12	16:23	16:18
27	05:38		06:28	07:20	08:12	08:07	08:38
	21:30		20:30	19:18	18:10	16:22	16:18
28	05:39		06:30	07:21	07:14	08:09	08:38
	21:28		20:28	19:15	17:08	16:21	16:19
29	05:41		06:31	07:23	07:16	08:10	08:38
	21:27		20:26	19:13	17:06	16:20	16:20
30	05:42		06:33	07:25	07:18	08:12	08:38
	21:25		20:23	19:11	17:04	16:19	16:21
31	05:44		06:35		07:19		08:38
	21:23		20:21		17:03		16:22
Sonnenscheinstunden	505	456	382	332	265	241	
astr.max.mögl.Beschattung	759						

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)



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 37a - Bruchstraße 4/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni	
1	08:38 16:23	08:11 17:11	07:17 18:04	07:05 19:59	18:44 (WEA 18-4) 05:59 19:30 (WEA 18-3) 20:52	05:12 21:39	20:34 (WEA 18-1) 20:56 (WEA 18-1)
2	08:38 16:24	08:10 17:13	07:15 18:06	07:03 20:01	18:44 (WEA 18-4) 05:57 19:32 (WEA 18-3) 20:53	05:11 21:40	20:33 (WEA 18-1) 20:57 (WEA 18-1)
3	08:38 16:25	08:08 17:15	07:13 18:08	07:01 20:03	18:44 (WEA 18-4) 05:55 19:33 (WEA 18-3) 20:55	05:11 21:41	20:32 (WEA 18-1) 20:57 (WEA 18-1)
4	08:38 16:26	08:06 17:17	07:10 18:10	06:58 20:05	18:43 (WEA 18-4) 05:53 19:32 (WEA 18-3) 20:57	05:10 21:42	20:32 (WEA 18-1) 20:58 (WEA 18-1)
5	08:38 16:28	08:05 17:19	07:08 18:12	06:56 20:06	18:43 (WEA 18-4) 05:51 19:33 (WEA 18-3) 20:58	05:09 21:43	20:32 (WEA 18-1) 20:59 (WEA 18-1)
6	08:37 16:29	08:03 17:21	07:06 18:13	06:54 20:08	18:43 (WEA 18-4) 05:50 19:33 (WEA 18-3) 21:00	05:08 21:44	20:32 (WEA 18-1) 20:59 (WEA 18-1)
7	08:37 16:30	08:01 17:23	07:04 18:15	06:51 20:10	18:42 (WEA 18-4) 05:48 19:32 (WEA 18-3) 21:02	05:08 21:45	20:32 (WEA 18-1) 21:00 (WEA 18-1)
8	08:37 16:31	08:00 17:25	07:01 18:17	06:49 20:12	18:43 (WEA 18-4) 05:46 19:32 (WEA 18-3) 21:04	05:07 21:46	21:00 (WEA 18-1) 21:01 (WEA 18-1)
9	08:36 16:33	07:58 17:27	06:59 18:19	06:47 20:13	18:44 (WEA 18-4) 05:44 19:32 (WEA 18-3) 21:05	05:07 21:47	20:32 (WEA 18-1) 21:01 (WEA 18-1)
10	08:36 16:34	07:56 17:28	06:57 18:21	06:45 20:15	18:44 (WEA 18-4) 05:42 19:31 (WEA 18-3) 21:07	05:06 21:48	20:32 (WEA 18-1) 21:01 (WEA 18-1)
11	08:35 16:36	07:54 17:30	06:55 18:22	06:42 20:17	18:45 (WEA 18-4) 05:41 19:29 (WEA 18-3) 21:08	05:06 21:49	20:31 (WEA 18-1) 21:01 (WEA 18-1)
12	08:34 16:37	07:52 17:32	06:52 18:24	06:40 20:19	18:46 (WEA 18-4) 05:39 19:28 (WEA 18-3) 21:10	05:05 21:49	20:32 (WEA 18-1) 21:02 (WEA 18-1)
13	08:34 16:39	07:50 17:34	06:50 18:26	06:38 20:20	18:48 (WEA 18-4) 05:37 19:27 (WEA 18-3) 21:12	05:05 21:50	20:32 (WEA 18-1) 21:02 (WEA 18-1)
14	08:33 16:40	07:48 17:36	06:48 18:28	06:35 20:22	18:50 (WEA 18-4) 05:36 19:25 (WEA 18-3) 21:13	05:05 21:51	20:32 (WEA 18-1) 21:03 (WEA 18-1)
15	08:32 16:42	07:46 17:38	06:45 18:30	06:33 20:24	18:55 (WEA 18-4) 05:34 19:20 (WEA 18-3) 21:15	05:05 21:51	20:31 (WEA 18-1) 21:02 (WEA 18-1)
16	08:31 16:43	07:45 17:40	06:43 18:31	06:31 20:26	7 19:20 (WEA 18-3) 21:15 05:32	05:04 21:52	21:02 (WEA 18-1) 20:32 (WEA 18-1)
17	08:30 16:45	07:43 17:42	06:41 18:33	06:29 20:27	06:29 20:27	05:31 21:18	21:03 (WEA 18-1) 20:32 (WEA 18-1)
18	08:29 16:47	07:40 17:44	06:38 18:35	06:27 20:29	06:27 20:29	05:29 21:20	20:32 (WEA 18-1) 21:03 (WEA 18-1)
19	08:28 16:48	07:38 17:46	06:36 18:37	06:24 20:31	06:24 20:31	05:28 21:21	20:32 (WEA 18-1) 21:03 (WEA 18-1)
20	08:27 16:50	07:36 17:47	06:34 18:38	06:22 20:33	06:22 20:33	05:26 21:23	20:33 (WEA 18-1) 21:04 (WEA 18-1)
21	08:26 16:52	07:34 17:49	06:31 18:40	06:20 20:34	06:20 20:34	05:25 21:24	20:33 (WEA 18-1) 21:04 (WEA 18-1)
22	08:25 16:53	07:32 17:51	06:29 18:42	06:18 20:36	06:18 20:36	05:24 21:26	20:33 (WEA 18-1) 21:04 (WEA 18-1)
23	08:24 16:55	07:30 17:53	06:27 18:44	06:16 20:38	06:16 20:38	05:22 21:27	20:33 (WEA 18-1) 21:04 (WEA 18-1)
24	08:23 16:57	07:28 17:55	06:24 18:46	06:14 20:40	06:14 20:40	05:21 21:29	20:33 (WEA 18-1) 21:04 (WEA 18-1)
25	08:21 16:59	07:26 17:57	07:22 19:47	06:11 20:41	18:57 (WEA 18-4) 06:11 19:09 (WEA 18-4) 20:41	05:20 21:30	20:34 (WEA 18-1) 21:05 (WEA 18-1)
26	08:20 17:00	07:24 17:59	07:19 19:49	06:09 20:43	18:53 (WEA 18-4) 06:09 19:11 (WEA 18-4) 20:43	05:19 21:31	20:34 (WEA 18-1) 21:05 (WEA 18-1)
27	08:19 17:02	07:22 18:01	07:17 19:51	06:07 20:45	18:51 (WEA 18-4) 06:07 19:13 (WEA 18-4) 20:45	05:17 21:33	20:35 (WEA 18-1) 21:06 (WEA 18-1)
28	08:17 17:04	07:19 18:02	07:15 19:53	06:05 20:47	18:49 (WEA 18-4) 06:05 19:15 (WEA 18-4) 20:47	05:16 21:34	20:35 (WEA 18-1) 21:05 (WEA 18-1)
29	08:16 17:06	07:12 19:54	07:12 19:54	06:03 20:48	18:47 (WEA 18-4) 06:03 19:15 (WEA 18-4) 20:48	05:15 21:35	20:35 (WEA 18-1) 21:06 (WEA 18-1)
30	08:14 17:08	07:10 19:56	07:10 19:56	06:01 20:50	18:46 (WEA 18-4) 06:01 19:26 (WEA 18-3) 20:50	05:14 21:36	20:35 (WEA 18-1) 21:05 (WEA 18-1)
31	08:13 17:10	07:08 19:58	07:08 19:58	05:13 21:38	18:45 (WEA 18-4) 05:13 19:28 (WEA 18-3) 21:38	05:13 21:38	20:34 (WEA 18-1) 21:05 (WEA 18-1)
	Sonnenscheinstunden astr.max.mögl.Beschattung	256 275	366 186	416 641	487 89	502 881	

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

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

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 37a - Bruchstraße 4/Nordwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	05:08	20:36 (WEA 18-1)	05:45		06:36	18:46 (WEA 18-4)	07:26	07:21	08:13			
	21:54	30 21:06 (WEA 18-1)	21:22		20:19	41 19:28 (WEA 18-3)	19:08	17:01	16:19			
2	05:09	20:35 (WEA 18-1)	05:47		06:38	18:43 (WEA 18-4)	07:28	07:23	08:15			
	21:53	30 21:05 (WEA 18-1)	21:20		20:16	45 19:28 (WEA 18-3)	19:06	16:59	16:18			
3	05:10	20:36 (WEA 18-1)	05:48		06:39	18:42 (WEA 18-4)	07:30	07:25	08:16			
	21:53	30 21:06 (WEA 18-1)	21:18		20:14	47 19:29 (WEA 18-3)	19:03	16:57	16:17			
4	05:10	20:37 (WEA 18-1)	05:50		06:41	18:40 (WEA 18-4)	07:31	07:27	08:18			
	21:53	29 21:06 (WEA 18-1)	21:17		20:12	49 19:29 (WEA 18-3)	19:01	16:55	16:17			
5	05:11	20:37 (WEA 18-1)	05:52		06:43	18:40 (WEA 18-4)	07:33	07:29	08:19			
	21:52	29 21:06 (WEA 18-1)	21:15		20:10	49 19:29 (WEA 18-3)	18:59	16:53	16:16			
6	05:12	20:37 (WEA 18-1)	05:53		06:44	18:38 (WEA 18-4)	07:35	07:30	08:20			
	21:52	28 21:05 (WEA 18-1)	21:13		20:07	50 19:28 (WEA 18-3)	18:56	16:51	16:16			
7	05:13	20:38 (WEA 18-1)	05:55		06:46	18:38 (WEA 18-4)	07:37	07:32	08:22			
	21:51	27 21:05 (WEA 18-1)	21:11		20:05	50 19:28 (WEA 18-3)	18:54	16:50	16:15			
8	05:14	20:38 (WEA 18-1)	05:56		06:48	18:38 (WEA 18-4)	07:38	07:34	08:23			
	21:50	27 21:05 (WEA 18-1)	21:09		20:03	50 19:28 (WEA 18-3)	18:52	16:48	16:15			
9	05:15	20:39 (WEA 18-1)	05:58		06:49	18:37 (WEA 18-4)	07:40	07:36	08:24			
	21:50	26 21:05 (WEA 18-1)	21:07		20:00	49 19:26 (WEA 18-3)	18:50	16:46	16:14			
10	05:16	20:40 (WEA 18-1)	06:00		06:51	18:37 (WEA 18-4)	07:42	07:38	08:25			
	21:49	25 21:05 (WEA 18-1)	21:06		19:58	49 19:26 (WEA 18-3)	18:47	16:45	16:14			
11	05:17	20:40 (WEA 18-1)	06:01		06:53	18:36 (WEA 18-4)	07:43	07:40	08:26			
	21:48	24 21:04 (WEA 18-1)	21:04		19:56	48 19:24 (WEA 18-3)	18:45	16:43	16:14			
12	05:18	20:41 (WEA 18-1)	06:03		06:54	18:36 (WEA 18-4)	07:45	07:41	08:28			
	21:47	23 21:04 (WEA 18-1)	21:02		19:53	47 19:23 (WEA 18-3)	18:43	16:41	16:14			
13	05:19	20:42 (WEA 18-1)	06:05		06:56	18:37 (WEA 18-4)	07:47	07:43	08:29			
	21:47	21 21:03 (WEA 18-1)	21:00		19:51	44 19:21 (WEA 18-3)	18:40	16:40	16:14			
14	05:20	20:43 (WEA 18-1)	06:06		06:58	18:36 (WEA 18-4)	07:49	07:45	08:30			
	21:46	20 21:03 (WEA 18-1)	20:58		19:48	38 19:17 (WEA 18-3)	18:38	16:38	16:14			
15	05:21	20:44 (WEA 18-1)	06:08		06:59	18:37 (WEA 18-4)	07:51	07:47	08:31			
	21:45	18 21:02 (WEA 18-1)	20:56		19:46	28 19:05 (WEA 18-4)	18:36	16:37	16:14			
16	05:23	20:45 (WEA 18-1)	06:10		07:01	18:38 (WEA 18-4)	07:52	07:49	08:31			
	21:44	16 21:01 (WEA 18-1)	20:54		19:44	26 19:04 (WEA 18-4)	18:34	16:35	16:14			
17	05:24	20:47 (WEA 18-1)	06:11		07:03	18:39 (WEA 18-4)	07:54	07:50	08:32			
	21:43	13 21:00 (WEA 18-1)	20:52		19:41	23 19:02 (WEA 18-4)	18:32	16:34	16:14			
18	05:25	20:49 (WEA 18-1)	06:13		07:04	18:41 (WEA 18-4)	07:56	07:52	08:33			
	21:42	9 20:58 (WEA 18-1)	20:49		19:39	19 19:00 (WEA 18-4)	18:29	16:32	16:14			
19	05:26		06:15		07:06	18:42 (WEA 18-4)	07:58	07:54	08:34			
	21:40		20:47		19:37	14 18:56 (WEA 18-4)	18:27	16:31	16:14			
20	05:28		06:16		07:08	18:48 (WEA 18-4)	07:59	07:56	08:35			
	21:39		20:45		19:34	2 18:50 (WEA 18-4)	18:25	16:30	16:15			
21	05:29		06:18		07:09		08:01	07:57	08:35			
	21:38		20:43		19:32		18:23	16:29	16:15			
22	05:31		06:20		07:11		08:03	07:59	08:36			
	21:37		20:41		19:29		18:21	16:27	16:15			
23	05:32		06:21		07:13		08:05	08:01	08:36			
	21:35		20:39		19:27		18:19	16:26	16:16			
24	05:33		06:23		07:14		08:07	08:02	08:37			
	21:34		20:37		19:25		18:17	16:25	16:16			
25	05:35		06:25		07:16		08:08	08:04	08:37			
	21:33		20:34		19:22		18:15	16:24	16:17			
26	05:36		06:26		07:18		08:10	08:06	08:37			
	21:31		20:32		19:20		18:12	16:23	16:18			
27	05:38		06:28		07:20		08:12	08:07	08:38			
	21:30		20:30		19:18		18:10	16:22	16:18			
28	05:39		06:30		07:21		07:14	08:09	08:38			
	21:28		20:28		19:15		17:08	16:21	16:19			
29	05:41		06:31	18:56 (WEA 18-4)	07:23		07:16	08:10	08:38			
	21:27		20:26	10 19:22 (WEA 18-3)	19:13		17:06	16:20	16:20			
30	05:42		06:33	18:50 (WEA 18-4)	07:25		07:18	08:12	08:38			
	21:25		20:23	27 19:25 (WEA 18-3)	19:10		17:04	16:19	16:21			
31	05:44		06:34	18:47 (WEA 18-4)			07:19		08:38			
	21:23		20:21	37 19:27 (WEA 18-3)			17:02		16:22			
	Sonnenscheinstunden	505	456		382	768	332	265	241			
	astr.max.mögl.Beschattung	425	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) Schattende
			(WEA mit letztem Schatten)

SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 37b - Bruchstraße 4/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März		April		Mai		Juni	
1	08:38	08:11	07:17		07:05		18:46 (WEA 18-4)	05:59	05:12	20:36 (WEA 18-1)
	16:23	17:11	18:04		19:59	44	19:30 (WEA 18-3)	20:52	21:39	21:03 (WEA 18-1)
2	08:38	08:10	07:15		07:03		18:45 (WEA 18-4)	05:57	05:11	20:35 (WEA 18-1)
	16:24	17:13	18:06		20:01	47	19:32 (WEA 18-3)	20:53	21:40	22 20:57 (WEA 18-1)
3	08:38	08:08	07:13		07:01		18:45 (WEA 18-4)	05:55	05:11	20:35 (WEA 18-1)
	16:25	17:15	18:08		20:03	48	19:33 (WEA 18-3)	20:55	21:41	23 20:58 (WEA 18-1)
4	08:38	08:06	07:10		06:58		18:44 (WEA 18-4)	05:53	05:10	20:34 (WEA 18-1)
	16:26	17:17	18:10		20:05	49	19:33 (WEA 18-3)	20:57	21:42	24 20:58 (WEA 18-1)
5	08:38	08:05	07:08		06:56		18:44 (WEA 18-4)	05:51	05:09	20:34 (WEA 18-1)
	16:28	17:19	18:12		20:06	50	19:34 (WEA 18-3)	20:58	21:43	25 20:59 (WEA 18-1)
6	08:37	08:03	07:06		06:54		18:44 (WEA 18-4)	05:50	05:08	20:34 (WEA 18-1)
	16:29	17:21	18:13		20:08	50	19:34 (WEA 18-3)	21:00	21:44	25 20:59 (WEA 18-1)
7	08:37	08:01	07:04		06:51		18:43 (WEA 18-4)	05:48	05:08	20:34 (WEA 18-1)
	16:30	17:23	18:15		20:10	50	19:33 (WEA 18-3)	21:02	21:45	26 21:00 (WEA 18-1)
8	08:37	08:00	07:01		06:49		18:44 (WEA 18-4)	05:46	05:07	20:33 (WEA 18-1)
	16:31	17:25	18:17		20:12	49	19:33 (WEA 18-3)	21:04	21:46	27 21:00 (WEA 18-1)
9	08:36	07:58	06:59		06:47		18:44 (WEA 18-4)	05:44	05:07	20:34 (WEA 18-1)
	16:33	17:27	18:19		20:13	49	19:33 (WEA 18-3)	21:05	21:47	27 21:01 (WEA 18-1)
10	08:36	07:56	06:57		06:45		18:45 (WEA 18-4)	05:42	05:06	20:34 (WEA 18-1)
	16:34	17:28	18:21		20:15	47	19:32 (WEA 18-3)	21:07	21:48	28 21:02 (WEA 18-1)
11	08:35	07:54	06:55		06:42		18:45 (WEA 18-4)	05:41	05:06	20:33 (WEA 18-1)
	16:36	17:30	18:22		20:17	46	19:31 (WEA 18-3)	21:08	21:49	29 21:02 (WEA 18-1)
12	08:34	07:52	06:52		06:40		18:46 (WEA 18-4)	05:39	05:05	20:34 (WEA 18-1)
	16:37	17:32	18:24		20:19	44	19:30 (WEA 18-3)	21:10	21:49	29 21:03 (WEA 18-1)
13	08:34	07:50	06:50		06:38		18:48 (WEA 18-4)	05:37	05:05	20:34 (WEA 18-1)
	16:39	17:34	18:26		20:20	40	19:29 (WEA 18-3)	21:12	21:50	29 21:03 (WEA 18-1)
14	08:33	07:48	06:48		06:35		18:50 (WEA 18-4)	05:36	05:05	20:34 (WEA 18-1)
	16:40	17:36	18:28		20:22	32	19:27 (WEA 18-3)	21:13	21:51	30 21:04 (WEA 18-1)
15	08:32	07:46	06:45		06:33		18:51 (WEA 18-4)	05:34	05:05	20:33 (WEA 18-1)
	16:42	17:38	18:30		20:24	22	19:23 (WEA 18-3)	21:15	21:51	30 21:03 (WEA 18-1)
16	08:31	07:45	06:43		06:31			05:32	05:04	20:33 (WEA 18-1)
	16:43	17:40	18:31		20:26			21:17	21:52	30 21:03 (WEA 18-1)
17	08:30	07:43	06:41		06:29			05:31	05:04	20:34 (WEA 18-1)
	16:45	17:42	18:33		20:27			21:18	21:52	30 21:04 (WEA 18-1)
18	08:29	07:40	06:38		06:27			05:29	05:04	20:34 (WEA 18-1)
	16:47	17:44	18:35		20:29			21:20	21:53	30 21:04 (WEA 18-1)
19	08:28	07:38	06:36		06:24			05:28	05:04	20:34 (WEA 18-1)
	16:48	17:46	18:37		20:31			21:21	21:53	30 21:04 (WEA 18-1)
20	08:27	07:36	06:34		06:22			05:26	05:04	20:35 (WEA 18-1)
	16:50	17:47	18:38		20:33			21:23	21:54	30 21:05 (WEA 18-1)
21	08:26	07:34	06:31		06:20			05:25	05:04	20:35 (WEA 18-1)
	16:52	17:49	18:40		20:34			21:24	21:54	30 21:05 (WEA 18-1)
22	08:25	07:32	06:29		06:18			05:24	05:05	20:35 (WEA 18-1)
	16:53	17:51	18:42		20:36			21:26	21:54	30 21:05 (WEA 18-1)
23	08:24	07:30	06:27		06:16			05:22	05:05	20:35 (WEA 18-1)
	16:55	17:53	18:44		20:38			21:27	21:54	30 21:05 (WEA 18-1)
24	08:23	07:28	06:24		06:14			05:21	05:05	20:35 (WEA 18-1)
	16:57	17:55	18:46		20:40			21:29	21:54	30 21:05 (WEA 18-1)
25	08:21	07:26	07:22	19:01 (WEA 18-4)	06:11			05:20	05:05	20:36 (WEA 18-1)
	16:59	17:57	19:47	6 19:07 (WEA 18-4)	20:41			21:30	21:54	30 21:06 (WEA 18-1)
26	08:20	07:24	07:19	18:56 (WEA 18-4)	06:09			05:19	05:06	20:36 (WEA 18-1)
	17:00	17:59	19:49	15 19:11 (WEA 18-4)	20:43			21:31	21:55	30 21:06 (WEA 18-1)
27	08:19	07:22	07:17	18:53 (WEA 18-4)	06:07			05:17	05:06	20:37 (WEA 18-1)
	17:02	18:01	19:51	20 19:13 (WEA 18-4)	20:45			21:33	21:54	30 21:07 (WEA 18-1)
28	08:17	07:19	07:15	18:51 (WEA 18-4)	06:05			05:16	05:07	20:36 (WEA 18-1)
	17:04	18:02	19:53	24 19:15 (WEA 18-4)	20:47			21:34	21:54	30 21:06 (WEA 18-1)
29	08:16		07:12	18:49 (WEA 18-4)	06:03			05:15	05:07	20:37 (WEA 18-1)
	17:06		19:54	27 19:16 (WEA 18-4)	20:48			21:35	21:54	30 21:07 (WEA 18-1)
30	08:14		07:10	18:48 (WEA 18-4)	06:01			05:14	05:08	20:37 (WEA 18-1)
	17:08		19:56	29 19:17 (WEA 18-4)	20:50			21:36	21:54	29 21:06 (WEA 18-1)
31	08:13		07:08	18:46 (WEA 18-4)				05:13		
	17:10		19:58	42 19:28 (WEA 18-3)				21:38		
Sonnenscheinstunden	256	275	366		416			487		502
astr.max.mögl.Beschattung			163		667			63		844

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

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

Berechnung: Windenergie Hollenstede 2018-12 **Schattenrezeptor:** IP 37b - Bruchstraße 4/Südwest
Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Juli		August		September		Oktober		November		Dezember	
1	05:08	20:38 (WEA 18-1)	05:45		06:36	18:46 (WEA 18-4)	07:26	07:21	08:13			
	21:54	29 21:07 (WEA 18-1)	21:22		20:19	44 19:30 (WEA 18-3)	19:08	17:01	16:19			
2	05:09	20:37 (WEA 18-1)	05:47		06:38	18:44 (WEA 18-4)	07:28	07:23	08:15			
	21:53	29 21:06 (WEA 18-1)	21:20		20:16	46 19:30 (WEA 18-3)	19:06	16:59	16:18			
3	05:10	20:38 (WEA 18-1)	05:48		06:39	18:43 (WEA 18-4)	07:30	07:25	08:16			
	21:53	28 21:06 (WEA 18-1)	21:18		20:14	47 19:30 (WEA 18-3)	19:03	16:57	16:17			
4	05:10	20:39 (WEA 18-1)	05:50		06:41	18:41 (WEA 18-4)	07:31	07:27	08:18			
	21:53	28 21:07 (WEA 18-1)	21:17		20:12	49 19:30 (WEA 18-3)	19:01	16:55	16:17			
5	05:11	20:39 (WEA 18-1)	05:52		06:43	18:41 (WEA 18-4)	07:33	07:29	08:19			
	21:52	28 21:07 (WEA 18-1)	21:15		20:10	49 19:30 (WEA 18-3)	18:59	16:53	16:16			
6	05:12	20:39 (WEA 18-1)	05:53		06:44	18:39 (WEA 18-4)	07:35	07:30	08:20			
	21:52	27 21:06 (WEA 18-1)	21:13		20:07	50 19:29 (WEA 18-3)	18:56	16:51	16:16			
7	05:13	20:40 (WEA 18-1)	05:55		06:46	18:39 (WEA 18-4)	07:37	07:32	08:22			
	21:51	26 21:06 (WEA 18-1)	21:11		20:05	50 19:29 (WEA 18-3)	18:54	16:50	16:15			
8	05:14	20:40 (WEA 18-1)	05:56		06:48	18:39 (WEA 18-4)	07:38	07:34	08:23			
	21:50	26 21:06 (WEA 18-1)	21:09		20:03	50 19:29 (WEA 18-3)	18:52	16:48	16:15			
9	05:15	20:41 (WEA 18-1)	05:58		06:49	18:38 (WEA 18-4)	07:40	07:36	08:24			
	21:50	25 21:06 (WEA 18-1)	21:07		20:00	49 19:27 (WEA 18-3)	18:50	16:46	16:14			
10	05:16	20:42 (WEA 18-1)	06:00		06:51	18:38 (WEA 18-4)	07:42	07:38	08:25			
	21:49	23 21:05 (WEA 18-1)	21:06		19:58	48 19:26 (WEA 18-3)	18:47	16:45	16:14			
11	05:17	20:43 (WEA 18-1)	06:01		06:53	18:37 (WEA 18-4)	07:43	07:40	08:26			
	21:48	22 21:05 (WEA 18-1)	21:04		19:56	47 19:24 (WEA 18-3)	18:45	16:43	16:14			
12	05:18	20:43 (WEA 18-1)	06:03		06:54	18:38 (WEA 18-4)	07:45	07:41	08:28			
	21:47	21 21:04 (WEA 18-1)	21:02		19:53	45 19:23 (WEA 18-3)	18:43	16:41	16:14			
13	05:19	20:44 (WEA 18-1)	06:05		06:56	18:38 (WEA 18-4)	07:47	07:43	08:29			
	21:47	20 21:04 (WEA 18-1)	21:00		19:51	43 19:21 (WEA 18-3)	18:40	16:40	16:14			
14	05:20	20:45 (WEA 18-1)	06:06		06:58	18:38 (WEA 18-4)	07:49	07:45	08:30			
	21:46	18 21:03 (WEA 18-1)	20:58		19:48	29 19:07 (WEA 18-4)	18:38	16:38	16:14			
15	05:21	20:46 (WEA 18-1)	06:08		06:59	18:39 (WEA 18-4)	07:51	07:47	08:31			
	21:45	16 21:02 (WEA 18-1)	20:56		19:46	27 19:06 (WEA 18-4)	18:36	16:37	16:14			
16	05:23	20:48 (WEA 18-1)	06:10		07:01	18:40 (WEA 18-4)	07:52	07:49	08:31			
	21:44	12 21:00 (WEA 18-1)	20:54		19:44	25 19:05 (WEA 18-4)	18:34	16:35	16:14			
17	05:24	20:51 (WEA 18-1)	06:11		07:03	18:41 (WEA 18-4)	07:54	07:50	08:32			
	21:43	8 20:59 (WEA 18-1)	20:52		19:41	21 19:02 (WEA 18-4)	18:32	16:34	16:14			
18	05:25		06:13		07:04	18:43 (WEA 18-4)	07:56	07:52	08:33			
	21:42		20:49		19:39	17 19:00 (WEA 18-4)	18:29	16:32	16:14			
19	05:26		06:15		07:06	18:46 (WEA 18-4)	07:58	07:54	08:34			
	21:40		20:47		19:37	9 18:55 (WEA 18-4)	18:27	16:31	16:14			
20	05:28		06:16		07:08		07:59	07:56	08:35			
	21:39		20:45		19:34		18:25	16:30	16:15			
21	05:29		06:18		07:09		08:01	07:57	08:35			
	21:38		20:43		19:32		18:23	16:29	16:15			
22	05:31		06:20		07:11		08:03	07:59	08:36			
	21:37		20:41		19:29		18:21	16:27	16:15			
23	05:32		06:21		07:13		08:05	08:01	08:36			
	21:35		20:39		19:27		18:19	16:26	16:16			
24	05:33		06:23		07:14		08:07	08:02	08:37			
	21:34		20:37		19:25		18:17	16:25	16:16			
25	05:35		06:25		07:16		08:08	08:04	08:37			
	21:33		20:34		19:22		18:15	16:24	16:17			
26	05:36		06:26		07:18		08:10	08:06	08:37			
	21:31		20:32		19:20		18:12	16:23	16:18			
27	05:38		06:28		07:20		08:12	08:07	08:38			
	21:30		20:30		19:18		18:10	16:22	16:18			
28	05:39		06:30		07:21		07:14	08:09	08:38			
	21:28		20:28		19:15		17:08	16:21	16:19			
29	05:41		06:31	18:53 (WEA 18-4)	07:23		07:16	08:10	08:38			
	21:27		20:26	23 19:25 (WEA 18-3)	19:13		17:06	16:20	16:20			
30	05:42		06:33	18:49 (WEA 18-4)	07:25		07:18	08:12	08:38			
	21:25		20:23	33 19:27 (WEA 18-3)	19:10		17:04	16:19	16:21			
31	05:44		06:34	18:47 (WEA 18-4)			07:19		08:38			
	21:23		20:21	40 19:28 (WEA 18-3)			17:02		16:22			
	Sonnenscheinstunden	505	456		382	745	332	265	241			
	astr.max.mögl.Beschattung	386	96									

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

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



SHADOW - Kalender

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 38 - Wielage 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni		
1	08:38	08:11	15:48 (WEA 18-4)	07:17	15:54 (WEA 18-2)	07:05	05:59	05:12
	16:23	17:11	25 16:13 (WEA 18-4)	18:04	16:36 (WEA 18-2)	20:00	20:52	21:39
2	08:38	08:10	15:50 (WEA 18-4)	07:15	15:55 (WEA 18-2)	07:03	05:57	05:11
	16:24	17:13	23 16:13 (WEA 18-4)	18:06	17:25 (WEA 18-1)	20:01	20:53	21:40
3	08:38	08:08	15:51 (WEA 18-4)	07:13	15:56 (WEA 18-2)	07:01	05:55	05:11
	16:25	17:15	21 16:12 (WEA 18-4)	18:08	17:28 (WEA 18-1)	20:03	20:55	21:41
4	08:38	08:07	15:51 (WEA 18-4)	07:10	15:57 (WEA 18-2)	06:58	05:53	05:10
	16:26	17:17	20 16:11 (WEA 18-4)	18:10	17:30 (WEA 18-1)	20:05	20:57	21:42
5	08:38	08:05	15:53 (WEA 18-4)	07:08	15:58 (WEA 18-2)	06:56	05:51	05:09
	16:28	17:19	23 16:48 (WEA 18-3)	18:12	17:32 (WEA 18-1)	20:06	20:59	21:43
6	08:37	08:03	15:55 (WEA 18-4)	07:06	15:59 (WEA 18-2)	06:54	05:50	05:08
	16:29	17:21	25 16:51 (WEA 18-3)	18:13	17:33 (WEA 18-1)	20:08	21:00	21:44
7	08:37	08:01	15:57 (WEA 18-4)	07:04	16:02 (WEA 18-2)	06:51	05:48	05:08
	16:30	17:23	35 16:53 (WEA 18-3)	18:15	17:34 (WEA 18-1)	20:10	21:02	21:45
8	08:37	08:00	16:06 (WEA 18-2)	07:01	16:05 (WEA 18-2)	06:49	05:46	05:07
	16:31	17:25	37 16:54 (WEA 18-3)	18:17	17:35 (WEA 18-1)	20:12	21:04	21:46
9	08:36	07:58	16:04 (WEA 18-2)	06:59	16:08 (WEA 18-2)	06:47	05:44	05:07
	16:33	17:27	44 16:56 (WEA 18-3)	18:19	17:35 (WEA 18-1)	20:13	21:05	21:47
10	08:36	07:56	16:03 (WEA 18-2)	06:57	17:02 (WEA 18-1)	06:45	05:42	05:06
	16:34	17:28	47 16:56 (WEA 18-3)	18:21	17:35 (WEA 18-1)	20:15	21:07	21:48
11	08:35	07:54	16:01 (WEA 18-2)	06:55	17:02 (WEA 18-1)	06:42	05:41	05:06
	16:36	17:30	53 16:57 (WEA 18-3)	18:22	17:36 (WEA 18-1)	20:17	21:09	21:49
12	08:34	07:52	16:00 (WEA 18-2)	06:52	17:00 (WEA 18-1)	06:40	05:39	05:05
	16:37	17:32	56 16:57 (WEA 18-3)	18:24	17:35 (WEA 18-1)	20:19	21:10	21:49
13	08:34	07:50	15:59 (WEA 18-2)	06:50	17:01 (WEA 18-1)	06:38	05:37	05:05
	16:39	17:34	58 16:57 (WEA 18-3)	18:26	17:35 (WEA 18-1)	20:20	21:12	21:50
14	08:33	07:48	15:58 (WEA 18-2)	06:48	17:01 (WEA 18-1)	06:35	05:36	05:05
	16:40	17:36	59 16:57 (WEA 18-3)	18:28	17:35 (WEA 18-1)	20:22	21:13	21:51
15	08:32	07:46	15:57 (WEA 18-2)	06:45	17:00 (WEA 18-1)	06:33	05:34	05:05
	16:42	17:38	60 16:57 (WEA 18-3)	18:30	17:34 (WEA 18-1)	20:24	21:15	21:51
16	08:31	07:45	15:55 (WEA 18-2)	06:43	17:01 (WEA 18-1)	06:31	05:32	05:04
	16:43	17:40	61 16:56 (WEA 18-3)	18:31	17:34 (WEA 18-1)	20:26	21:17	21:52
17	08:30	07:43	15:55 (WEA 18-2)	06:41	17:01 (WEA 18-1)	06:29	05:31	05:04
	16:45	17:42	60 16:55 (WEA 18-3)	18:33	17:33 (WEA 18-1)	20:27	21:18	21:52
18	08:29	07:41	15:54 (WEA 18-2)	06:38	17:01 (WEA 18-1)	06:27	05:29	05:04
	16:46	17:44	60 16:54 (WEA 18-3)	18:35	17:31 (WEA 18-1)	20:29	21:20	21:53
19	08:28	07:38	15:54 (WEA 18-2)	06:36	17:03 (WEA 18-1)	06:24	05:28	05:04
	16:48	17:46	59 16:53 (WEA 18-3)	18:37	17:30 (WEA 18-1)	20:31	21:21	21:53
20	08:27	07:36	15:54 (WEA 18-2)	06:34	17:03 (WEA 18-1)	06:22	05:26	05:04
	16:50	17:47	56 16:51 (WEA 18-3)	18:38	17:28 (WEA 18-1)	20:33	21:23	21:54
21	08:26	07:34	15:53 (WEA 18-2)	06:31	17:05 (WEA 18-1)	06:20	05:25	05:04
	16:52	17:49	46 16:39 (WEA 18-2)	18:40	17:27 (WEA 18-1)	20:34	21:24	21:54
22	08:25	07:32	15:53 (WEA 18-2)	06:29	17:07 (WEA 18-1)	06:18	05:24	05:05
	16:53	17:51	46 16:39 (WEA 18-2)	18:42	17:25 (WEA 18-1)	20:36	21:26	21:54
23	08:24	07:30	15:52 (WEA 18-2)	06:27	17:10 (WEA 18-1)	06:16	05:22	05:05
	16:55	17:53	47 16:39 (WEA 18-2)	18:44	17:20 (WEA 18-1)	20:38	21:27	21:54
24	08:23	07:28	15:53 (WEA 18-2)	06:24		06:14	05:21	05:05
	16:57	17:55	46 16:39 (WEA 18-2)	18:46		20:40	21:29	21:54
25	08:21	07:26	15:53 (WEA 18-2)	07:22		06:11	05:20	05:05
	16:59	17:57	46 16:39 (WEA 18-2)	19:47		20:41	21:30	21:55
26	08:20	07:24	15:53 (WEA 18-2)	07:19		06:09	05:19	05:06
	17:00	17:59	45 16:38 (WEA 18-2)	19:49		20:43	21:31	21:55
27	08:19	07:22	15:53 (WEA 18-2)	07:17		06:07	05:17	05:06
	17:02	18:01	44 16:37 (WEA 18-2)	19:51		20:45	21:33	21:55
28	08:17	07:19	15:54 (WEA 18-2)	07:15		06:05	05:16	05:07
	17:04	18:02	43 16:37 (WEA 18-2)	19:53		20:47	21:34	21:54
29	08:16	07:17		07:12		06:03	05:15	05:07
	17:06			19:54		20:48	21:35	21:54
30	08:14	07:15		07:10		06:01	05:14	05:08
	17:08			19:56		20:50	21:37	21:54
31	08:13	07:14		07:08			05:13	
	17:10			19:58			21:38	
	Sonnenscheinstunden 256	275		366		416	487	502
	astr.max.mögl.Beschattung 404	1245		873				

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 38 - Wielage 5

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	October	November	Dezember
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08	07:21 17:01	08:13 16:19
2	05:09 21:54	05:47 21:20	06:38 20:16	07:28 19:06	07:23 16:59	08:15 16:18
3	05:10 21:53	05:48 21:18	06:39 20:14	07:30 19:03	07:25 16:57	08:16 16:17
4	05:10 21:53	05:50 21:17	06:41 20:12	07:31 19:01	07:27 16:55	08:18 16:17
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59	07:29 16:53	08:19 16:16
6	05:12 21:52	05:53 21:13	06:44 20:07	07:35 18:56	07:30 16:51	08:20 16:15
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	07:32 16:50	08:22 16:15
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	07:34 16:48	08:23 16:15
9	05:15 21:50	05:58 21:07	06:49 20:00	07:40 18:50	07:36 16:46	08:24 16:14
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	07:38 16:44	08:25 16:14
11	05:17 21:48	06:01 21:04	06:53 19:56	07:43 18:45	07:40 16:43	08:27 16:14
12	05:18 21:48	06:03 21:02	06:54 19:53	07:45 18:43	07:41 16:41	08:28 16:14
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:40	07:43 16:40	08:29 16:14
14	05:20 21:46	06:06 20:58	06:58 19:48	07:49 18:38	07:45 16:38	08:30 16:14
15	05:21 21:45	06:08 20:56	06:59 19:46	07:51 18:36	07:47 16:37	08:31 16:14
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	07:49 16:35	08:31 16:14
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	07:50 16:34	08:32 16:14
18	05:25 21:42	06:13 20:50	07:04 19:39	07:56 18:29	07:52 16:32	08:33 16:14
19	05:26 21:40	06:15 20:47	07:06 19:37	07:58 18:27	07:54 16:31	08:34 16:14
20	05:28 21:39	06:16 20:45	07:08 19:34	07:59 18:25	07:56 16:30	08:35 16:15
21	05:29 21:38	06:18 20:43	07:09 19:32	08:01 18:23	07:57 16:29	08:35 16:15
22	05:30 21:37	06:19 20:41	07:11 19:29	08:03 18:21	07:59 16:27	08:36 16:15
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	08:01 16:26	08:36 16:16
24	05:33 21:34	06:23 20:37	07:14 19:25	08:07 18:17	08:02 16:25	08:37 16:16
25	05:35 21:33	06:24 20:34	07:16 19:22	08:08 18:14	08:04 16:24	08:37 16:17
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:12	08:06 16:23	08:37 16:18
27	05:38 21:30	06:28 20:30	07:20 19:18	08:12 18:10	08:07 16:22	08:38 16:18
28	05:39 21:28	06:29 20:28	07:21 19:15	08:14 18:08	08:09 16:21	08:38 16:19
29	05:41 21:27	06:31 20:26	07:23 19:13	08:16 18:06	08:10 16:20	08:38 16:20
30	05:42 21:25	06:33 20:23	07:25 19:10	08:18 18:04	08:12 16:19	08:38 16:21
31	05:44 21:23	06:34 20:21		08:20 18:02	08:14 16:18	08:38 16:22
	Sonnenscheinstunden 505	456	382	332	265	241
	astr.max.mögl.Beschattung		255	1547	751	

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 39 - Wielage 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	Januar	Februar	März	April	Mai	Juni
1	08:38 16:23	08:11 17:11	15:57 (WEA 18-4) 16:24 (WEA 18-2)	07:17 18:04	16:51 (WEA 18-1) 17:19 (WEA 18-1)	07:05 19:59
2	08:38 16:24	08:10 17:13	15:59 (WEA 18-2) 16:26 (WEA 18-2)	07:15 18:06	16:52 (WEA 18-1) 17:19 (WEA 18-1)	07:03 20:01
3	08:38 16:25	08:08 17:15	15:58 (WEA 18-2) 16:27 (WEA 18-2)	07:13 18:08	16:51 (WEA 18-1) 17:18 (WEA 18-1)	07:01 20:03
4	08:38 16:26	08:07 17:17	15:57 (WEA 18-2) 16:27 (WEA 18-2)	07:10 18:10	16:52 (WEA 18-1) 17:17 (WEA 18-1)	06:58 20:05
5	08:38 16:28	08:05 17:19	15:56 (WEA 18-2) 16:28 (WEA 18-2)	07:08 18:12	16:53 (WEA 18-1) 17:16 (WEA 18-1)	06:56 20:06
6	08:37 16:29	08:03 17:21	15:55 (WEA 18-2) 16:28 (WEA 18-2)	07:06 18:13	16:53 (WEA 18-1) 17:14 (WEA 18-1)	06:54 20:08
7	08:37 16:30	08:01 17:23	15:55 (WEA 18-2) 16:29 (WEA 18-2)	07:04 18:15	16:55 (WEA 18-1) 17:13 (WEA 18-1)	06:51 20:10
8	08:37 16:31	08:00 17:25	15:55 (WEA 18-2) 16:29 (WEA 18-2)	07:01 18:17	16:57 (WEA 18-1) 17:11 (WEA 18-1)	06:49 20:12
9	08:36 16:33	7 15:57 (WEA 18-4) 07:58	15:55 (WEA 18-2) 16:30 (WEA 18-2)	06:59 18:19	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:12 20:13
10	08:36 16:34	9 15:58 (WEA 18-4) 07:56	15:55 (WEA 18-2) 16:30 (WEA 18-2)	06:57 18:21	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:13 20:15
11	08:35 16:36	11 15:59 (WEA 18-4) 07:54	15:55 (WEA 18-2) 16:30 (WEA 18-2)	06:55 18:22	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:14 20:16
12	08:34 16:37	14 16:02 (WEA 18-4) 07:52	15:56 (WEA 18-2) 16:30 (WEA 18-2)	06:52 18:24	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:15 20:17
13	08:34 16:39	16 16:03 (WEA 18-4) 07:50	15:56 (WEA 18-2) 16:30 (WEA 18-2)	06:50 18:26	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:17 20:20
14	08:33 16:40	17 16:04 (WEA 18-4) 07:48	15:56 (WEA 18-2) 16:30 (WEA 18-2)	06:48 18:28	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:21 20:22
15	08:32 16:42	18 16:05 (WEA 18-4) 07:46	15:57 (WEA 18-2) 16:30 (WEA 18-2)	06:45 18:30	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:22 20:24
16	08:31 16:43	18 16:05 (WEA 18-4) 07:45	15:56 (WEA 18-2) 16:30 (WEA 18-2)	06:43 18:31	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:23 20:26
17	08:30 16:45	19 16:06 (WEA 18-4) 07:43	15:57 (WEA 18-2) 16:30 (WEA 18-2)	06:41 18:33	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:26 20:27
18	08:29 16:46	20 16:07 (WEA 18-4) 07:42	15:58 (WEA 18-2) 16:30 (WEA 18-2)	06:38 18:35	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:27 20:29
19	08:28 16:48	21 16:08 (WEA 18-4) 07:38	16:00 (WEA 18-2) 17:10 (WEA 18-1)	06:36 18:37	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:28 20:31
20	08:27 16:50	22 16:09 (WEA 18-4) 07:36	16:01 (WEA 18-2) 17:14 (WEA 18-1)	06:34 18:38	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:31 20:33
21	08:26 16:52	23 16:09 (WEA 18-4) 07:34	16:03 (WEA 18-2) 17:16 (WEA 18-1)	06:31 18:40	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:32 20:34
22	08:25 16:53	22 16:09 (WEA 18-4) 07:32	16:06 (WEA 18-2) 17:17 (WEA 18-1)	06:29 18:42	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:33 20:36
23	08:24 16:55	23 16:10 (WEA 18-4) 07:30	16:54 (WEA 18-1) 17:17 (WEA 18-1)	06:27 18:44	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:36 20:38
24	08:23 16:57	23 16:10 (WEA 18-4) 07:28	16:53 (WEA 18-1) 17:18 (WEA 18-1)	06:24 18:45	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:38 20:40
25	08:21 16:59	22 16:10 (WEA 18-4) 07:26	16:53 (WEA 18-1) 17:19 (WEA 18-1)	07:22 19:47	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:39 20:41
26	08:20 17:00	22 16:10 (WEA 18-4) 07:24	16:52 (WEA 18-1) 17:20 (WEA 18-1)	07:19 19:49	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:40 20:43
27	08:19 17:02	21 15:49 (WEA 18-4) 07:22	16:51 (WEA 18-1) 17:19 (WEA 18-1)	07:17 19:51	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:44 20:45
28	08:17 17:04	20 16:09 (WEA 18-4) 07:19	16:51 (WEA 18-1) 17:19 (WEA 18-1)	07:15 19:53	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:46 20:47
29	08:16 17:06	25 16:16 (WEA 18-2) 18:02	17:19 (WEA 18-1)	07:12 19:54	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:48 20:50
30	08:14 17:08	27 16:18 (WEA 18-2) 15:53 (WEA 18-4)		07:10 19:56	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:49 20:50
31	08:13 17:10	28 16:21 (WEA 18-2) 15:55 (WEA 18-4)		07:08 19:58	17:01 (WEA 18-1) 17:05 (WEA 18-1)	20:50 20:51
	Sonnenscheinstunden 256	275	366	416	487	502
	astr.max.mögl.Beschattung 476	879	187			

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

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

Berechnung: Windenergie Hollenstede 2018-12 Schattenrezeptor: IP 39 - Wielage 4

Voraussetzungen für Berechnung des Schattenwurfs

Referenzjahr für Kalender 2018

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

- Die Sonne scheint täglich von Sonnenauf- bis -untergang
- Die Rotorfläche steht immer senkrecht zur Sonneneinfallrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

	July	August	September	Oktober		November		Dezember		
1	05:08 21:54	05:45 21:22	06:36 20:19	07:26 19:08		07:21 17:01	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	08:13 16:19	15 15:29 (WEA 18-4) 15:44 (WEA 18-4)
2	05:09 21:54	05:47 21:20	06:38 20:16	07:28 19:06		07:23 16:59	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	08:15 16:18	14 15:44 (WEA 18-4) 15:32 (WEA 18-4)
3	05:10 21:53	05:48 21:18	06:39 20:14	07:30 19:03		07:25 16:57	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	08:16 16:17	12 15:44 (WEA 18-4) 15:33 (WEA 18-4)
4	05:10 21:53	05:50 21:17	06:41 20:12	07:31 19:01		07:27 16:55	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	08:18 16:17	9 15:42 (WEA 18-4) 15:35 (WEA 18-4)
5	05:11 21:52	05:52 21:15	06:43 20:10	07:33 18:59		07:29 16:53	33	15:25 (WEA 18-2) 15:58 (WEA 18-2)	08:19 16:16	7 15:42 (WEA 18-4)
6	05:12 21:52	05:53 21:13	06:44 20:07	07:35 18:56	10	17:35 (WEA 18-1) 17:45 (WEA 18-1)	07:30 16:51	15:25 (WEA 18-2) 15:58 (WEA 18-2)	08:20 16:15	
7	05:13 21:51	05:55 21:11	06:46 20:05	07:37 18:54	16	17:32 (WEA 18-1) 17:48 (WEA 18-1)	07:32 16:50	15:26 (WEA 18-2) 15:57 (WEA 18-2)	08:22 16:15	
8	05:14 21:51	05:56 21:09	06:48 20:03	07:38 18:52	20	17:30 (WEA 18-1) 17:50 (WEA 18-1)	07:34 16:48	15:27 (WEA 18-2) 15:57 (WEA 18-2)	08:23 16:15	
9	05:15 21:50	05:58 21:07	06:49 20:00	07:40 18:50	22	17:29 (WEA 18-1) 17:51 (WEA 18-1)	07:36 16:46	15:27 (WEA 18-2) 15:56 (WEA 18-2)	08:24 16:14	
10	05:16 21:49	06:00 21:06	06:51 19:58	07:42 18:47	25	17:26 (WEA 18-1) 17:51 (WEA 18-1)	07:38 16:44	15:28 (WEA 18-2) 15:55 (WEA 18-2)	08:25 16:14	
11	05:17 21:48	06:01 21:04	06:53 19:56	07:43 18:45	26	17:26 (WEA 18-1) 17:52 (WEA 18-1)	07:40 16:43	15:28 (WEA 18-2) 15:54 (WEA 18-2)	08:27 16:14	
12	05:18 21:48	06:03 21:02	06:54 19:53	07:45 18:43	27	17:25 (WEA 18-1) 17:52 (WEA 18-1)	07:41 16:41	15:25 (WEA 18-4) 15:53 (WEA 18-2)	08:28 16:14	
13	05:19 21:47	06:05 21:00	06:56 19:51	07:47 18:40	27	17:25 (WEA 18-1) 17:52 (WEA 18-1)	07:43 16:40	15:24 (WEA 18-4) 15:52 (WEA 18-2)	08:29 16:14	
14	05:20 21:46	06:06 20:58	06:58 19:48	07:49 18:38	28	17:24 (WEA 18-1) 17:52 (WEA 18-1)	07:45 16:38	15:23 (WEA 18-4) 15:50 (WEA 18-2)	08:30 16:14	
15	05:21 21:45	06:08 20:56	06:59 19:46	07:51 18:36	28	17:24 (WEA 18-1) 17:52 (WEA 18-1)	07:47 16:37	15:22 (WEA 18-4) 15:47 (WEA 18-2)	08:31 16:14	
16	05:23 21:44	06:10 20:54	07:01 19:44	07:52 18:34	28	17:24 (WEA 18-1) 17:52 (WEA 18-1)	07:49 16:35	15:22 (WEA 18-4) 15:22 (WEA 18-4)	08:31 08:32	
17	05:24 21:43	06:11 20:52	07:03 19:41	07:54 18:32	28	17:23 (WEA 18-1) 17:51 (WEA 18-1)	07:50 16:34	15:22 (WEA 18-4) 15:43 (WEA 18-4)	08:32 16:14	
18	05:25 21:42	06:13 20:50	07:04 19:39	07:56 18:29	26	17:24 (WEA 18-1) 17:50 (WEA 18-1)	07:52 16:32	15:22 (WEA 18-4) 15:44 (WEA 18-4)	08:33 16:14	
19	05:26 21:40	06:14 20:47	07:06 19:37	07:58 18:27	24	17:25 (WEA 18-1) 17:49 (WEA 18-1)	07:54 16:31	15:22 (WEA 18-4) 15:44 (WEA 18-4)	08:34 16:14	
20	05:28 21:39	06:16 20:45	07:08 19:34	07:59 18:25	30	16:40 (WEA 18-2) 17:48 (WEA 18-1)	07:56 16:30	15:22 (WEA 18-4) 15:44 (WEA 18-4)	08:35 16:15	
21	05:29 21:38	06:18 20:43	07:09 19:32	08:01 18:23	35	16:36 (WEA 18-2) 17:47 (WEA 18-1)	07:57 16:29	15:22 (WEA 18-4) 15:45 (WEA 18-4)	08:35 16:15	
22	05:30 21:37	06:19 20:41	07:11 19:29	08:03 18:21	37	16:33 (WEA 18-2) 17:45 (WEA 18-1)	07:59 16:27	15:23 (WEA 18-4) 15:45 (WEA 18-4)	08:36 16:15	
23	05:32 21:35	06:21 20:39	07:13 19:27	08:05 18:19	37	16:31 (WEA 18-2) 17:43 (WEA 18-1)	08:01 16:26	15:23 (WEA 18-4) 15:46 (WEA 18-4)	08:36 16:16	
24	05:33 21:34	06:23 20:37	07:14 19:25	08:07 18:17	30	16:30 (WEA 18-2) 17:39 (WEA 18-1)	08:02 16:25	15:23 (WEA 18-4) 15:45 (WEA 18-4)	08:37 16:16	
25	05:35 21:33	06:24 20:34	07:16 19:22	08:08 18:14	29	16:28 (WEA 18-2) 16:57 (WEA 18-2)	08:04 16:24	15:24 (WEA 18-4) 15:45 (WEA 18-4)	08:37 16:17	
26	05:36 21:31	06:26 20:32	07:18 19:20	08:10 18:12	31	16:27 (WEA 18-2) 16:58 (WEA 18-2)	08:06 16:23	15:25 (WEA 18-4) 15:45 (WEA 18-4)	08:37 16:18	
27	05:38 21:30	06:28 20:30	07:19 19:18	08:12 18:10	32	16:27 (WEA 18-2) 16:59 (WEA 18-2)	08:07 16:22	15:26 (WEA 18-4) 15:45 (WEA 18-4)	08:38 16:18	
28	05:39 21:28	06:29 20:28	07:21 19:15	07:14 17:08	33	15:26 (WEA 18-2) 15:59 (WEA 18-2)	08:09 16:21	15:27 (WEA 18-4) 15:46 (WEA 18-4)	08:38 16:19	
29	05:41 21:27	06:31 20:26	07:23 19:13	07:16 17:06	34	15:26 (WEA 18-2) 16:00 (WEA 18-2)	08:10 16:20	15:27 (WEA 18-4) 15:45 (WEA 18-4)	08:38 16:20	
30	05:42 21:25	06:33 20:23	07:25 19:10	07:18 17:04	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	08:12 16:19	15:28 (WEA 18-4) 15:45 (WEA 18-4)	08:38 16:21	
31	05:44 21:23	06:34 20:21	 19:08	07:19 17:02	35	15:24 (WEA 18-2) 15:59 (WEA 18-2)	 16:19	 15:45 (WEA 18-4)	08:38 16:21	
Sonnenscheinstunden	505	456	382	332		265	768	241	57	
astr.max.mögl.Beschattung				733						

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

Tag im Monat	Sonnenaufgang (SS:MM)	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenanfang	Zeitpunkt (SS:MM) Schattende	(WEA mit erstem Schatten)	(WEA mit letztem Schatten)
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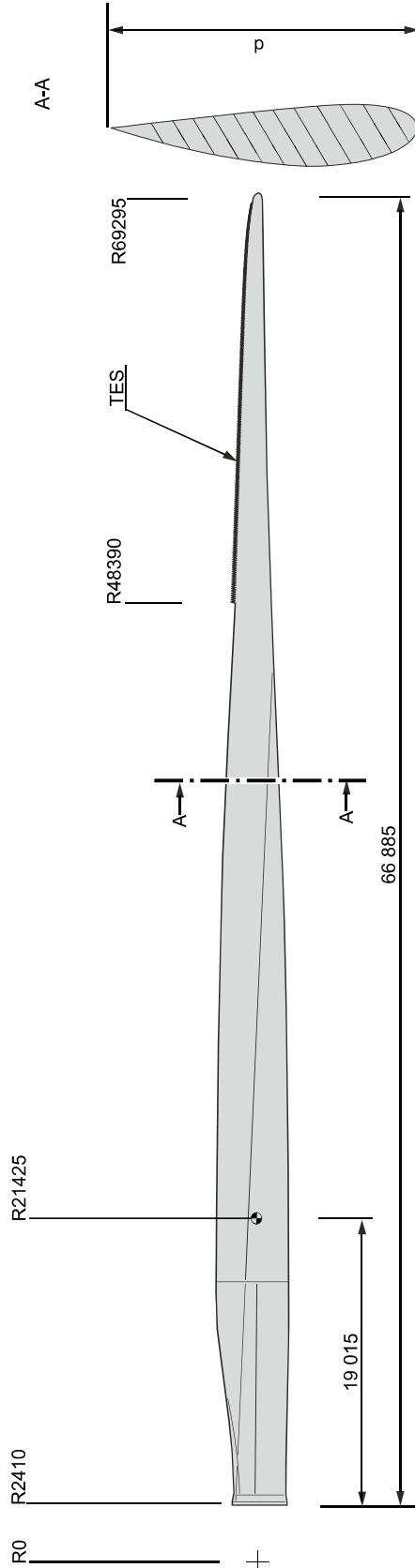
Anlage 9: Rotordatenblätter ENERCON E-138 EP3-RB-01

**Rotorblatt E-138 EP3-RB-01 mit Hinterkantenkamm (TES) /
Rotor Blade E-138 EP3-RB-01 with Trailing Edge Serration (TES)**

Radius R R in mm	Tiefe d chord d d in mm
2 410	2 980
2 980	2 980
2 930	2 855
3 519	2 865
4 416	2 914
5 520	3 022
6 693	3 178
8 004	3 379
9 384	3 595
10 902	3 802
12 558	3 944
14 283	3 956
16 077	3 922
17 940	3 886
19 841	3 845
21 942	3 804
24 012	3 755
26 082	3 695
28 221	3 620
30 360	3 529
32 568	3 411
34 776	3 261
36 984	3 080
39 192	2 879
41 400	2 662
43 539	2 445
45 678	2 227
47 748	2 020
49 818	1 940
51 819	1 796
53 820	1 596
55 683	1 459
57 477	1 330
59 202	1 213
60 858	1 108
62 386	1 024
63 756	951
65 067	876
66 240	802
67 344	720
68 241	634
69 000	510

¹ Angabe bei 90 % Blatt-
radius / Information at 90 %
blade radius

	ohne Blattheizung without rotor blade heating system	mit Blattheizung with rotor blade heating system
Gewicht / weight	ca. / approx. 18 550 kg	ca. / approx. 18 850 kg
Schwerpunkt, radial / center of mass, radial	ca. / approx. 21 425 mm	ca. / approx. 21 140 mm
Schwerpunkt, center of mass	ca. / approx. 19 015 mm	ca. / approx. 18 730 mm
Länge / length	ca. / approx. 66 885 mm	ca. / approx. 66 885 mm
Zum Heben: Nummer des Bolzens auf 6 Uhr / For lifting: Number of the bolt at 6 o'clock	-	-
Windangriffsfläche A_w (inkl. c_w -Wert, ohne Sicherheitsfaktor) bei Rotorblatt in Hubposition mit oberstehendem Bolzen auf 6 Uhr / area exposed to wind A_w (including c_w -value, without safety factor) referring to above bolt number at 6 o'clock in lifting position	-	-



R0	Mittelpunkt der Rotorachse / center of rotor axis
TES	Hinterkantenkamm / Trailing Edge Serration

ENERCON E-138 EP3 E2 4200 138.6 !O!

Datei C:\Users\Wi\Documents\WindPRO Data\WTG Data\ENERCON E-138 EP3 E2 4200 138.6 !O!.wtg

Firma	ENERCON
Typ/Version	E-138 EP3 E2
Nennleistung	4.200,0 kW
zweiter Generator	0,0 kW
Rotordurchmesser	138,6 m
Turm	konisch
Netzfrequenz	50 Hz
Herkunftsland	DE
Blatt-Typ	E-138 EP3-RB-01
Generatortyp	variabel
Nennzahl	11,1 U/min
Einschaltzahl	0,0 U/min
Nabenhöhe(n)	160,0; 81,0; 111,0; 131,0 m
Maximale Blatttiefe	3,96 m
Blatttiefe bei 90% Radius	1,02 m
Aktuell	Ja
Erstellt von	USER
Erzeugt	17.12.2018 4513:45
Bearbeitet	17.12.2018 4513:45

Anlage 10: Standortkoordinaten der geplanten Windenergieanlagen

Koordinaten nach ETRS89/32U und Gauß-Krüger-Kataster-Höhen



Windparkplanung in der Gemeinde Hollenstede - Fläche 17 (WEA 1-3)

Errichtung und Betrieb von 3 WEA des Typs ENERCON E-138 EP3 - Nh 160 m

Windparkplanung in der Gemeinde Hollenstede - Fläche 18 (WEA 1-4)

Errichtung und Betrieb von 4 WEA des Typs ENERCON E-138 EP3 - Nh 160 m

Stand: 28.09.18

WEA	Typ	UTM		Sexagesimal		Gauß-Krüger		Kataster			Höhenangaben in m über NN			
		RW	HW	Latitude	Longitude	RW	HW	Gemarkung	Flur	Flurst.	Höhe GOK	Nabenhöhe	Gesamthöhe	
Fläche 17														
1	E-138 EP3 Nh 160 m	409.261	5.815.378											
2	E-138 EP3 Nh 160 m	408.752	5.815.215											
3	E-138 EP3 Nh 160 m	409.155	5.814.940											
Fläche 18														
1	E-138 EP3 Nh 160 m	411.682	5.814.008											
2	E-138 EP3 Nh 160 m	411.992	5.813.886											
3	E-138 EP3 Nh 160 m	411.288	5.813.534											
4	E-138 EP3 Nh 160 m	411.624	5.813.436											