Soler S.A.

2, rue Pierre d'Aspelt

L-1142 Luxembourg

Tel. : 2827-1

Anfrage hinsichtlich der UVP-Pflicht in Bezug auf das geplante „Repowering" der Phase 1 des Windparks Kehmen-Heischent

für die

Wandpark Kehmen-Heischent S.A.

Schlasswee 1

L - 9140 Bourscheid

Kontaktpersonen:

Charel Gleis

charel.gleis@seo.lu, 2827-3237

Laurent Winkin

laurent.winkin@seo.lu, 2827-3246

erstellt am: 23.07.2018

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1. Einleitung

Die Wandpark Kehmen-Heischent S.A. betreibt heute 10 Windkraftanlagen aus 2 Phasen. 2004 baute man die ersten 7 Anlagen von jeweils 1.800 kW. In einer zweiten Phase wurde der Windpark 2015 um 3 Anlagen mit einer jeweiligen Leistung von 2.350 kW erweitert.

Die erste Phase ist seit etwas mehr als 14 Jahren ohne größere Vorfälle in Betrieb. Die feste Vergütung entfällt nach dem 15ten Lebensjahr. Deshalb wird die erste Phase ab September 2019 nach dem Marktpreis vergütet. Diese finanziellen Rahmenbedingungen ermöglichen mittelfristig keinen stabilen wirtschaftlichen, Betrieb wodurch ein Repowering (Ersetzen der alten Anlagen durch neue Anlagen) unumgänglich geworden ist. Die Entwicklung der Windkraftanlagen für Binnenlandstandorte ist in den letzten Jahren rasant an Leistung, Nabenhöhe und Rotordurchmesser angestiegen wodurch mit weniger Anlagen mehr Energie produziert werden kann.

Das in Rede stehende Vorhaben ist nach dem modifizierten Gesetz vom 10.06.1999 „relative aux établissements classés“ (Commodo-/Incommodo-Gesetz) genehmigungspflichtig (Nomenklaturpunkt 143)1)g), Klasse 1-Verfahren). Hierbei handelt es sich um ein sogenanntes Verfahren des Typ B2, also um ein solches, für das entsprechend dem Règlement Grand-Ducal vom 07.03.2003 „concernant l’évaluation des incidences de certains projets publiques et privés sur l’environnement“, Artikel 3.i) Annexe II, fallbezogen eine Umwelt-Verträglichkeits-Prüfung (UVP) von der Behörde durchgeführt werden kann.

Aus nachvollziehbaren Gründen ist es daher als sinnvoll anzusehen, bereits rechtzeitig vor Einleitung des Genehmigungsverfahrens (Commodo-/Incommodo) die konkrete Notwendigkeit einer Umwelt-Verträglichkeits-Prüfung (UVP), respektiv die Erstellung einer Umwelt-Verträglichkeits-Untersuchung (UVU) prüfen zu lassen.

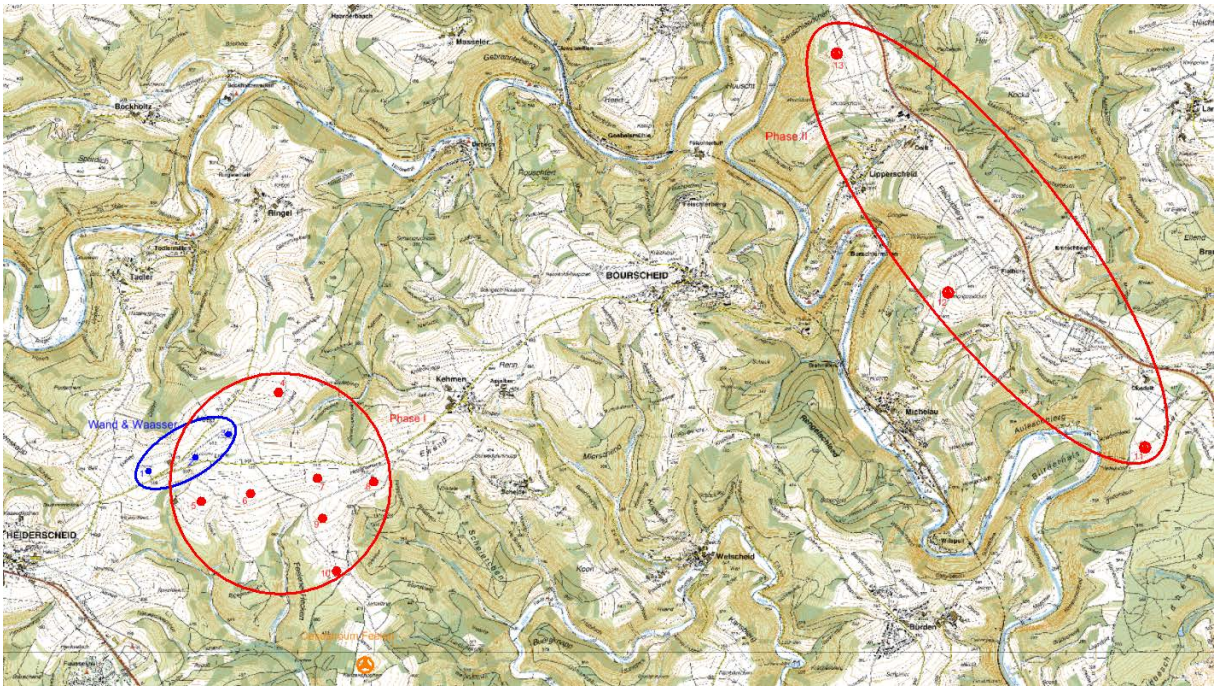
Um der zuständigen Behörde die Möglichkeit zu geben, über die Notwendigkeit einer Umwelt-Verträglichkeits-Prüfung (UVP) zu entscheiden, stellen wir Ihnen hiermit die erforderlichen Unterlagen zur Verfügung.

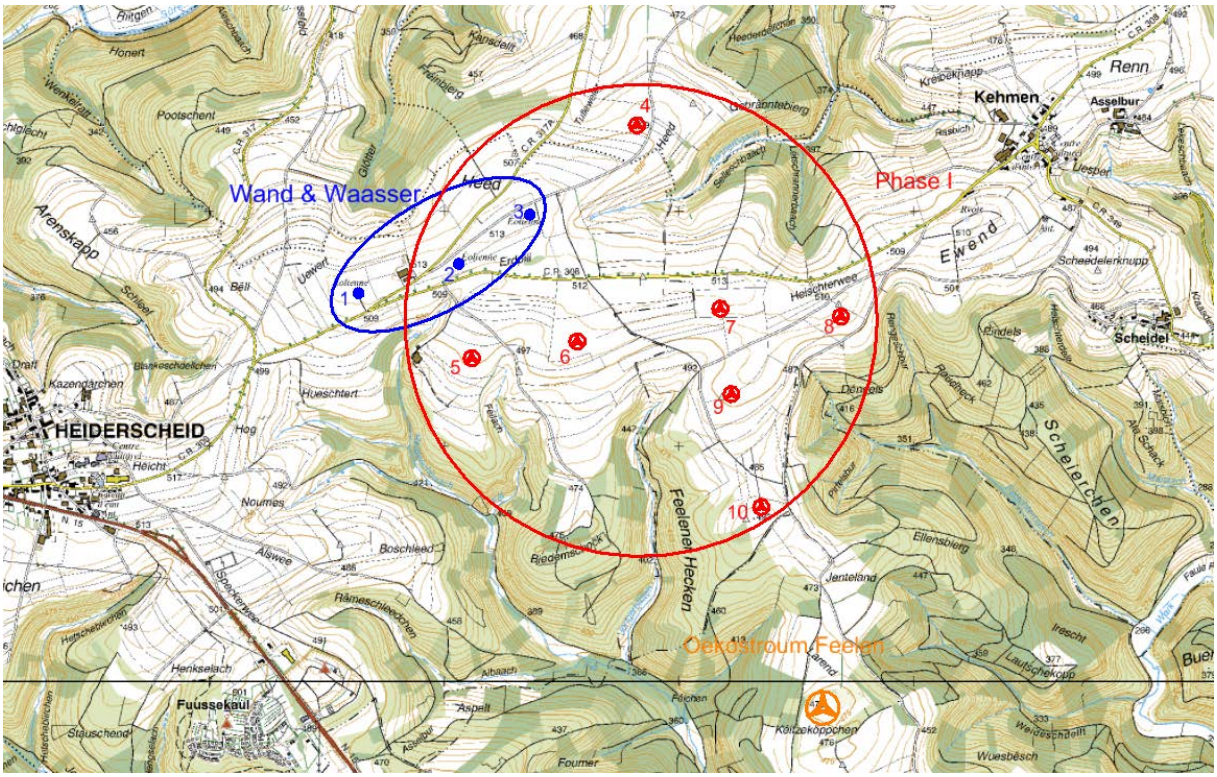
2. Gegenüberstellung der „Repowering“-Variante zur Ist-Situation

2.1. Topografische Gegenüberstellung mit dem Vergleich der installierten Leistung und der jährlichen Energieproduktion.

2.1.1. Ist-Situation

Im Folgenden topografischen Plan, ist die aktuelle Situation des Windparks mit den 10 Windkraftanlagen der beiden bestehenden Phasen, dargestellt.




Wand & Waasser
Phase I
Oekostroum Feelen
HEIDERSCHEID
Kehmen
Scheidel
Fuussekaul
Renn
Feelener Hecken
Schelerchen
Ewend
Heed
Heischterwee
Arenskapp
Pootschent
Honert
Hueschtert
Noumes
Boschleed
Ellensbierg
Jenteland
Irescht
Weidescheidt
Wuesbesch
Foumer
Aspelt
Kaltzekoppchen
Henkselach
Stauscheid
Alawee
Ramesbleechen
Albaach
Fëchen
Kazendarchen
Heicht
Hog
Bell
Uewert
Glicker
Schiber
Draft
Bëndels
Dëpënds
Ellensbierg
Scheedelerknupp
Uesper
Kreiseknapp
Asselbur
Gebrënntebierg
Fëlleisch
Reedemscheer
Pëtkeber
Rëndbeck
Ënn Schack
Hutschebierchen
Stauscheidchen
Schockerwee
Glaskeschdelchen
Werkëfëlt
Hëlzbierg
Hëlzbierg
Hëlzbierg

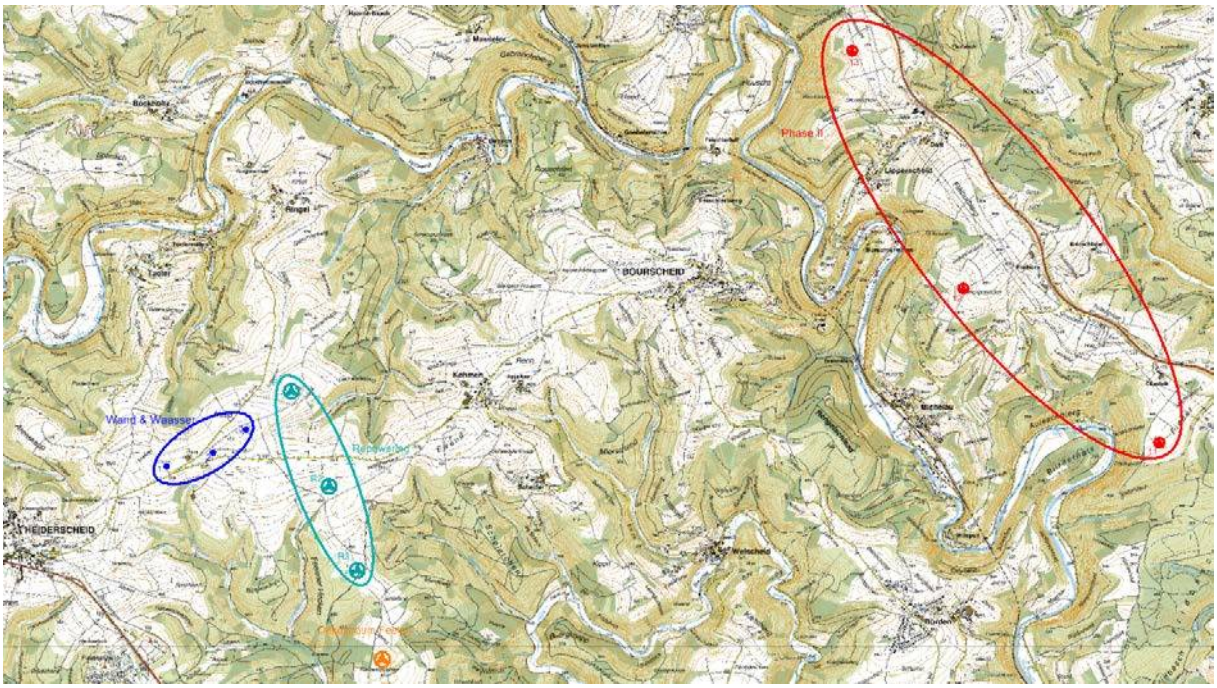
2.1.2. Anrainende Windparks

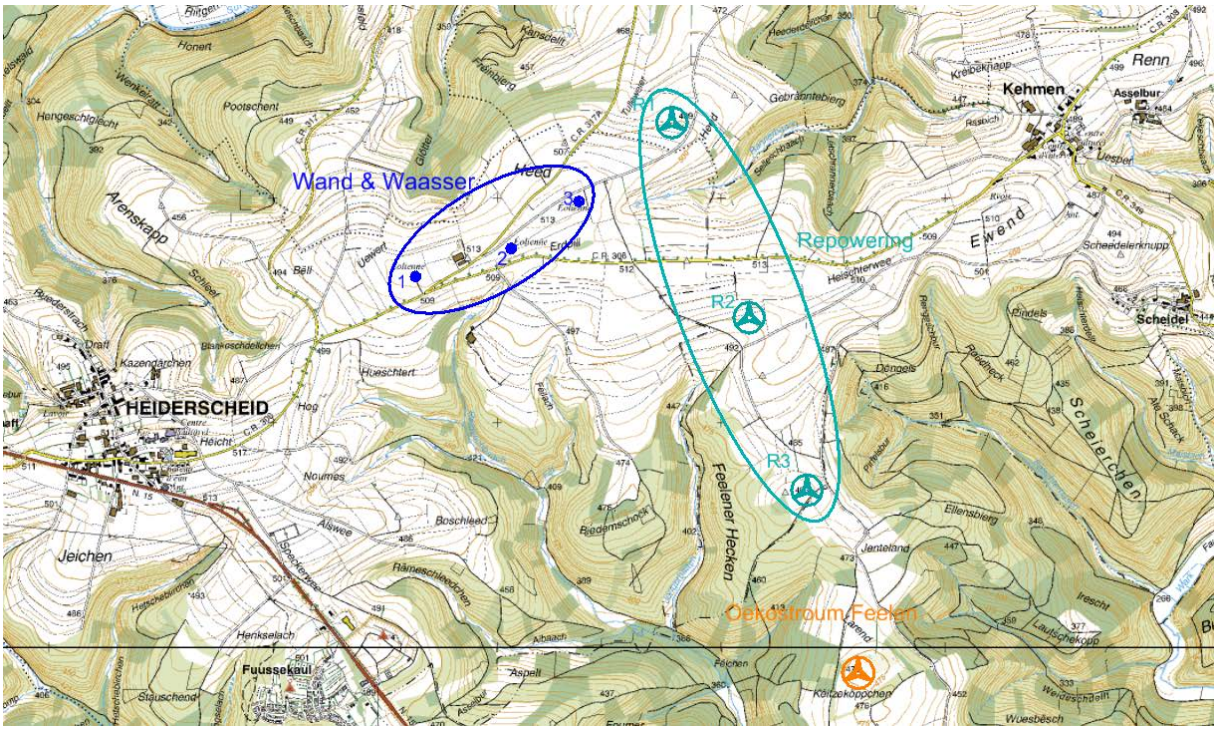
Die folgende Tabelle zeigt die nahegelegenen Windparks, welche einen Einfluss auf den Parkwirkungsgrad des Windparks Kehmen-Heischent haben.

Windpark	Anzahl WEA	Anlagentyp	Rotordurchmesser	Leistung	Nabenhöhe
Wand & Waasser	3	Enercon E-40	40 m	3 x 500 kW	65 m
Oekostroum Feelen	1	Siemens SWT-3.0-113	113 m	1 x 3.000 kW	142,5 m

2.1.3. „Repowering“-Variante

Folgender topographischer Plan stellt die „Repowering“-Variante im Windparkgebiet dar. In dieser Variante werden die 7 Windkraftanlagen der ersten Phase, durch die drei Windkraftanlagen R1-R3 ersetzt. Es ist geplant die 7 Anlagen der Phase 1 außer Betrieb zu nehmen, bevor die neuen Anlagen der „Repowering“-Variante in Betrieb genommen werden.





Die nachstehende Tabelle stellt eine Übersicht der Anlagen nach der Realisierung der geplanten „Repowering“-Variante dar.

	Anzahl der WKA	Installierte Leistung (kW)	Anlagen-typ	Naben-höhe (m)	Rotor-durch-messer (m)	Inbetrieb-nahme	Installierte Leistung insgesamt	Jahres-produktion
Repowering	3	3.500 kW	Enercon E-138	160	138,6	-	10.500 kW	29,08 GWh[1]
Phase II	3	2.350 kW	Enercon E-92	2x 138 1x 108	92	2015	7.050 kW	13,72 GWh
						Total	17.550 kW	42,80 GWh

Bei den 3 Windkraftanlagen der „Repowering“-Variante steht die Enercon E-138 mit einer Nabenhöhe von 160 m und einem Rotordurchmesser von 138,6 m stellvertretend für den möglichen Anlagentyp. Im Anhang 5 befindet sich die technische Beschreibung der Enercon E-138 Windkraftanlage.

Nach neuesten Ertragsschätzungen, ist zu erwarten dass die 3 neuen Anlagen, welche die 7 alten Enercon E-66 Anlagen ersetzen, eine durchschnittliche Jahresproduktion von 29,08 GWh im Jahr erreichen werden. Somit kann die „Repowering“-Variante mit 3 Windkraftanlagen, bei geringerer installierter Leistung, mehr elektrische Energie in einem Jahr erzeugen, als die 7 bestehenden Anlagen der Phase 1.

Mit dem „Repowering“ der Phase 1 erreicht der Windpark Kehmen-Heischent eine voraussichtliche geschätzte Jahresproduktion von insgesamt 42,8 GWh, gegenüber den 35,04 GWh des bestehenden Windparks.

[1] Ertragsschätzung

2.2. Schall- und Schattenwurfberechnungen

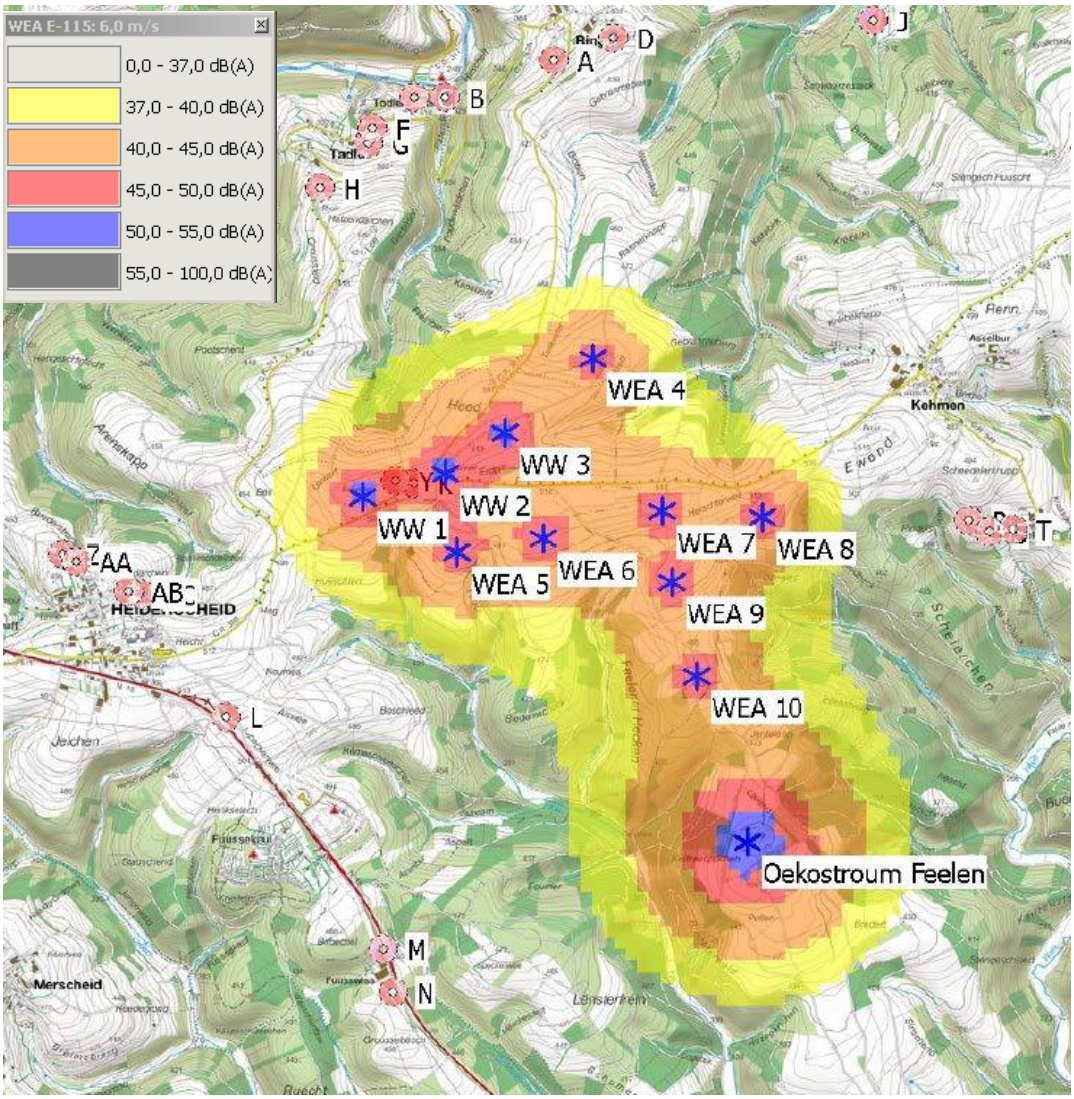
Die Berechnungen und die entsprechenden Darstellungen für die Schall und Schattenwurfberechnungen sind anhand der Software „WindPro“ hausintern erstellt worden.

Mehrere Immissionspunkte (IP) wurden an den Rand, des Bebauungsgebietes, der umliegenden Dörfer und Aussiedlerhöfe gesetzt. Bei der Commodo/Incommodo Prozedur wird eine Studie von einem externen Gutachter erstellt, welche darlegt dass wir die geforderten Schall- und Schattenemissionen einhalten.

2.3. Schalldarstellung der Phase 1 im Vergleich zur „Repowering"-Variante

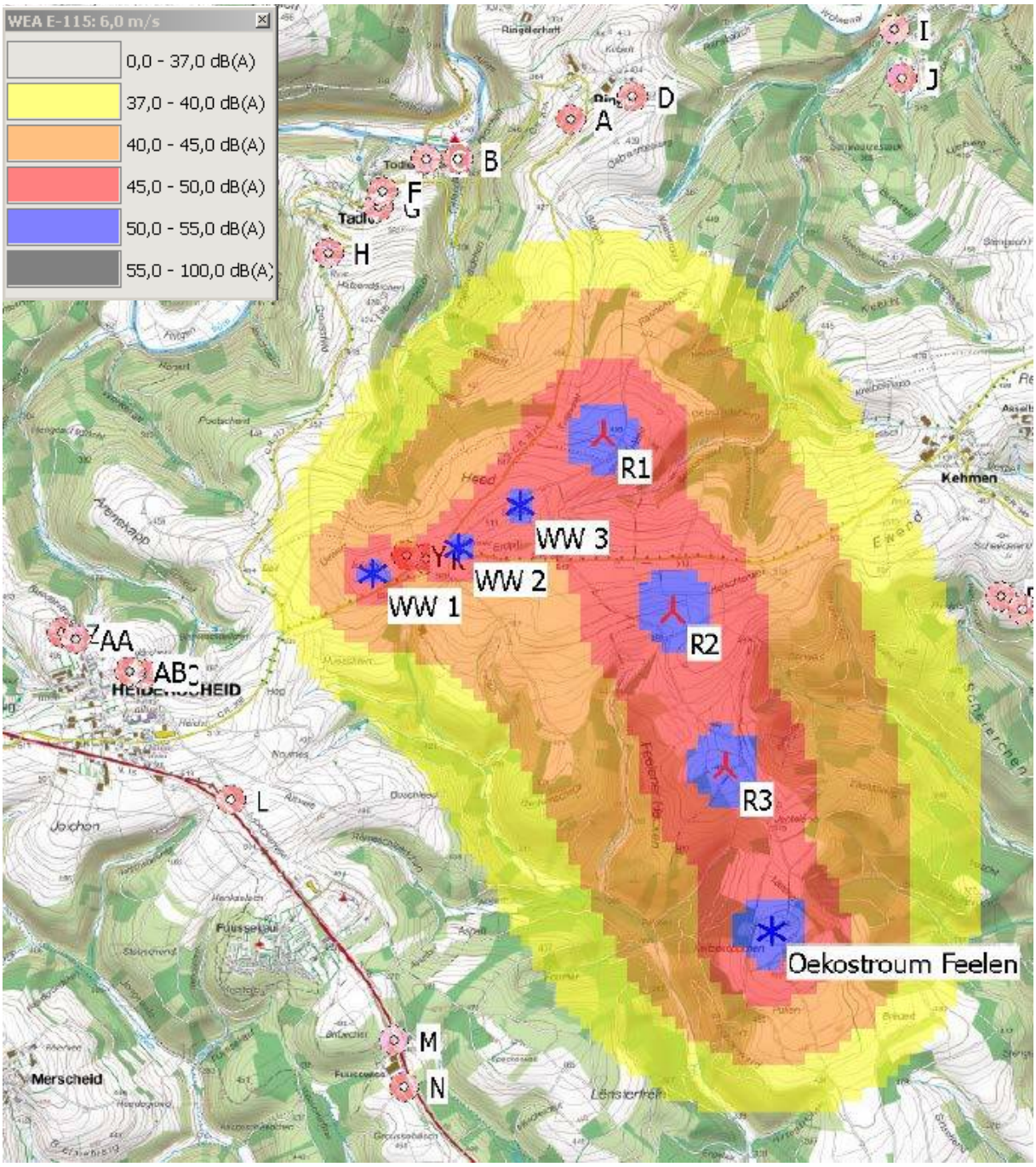
2.3.1. Ist-Situation

Aus dem aktuellen Wandpark Kehmen-Heischent Layout ergibt sich folgende Schallsituation, bei 6 m/s auf 10 m Höhe.



2.3.2. „Repowering“-Variante

Die Schallausbreitung der „Repowering“-Variante sieht, bei 6 m/s auf 10 m Höhe, wie folgt aus.

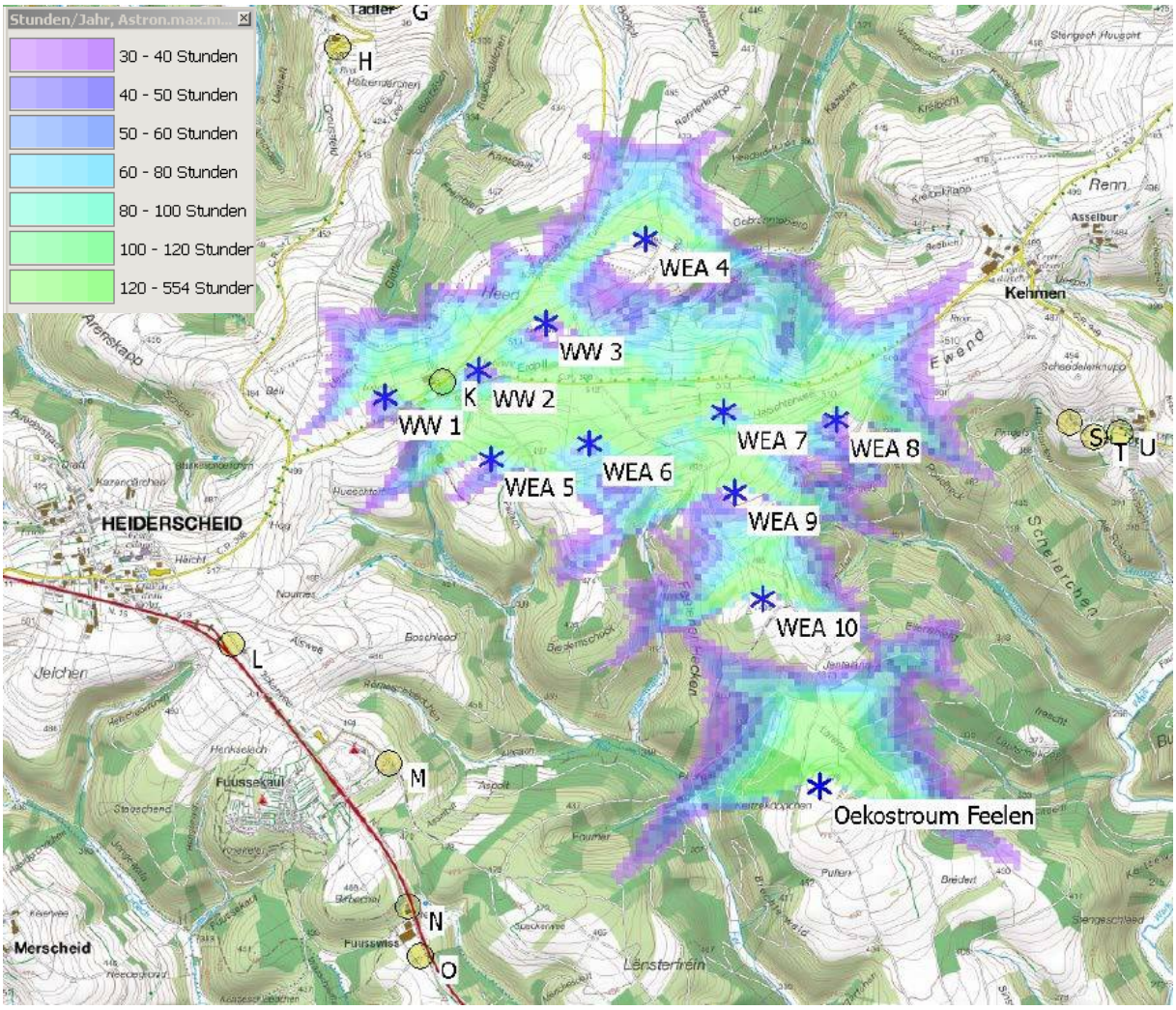


Im Anhang 3 sind die gesamten Berechnungsergebnisse der „Repowering“-Variante dargestellt.

2.4. Schattenwurf der Phase 1 im Vergleich zur „Repowering“-Variante

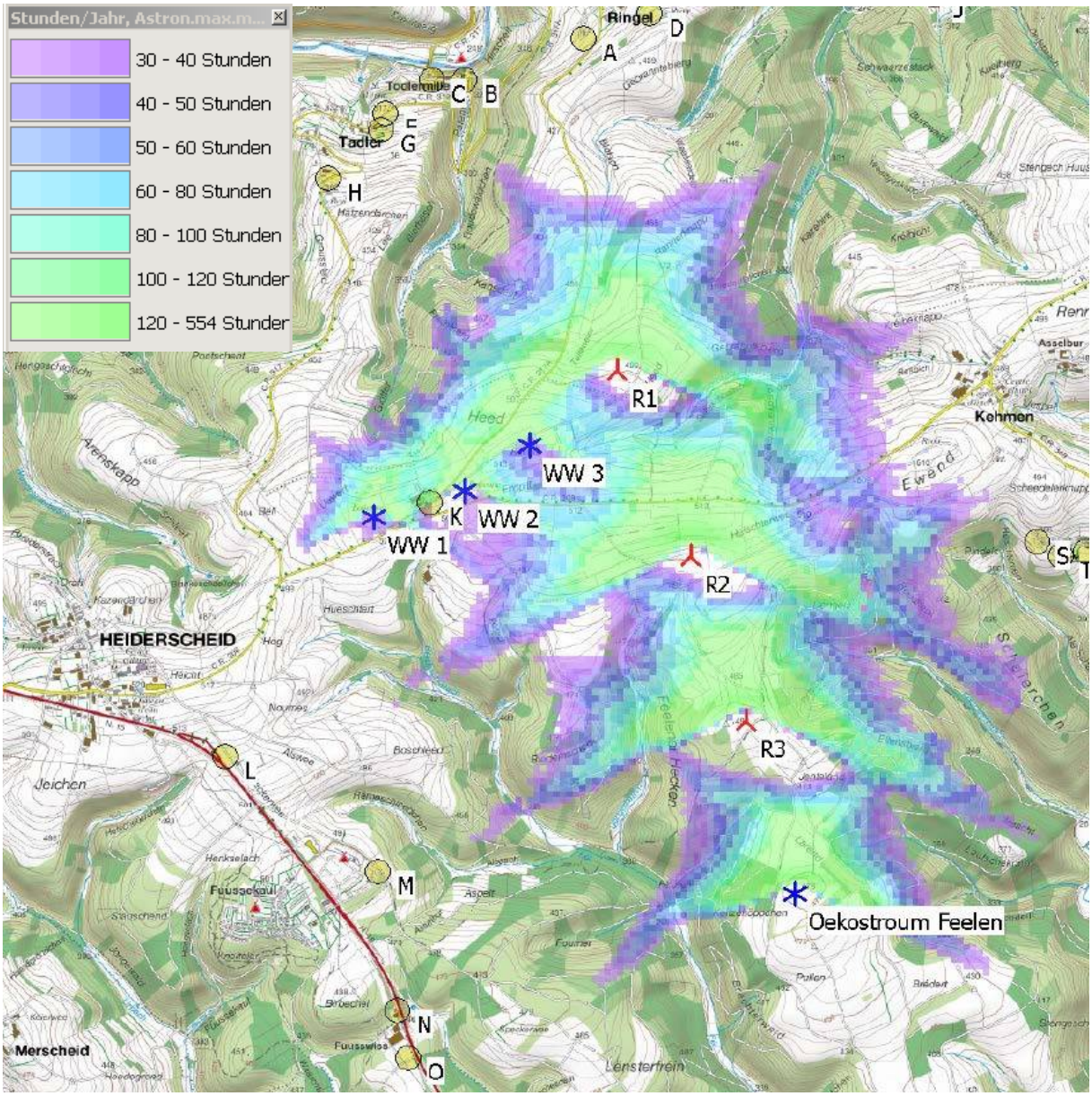
2.4.1. Ist-Situation

Aus dem aktuellen Wandpark Kehmen-Heischent Layout ergibt sich folgende Schattenwurfsituation (max. Stunden/Jahr Worst-Case).



2.4.2. „Repowering“-Variante

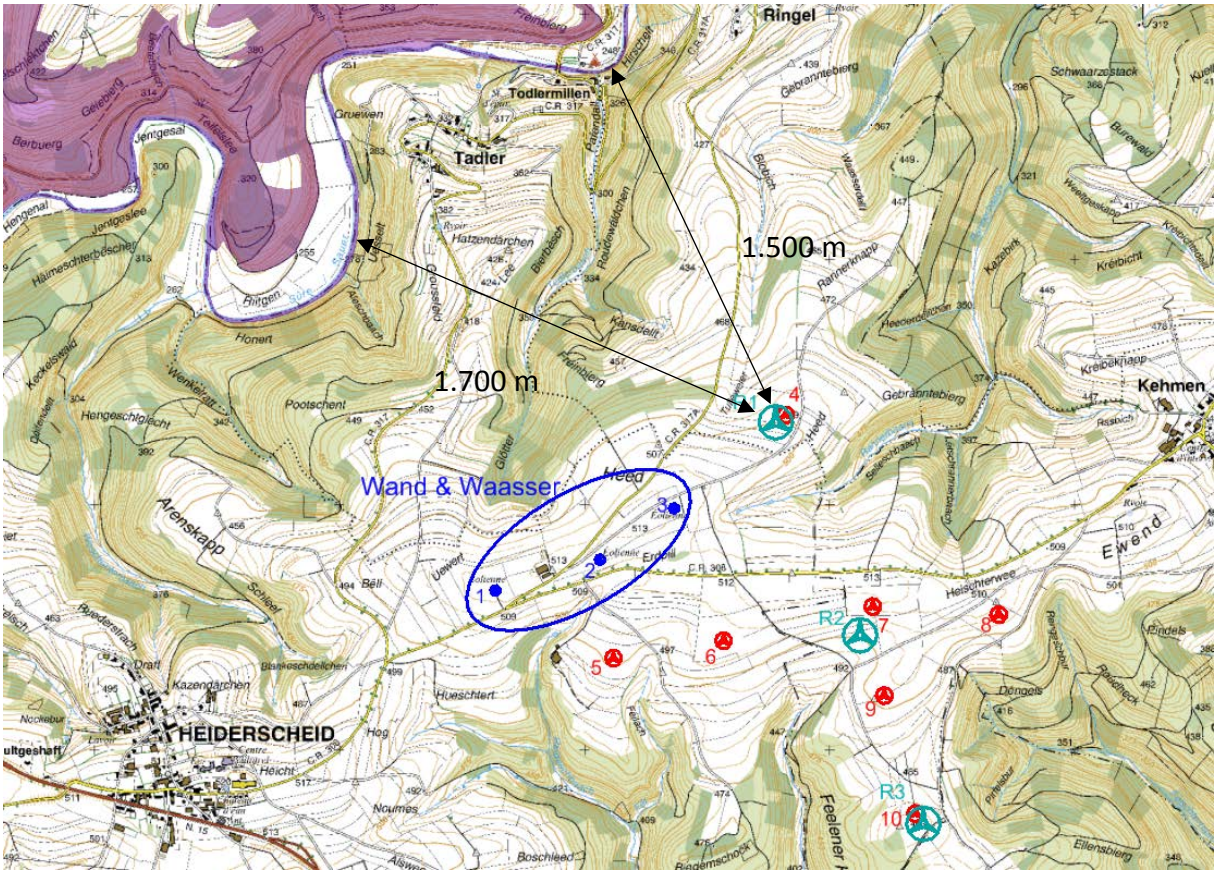
Der Schattenwurf der „Repowering“-Variante sieht wie folgt aus (max. Stunden/Jahr Worst-Case).



Im Anhang 4 sind die gesamten Berechnungsergebnisse der „Repowering“-Variante dargestellt.

2.5. Distanz zu Schutzgebieten

Folgende Darstellung zeigt die Distanz zu dem Schutzgebiet „Région Kiischpelt“.

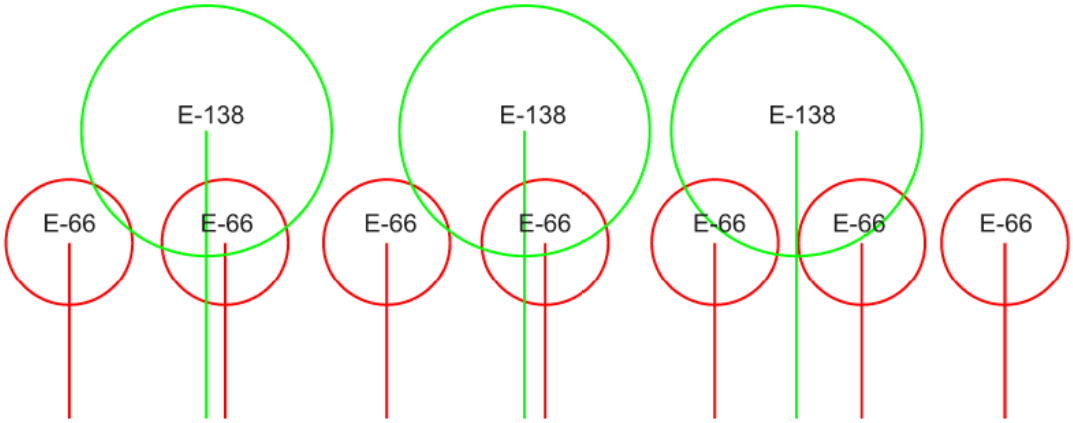


Das nächstgelegene Natura 2000 – Gebiet des Windparks Kehmen-Heischent, liegt nördlich des Windparks und ist das Gebiet „Région Kiischpelt“. Die Repowering-Anlage R1 befindet sich etwa auf dem gleichen Standort, wie die Anlage Nummer 4 des bestehenden Windparks. Somit halten wir immer noch einen Abstand von 1,5 km zum Schutzgebiet ein und beeinträchtigen es nicht zusätzlich.

2.6. Vergleich der Ist-Situation zur „Repowering“-Variante bezüglich der Windenergieanlagen

Die folgende Darstellung stellt maßstäblich die verschiedenen Anlagen der beiden Szenarien dar.

<u>Vergleich WEA</u>



Bei den bestehenden Anlagen beträgt der Abstand zwischen der Rotorspitze und der Geländeoberkante 63 m, dieser Abstand beträgt bei der Repowering-Variante 90,7 m. Somit erhöht sich der Abstand von der Rotorspitze zur Geländeoberkante um 27,7 m.

Die freie Fläche unterhalb der Rotorspitze, mit einer Höhe von 90,7 m, trägt dazu bei dass sich Vögel im Jagd- oder Suchflug den Rotorblättern nicht mehr so gefährlich nähern.

Folgende Tabelle zeigt Anhand der jährlichen Energieproduktion den Vergleich, der CO2-Ersparnis und die Anzahl der Versorgung von 4-Personen Haushalten im Jahr (gerechnet mit einem Durchschnittsverbrauch von 4.500 kWh/a).

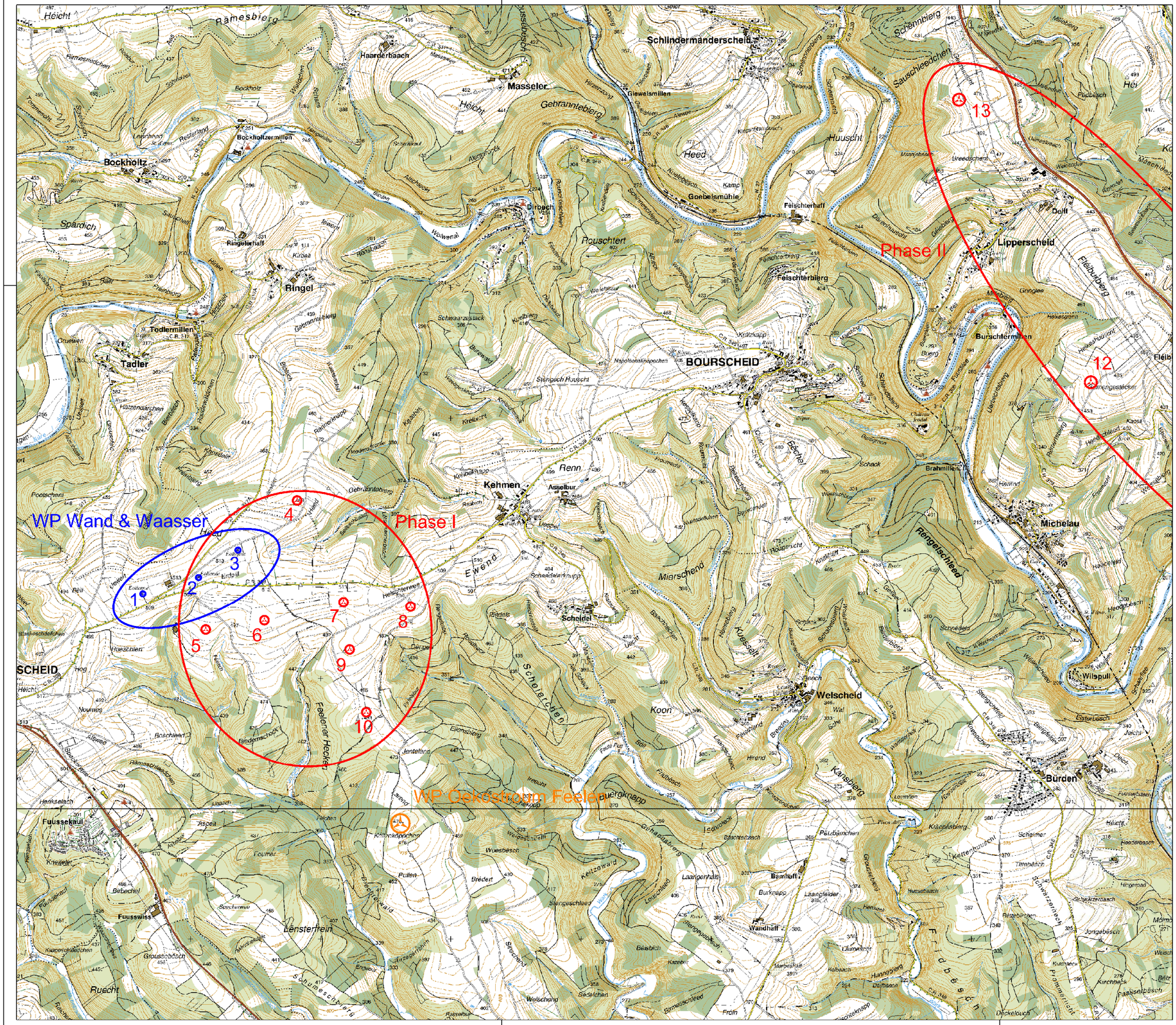
	kWh	**Verbrauch von ____ Haushalten pro Jahr** **(4 Personenhaushalte)**	**CO2-Ersparnis pro Jahr**
Phase 1	21.320.000	4.738	11.982 tCO2
Repowering	29.080.000	6.462	18.900 tCO2

3. Schlussfolgerungen

Unter Betrachtung der einzelnen Gegenüberstellungen wird die vorgestellte „Repowering“-Variante zu keinen erheblichen Erhöhungen der bestehenden Umweltbelastungen führen. Alle erforderlichen Grenzwerte werden mit dieser Variante eingehalten. Die geringere Anzahl der Anlagen und die Erhöhung der Rotorblattspitze zur Geländeoberkante weist auf eine Minimierung der Belastungen hin.

4. Anhänge

1. Lageplan des aktuellen Windparks
2. Lageplan der „Repowering“-Variante
3. Schalldarstellung der „Repowering“-Variante
4. Schattenwurf der „Repowering“-Variante
5. Anlagenbeschreibung



LEGENDE

- bestehende WEA
- Repowering
- ~~WEA Oekostrom / Feelen~~

Index	Datum	
a		
b		
c		
d		

Maître d'oeuvre

soler

SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tél.: 2927-1 Fax: 2927-3250

Maître d'ouvrage

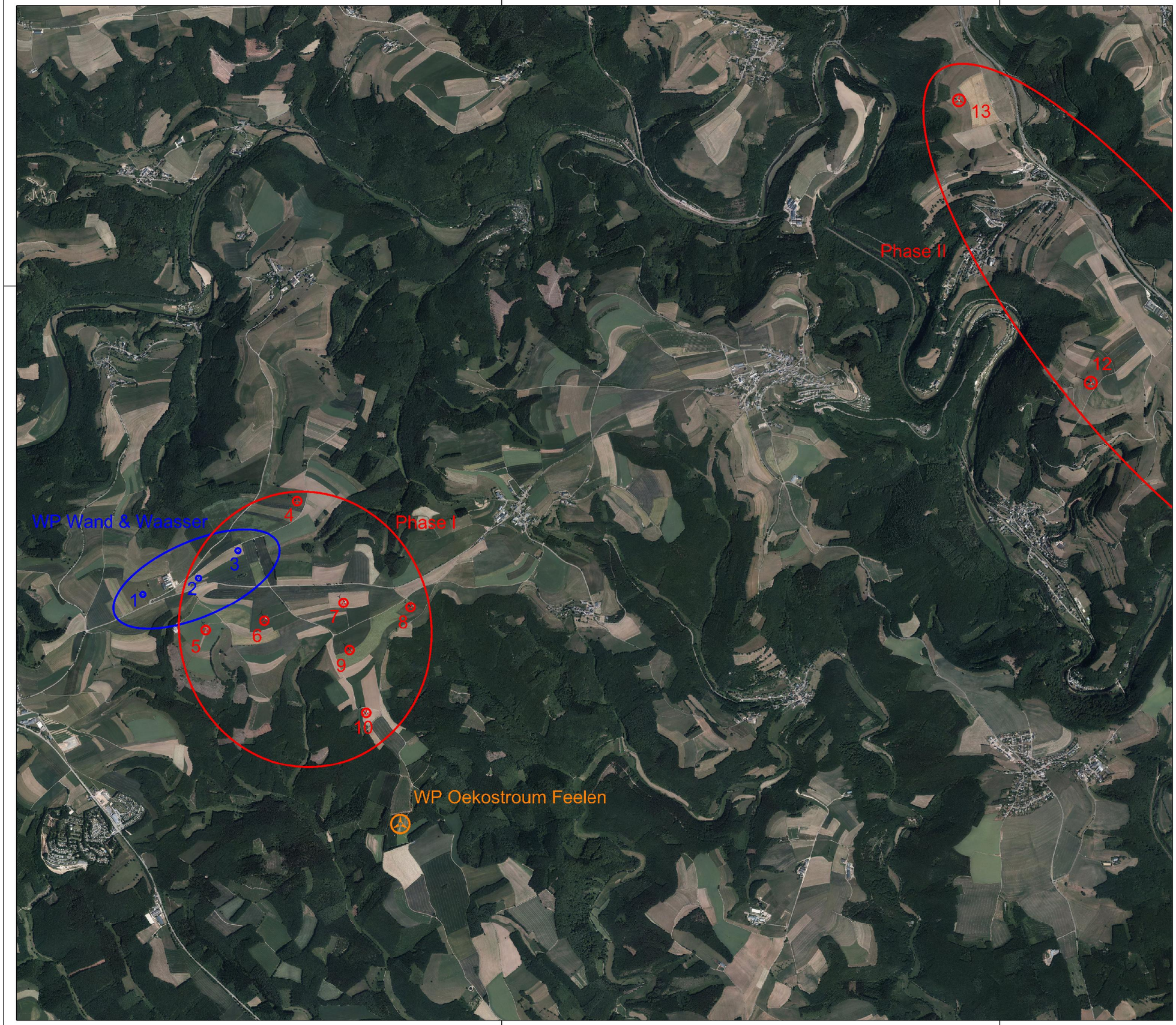
soler

SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tél.: 2927-1 Fax: 2927-3250

Repowering Kehmen-Heischent

WEA Standorte bestehender Windpark

Freigeber	
Projektleiter	
Prüfer	
Zeichner	



LEGENDE

- bestehende WEA
- Repowering
- WEA Oekostroum / Feelen

Index	Datum	
a		
b		
c		
d		

Maître d'oeuvre

soler

SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tél.: 2827-1 Fax: 2827-3250

Maître d'ouvrage

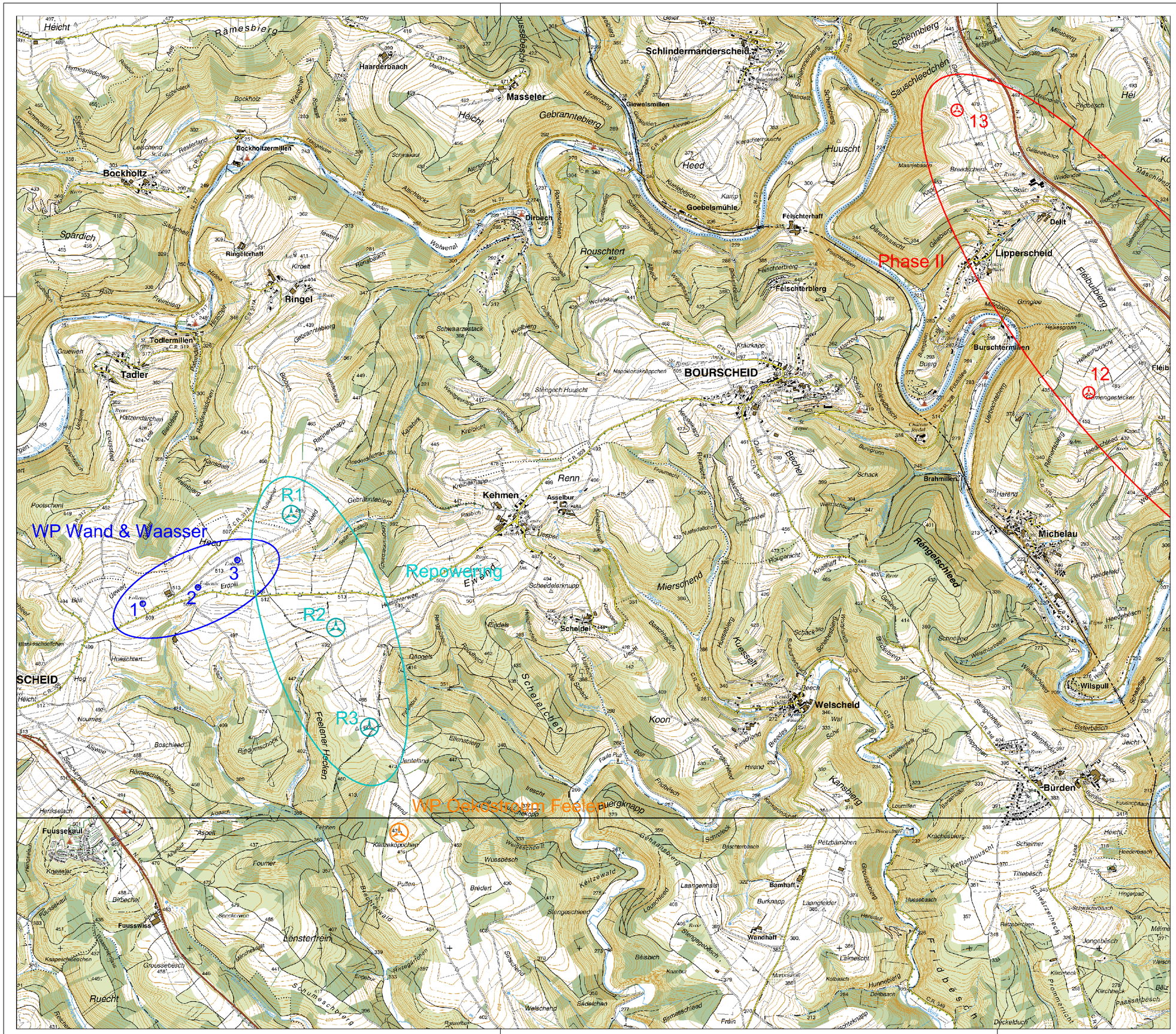
soler

SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tél.: 2827-1 Fax: 2827-3250

Repowering Kehmen-Heischent

WEA Standorte bestehender Windpark

Freigeber	
Projektleiter	
Prüfer	
Zeichner	


Phase II
13
12
R1
R2
R3
1
2
3
WP Wand & Waasser
Repowering
WP Oekostrom Feelen
Schlindermanderscheid
Haarderbaach
Masseler
Giewelsmillen
Bockholtz
Bockholtzermillen
Dirbach
Goebelsmühle
Feischterhaff
Delit
Lipperscheid
Ringelerhaff
Ringel
Todlermillen
Tadler
BOURSCHEID
Burschtermillen
Brahmillen
Michelau
Kehmen
Asselbur
Scheidel
Welscheld
Wilspull
Bürden
Fuussekaul
Fuusswiss
Lënsterfrëm
Ruecht
Feelener Hecken
Schaierchen
Klaesseh
Kansberg
Frëdbësch
Rëngelschieed
Miersched
Koon
Renn
Gebranntebierg
Rouschtert
Huuscht
Heed
Héicht
Rämesbierg
Spärdich
Schlaierchen
Sauschleedchen
Schennbierg
Millebierg
Fleiburbierg
Gringlou
Heikesgronn
Heedscheed
Heedebësch
Wëlspull
Elsterbësch
Jeicht
Deich
Fuussekaul
Fuusswiss
Lënsterfrëm
Ruecht
Birbechel
Foumer
Pullen
Bredert
Wuesbësch
Kaitzekopochen
Kaitzewald
Bëestrëtewald
Stengeschieed
Stengesbësch
Laangenhals
Laangfelder
Burknapp
Bamhaff
Wandhaff
Läimescht
Kolbasch
Hunnebierg
Deilbasch
Fréim
Welschend
Sëdelchen
Birnesschied
Schumeschbërg
Grousseebësch
Kaapeschleechen
Hëlsterwee
Ewerland
Jewert
Boll
Faule Pull
Buergknapp
Petzbämchen
Brëscheid
Krächesbierg
Kettenhuuscht
Tillebësch
Schwärzenbësch
Schwärzenbaach
Hingerpad
Jongebësch
Klirchheck
Prommenicht
Paassalbësch
Bëlz
Deckelduch
Hëlsterwee
Ewerland
Jewert
Boll
Faule Pull
Buergknapp
Fréim
Welschend
Sëdelchen
Birnesschied
Schumeschbërg
Ruecht
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Pullen
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Kaitzekopochen
Kaitzewald
Bëestrëtewald
Stengeschieed
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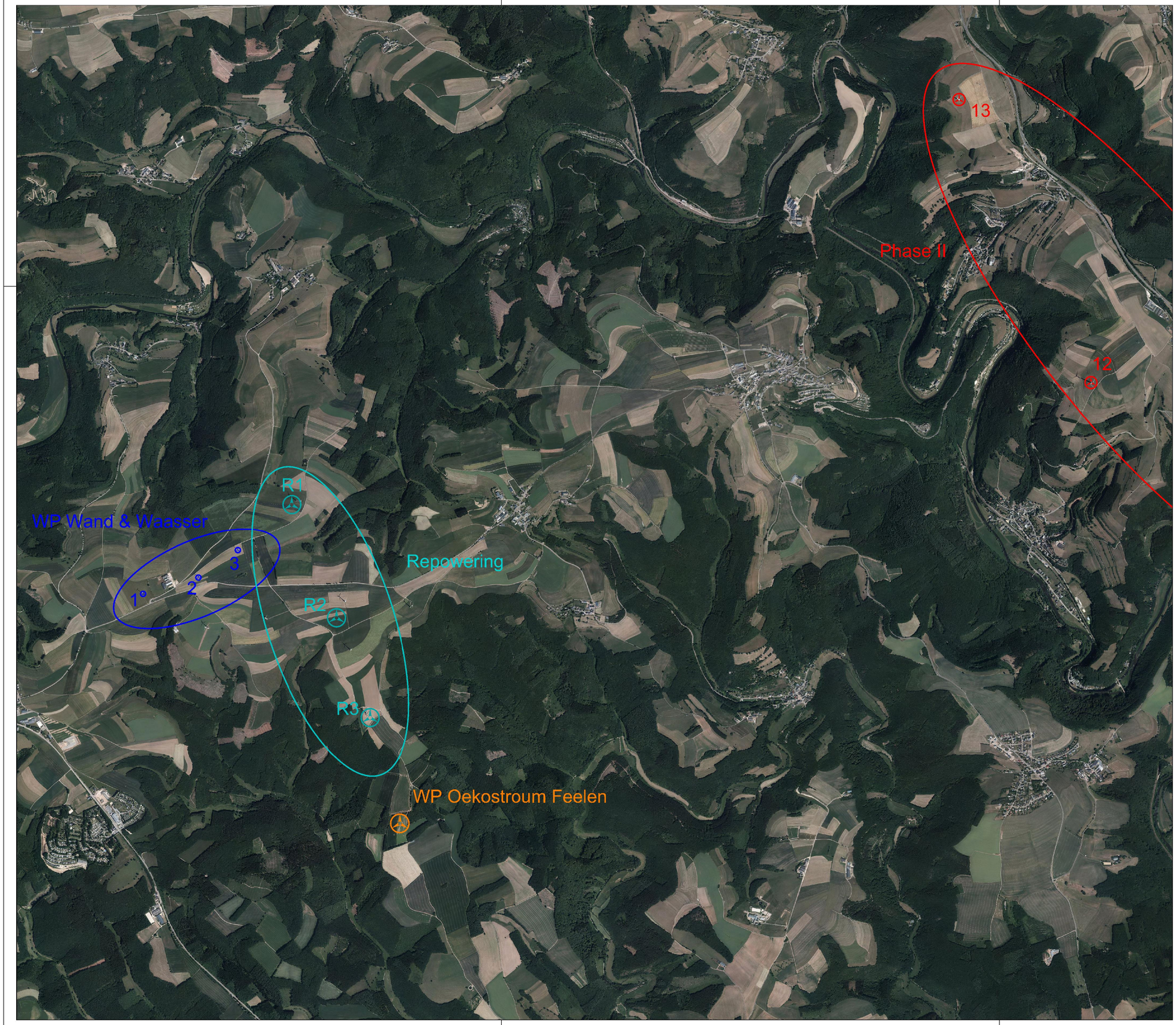
Bamhaff
Wandhaff
Läimescht
Kolbasch
Hunnebierg
Deilbasch



LEGENDE

- bestehende WEA
- Repowering
- WEA Oekostroum

Maître d'oeuvre

soler
SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tel.: 2827-1 Fax: 2827-3250

Maître d'ouvrage

soler
SOLER S.A.
2 rue Pierre d'Aspelt
L-2010 Luxembourg
tel.: 2827-1 Fax: 2827-3250

Repowering Kehmen-Heischent

WEA Standort Phase 2 + Repo

RECOMMANDÉE AVEC AVIS DE RÉCEPTION

MINISTERE DU DEVELOPPEMENT DURABLE
ET DES INFRASTRUCTURES
Département de l'environnement
4, place de l'Europe
L – 1499 LUXEMBOURG

VOTRE REFERENCE	*NOTRE REFERENCE*	*DATE*
91101	9922-079-301-104	23.07.2018

Antrag auf Prüfung der UVP-Pflicht für das Projekt Repowering der Phase 1 des Wandpark Kehmen-Heischent S.A. (MIT NUR 3 WINDKRAFTANLAGEN)

Sehr geehrte Damen und Herren,

im Namen der Wandpark Kehmen-Heischent S.A. beantragen wir hiermit die konkrete Notwendigkeit einer Umwelt-Verträglichkeits-Prüfung (UVP), respektive der Erstellung einer Umwelt-Verträglichkeits-Untersuchung (UVU) zu prüfen.

Gegenüber dem Antrag vom 7. Mai 2018 ist bei diesem Antrag die nördlichste Windkraftanlage nicht zurückbehalten worden.

Drei Exemplare und ein USB-Stick mit Informationen zum Projekt sind dem Schreiben beigefügt, um eine Entscheidung hinsichtlich der UVP-Pflicht des geplanten Vorhabens treffen zu können.

In der Hoffnung, dass der Ministère du Developpement Durable et des Infrastructures – Département de l'environnement auf die Erstellung einer Umwelt-Verträglichkeits-Untersuchung für dieses Repowering Projekt verzichten kann, verbleiben wir,

mit freundlichen Grüßen,

Paul Zeimet

Laurent Winkin

Adresse postale BP 37, L-2010 Luxembourg
Siège social 2, rue Pierre d'Aspelt Luxembourg
T (+352) 28 27-1 F (+352) 28 27-3250

An SEO an Enovos jointventure

Technical Description

ENERCON Wind Energy Converter
E-138 EP3

ENERCON
ENERGY FOR THE WORLD

Publisher

ENERCON GmbH ▪ Dreekamp 5 ▪ 26605 Aurich ▪ Germany
Phone: +49 4941 927-0 ▪ Fax: +49 4941 927-109
E-mail: info@enercon.de ▪ Internet: http://www.enercon.de
Managing Directors: Hans-Dieter Kettwig, Simon-Hermann Wobben
Local court: Aurich ▪ Company registration number: HRB 411
VAT ID no.: DE 181 977 360

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1 Overview of ENERCON E-138 EP3

The ENERCON E-138 EP3 wind energy converter is a direct-drive wind energy converter with a three-bladed rotor, active pitch control, variable speed operation and a nominal power output of 3500 kW. It has a rotor diameter of 138.6 m and can be supplied with hub heights from 81 m to 160 m.

Fig. 1: Total view of E-138 EP3

2 ENERCON wind energy converter concept

Gearless

The E-138 EP3 drive system comprises very few rotating components. The rotor hub and the rotor of the annular generator are directly interconnected to form one solid unit. This reduces the mechanical strain and increases technical service life. Maintenance and service costs are reduced (fewer wearing parts, no gear oil change, etc.) and operating expenses are also minimised. Since there are no gears or other fast rotating parts, the energy loss between generator and rotor as well as noise emissions are considerably reduced.

Active pitch control

Each of the 3 rotor blades is equipped with a pitch unit. Each pitch unit consists of an electrical drive, a control system, and a dedicated emergency power supply. The pitch control drive for each rotor blade consists of two direct-current compositely excited motors with a gear. The pitch units limit the rotor speed and the amount of power extracted from the wind. This way, the maximum output of the E-138 EP3 can be accurately limited to nominal power, even at short notice. By pitching the rotor blades into the feathered position, the rotor is stopped without any strain on the drive train caused by the application of a mechanical brake.

Indirect grid connection

The power produced by the annular generator is fed into the distribution or transport grid via the ENERCON grid feed system. The ENERCON grid feed system, which consists of modular rectifier and inverter systems with a common DC link each, ensures maximum energy yield with excellent power quality. The electrical properties of the annular generator are therefore irrelevant to the behaviour of the wind energy converter in the distribution or transport grid. Rotational speed, excitation, output voltage and output frequency of the annular generator may vary depending on the wind speed. This way, the energy contained in the wind can be optimally exploited even in the partial load range.

3 E-138 EP3 components

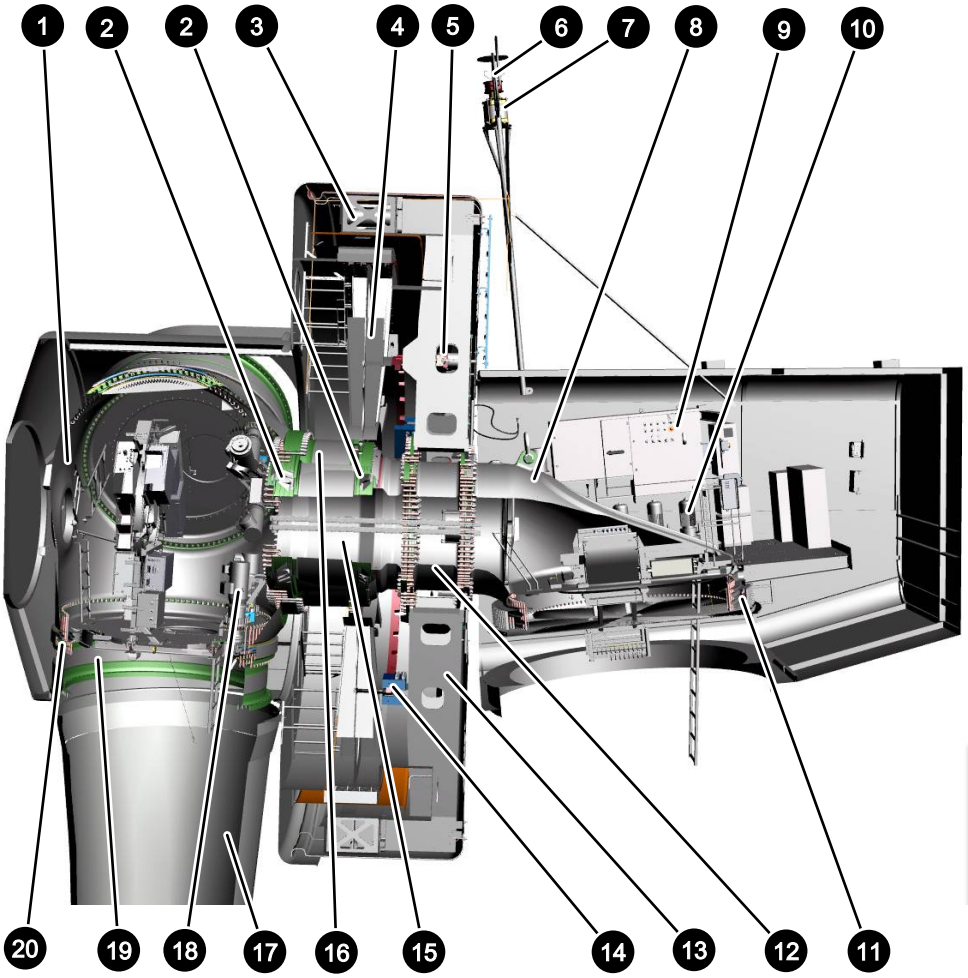


Fig. 2: Sectional view of nacelle

1	Hub	2	Rotor bearing
3	Generator stator	4	Generator rotor
5	Rotor lock	6	Wind measuring unit with lightning rods
7	Beacon system (optional)	8	Main carrier
9	Nacelle control cabinet	10	Yaw drive
11	Yaw bearing	12	Stator support star
13	Support	14	Rotor brake
15	Axle pin	16	Rotor support
17	Rotor blade	18	Pitch drives
19	Blade adapter	20	Blade flange bearing

3.1 Rotor blades

The rotor blades made of glass-fibre reinforced plastic (GRP; glass fibre and epoxy resin), balsa wood and foam have a major influence on the yield from the wind energy converter and its noise emission. The rotor blade is manufactured using half shells by the vacuum infusion method. The shape and profile of the E-138 EP3 rotor blades were designed with the following criteria in mind:

- High power coefficient
- Long service life
- Low noise emissions
- Low mechanical strain
- Efficient use of material

The rotor blades of the E-138 EP3 were specially designed to operate with variable pitch control and at variable speeds. The polyurethane-based surface coating protects the rotor blades from environmental effects such as UV radiation and erosion. This coating is visco-hard and highly resistant to abrasion.

Microprocessor-controlled pitch units adjust each of the 3 rotor blades independently of each another. 2 blade angle measurements in each rotor blade constantly monitor the set blade angle and ensure blade angle synchronisation across all 3 blades. This enables quick and precise setting of the blade angles according to the prevailing wind conditions.

Optionally, and in some cases as standard, the rotor blades have a serrated profile on part of the trailing edge. This trailing edge serration reduces the turbulence on the trailing edge and thus lowers the noise emission from the wind energy converter.

Vortex generators are mounted on the inside of the rotor blades on the suction face. The vortex generators delay the breakaway of the boundary layer flow from the rotor blade surface. Thus the aerodynamic properties of the WEC are less sensitive to temporary surface changes and wind conditions. The power of the WEC increases and the noise emissions decrease.

3.2 Nacelle

The hub rotates on the fixed axle pin on 2 hub bearings. Among other components, the rotor blades and the generator rotor are attached to the hub. The slip ring unit is located at the tip of the axle pin. It transmits electrical energy and data between the stationary and the rotating parts of the nacelle via sliding contacts.
The stator support with i6 supports is the load-bearing element of the fixed generator stator. The stator support star connects the stator support to the main carrier. The stator ring is mounted on the ends of the supports with aluminium windings, in which the electric current is induced.
The main carrier is the central load-bearing element of the nacelle. All rotor and generator components are attached to it either directly or indirectly. The main carrier rotates on the tower head by means of the yaw bearing. The entire nacelle can be rotated by the yaw drives, so that the rotor is always optimally aligned with the wind.
The nacelle casing consists of glass-fibre reinforced plastic (GRP). It is composed of multiple sections and attached to the generator stator, the nacelle floor and the hub (in the rotor area) by means of steel profiles.

3.2.1 Annular generator

ENERCON wind energy converters are equipped with a multi-polar, separately excited synchronous generator (annular generator). The WEC operates at variable speeds so as to optimally utilise the wind energy potential. The annular generator therefore produces alternating current with varying voltage, frequency and amplitude.

The windings in the stator of the annular generator form several three-phase alternating current systems that are independent of each other. These systems are rectified independently of each other in the tower base. The inverters then reconvert them into three-phase current whose voltage, frequency, and phase position conform to the grid.

Consequently, the annular generator is not directly connected to the receiving power grid of the utility company; instead, it is completely decoupled from the grid by the full-scale converter.

3.3 Tower

The tower of the E-138 EP3 wind energy converter is a hybrid tower assembled from precast concrete segments and a steel section, or a tubular steel tower.
All towers are painted and coated with weather and corrosion protection at the factory. This means that no work is required in this regard after assembly except for repairing defects or any transport damage. By default, the paintwork on the bottom of the tower has a graded colour scheme (can be omitted if desired).

Each tubular steel tower is a sheet steel tube that consists of few large sections. Depending on the tower variant, sections may be single-piece or subdivided into multiple longitudinal elements. First, the longitudinal elements are joined to form sections at the installation site. Flanges with drill holes for installation are welded to the ends of the sections. The tower sections are stacked on top of each other and bolted together at the installation site. They are linked to the foundation by means of a foundation basket.

The hybrid tower is assembled from the precast concrete elements at the installation site. As a rule, segments are dry-stacked; however, a compensatory grout layer can be applied. Vertical joints are bolted. As a final step, the top steel section is placed on the tower and bolted.

Hybrid towers are prestressed vertically by means of prestressing steel tendons. The prestressing tendons run vertically either through ducts in the concrete elements or externally along the interior tower wall. They are anchored to the foundation.

For technical and economic reasons, the slender top part of the hybrid tower is made of steel. It is not possible, for example, to install the yaw bearing directly on the concrete elements and the considerably thinner wall of the steel section provides for more space in the tower interior.

4 Grid Management System

The annular generator is coupled to the grid through the ENERCON grid feed system. This system essentially consists of a modular rectifier and inverter system with a common DC link each.

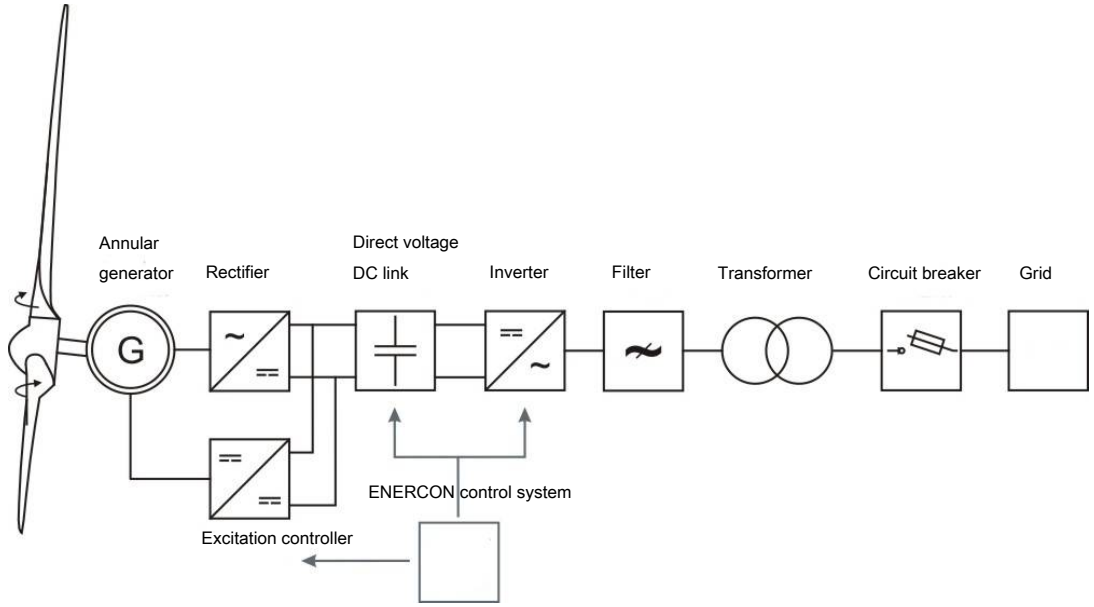


Fig. 3: Simplified electric diagram of an ENERCON WEC

The grid feed system, generator excitation and pitch control are all managed by the control system to achieve maximum energy yield and excellent power quality.

Decoupling the annular generator from the grid provides for optimum power transmission. Sudden changes in the wind speed are translated into controlled change in fed-in power on the grid side. Conversely, possible grid faults have virtually no effect on WEC mechanics. The power injected by the E-138 EP3 can be precisely regulated from 0 kW to 3500 kW.

In general, the features required for a specific wind energy converter or wind farm to be connected to the receiving power grid are predefined by the operator of that grid. To be able to meet different requirements, ENERCON wind energy converters are available with different configurations.

The inverter system in the tower base is dimensioned according to the particular base configuration. As a rule, a transformer inside or near the wind energy converter converts 630 V low voltage to the desired medium voltage.

Reactive power

If necessary, an E-138 EP3 equipped with standard FACTS (Flexible AC Transmission System) control can supply reactive power in order to contribute to reactive power balance and to maintaining voltage levels in the grid. The maximum reactive power range is available at an output as low as 10 % of the nominal active power. The maximum reactive power range varies, depending on the WEC configuration.

FT configuration

By default, the E-138 EP3 comes equipped with FACTS technology that meets the stringent requirements of specific grid codes. It is able to ride through grid faults (undervoltage, overvoltage, automatic reclosing, etc.) of up to 5 seconds (FT = FACTS + FRT [Fault Ride Through]) and to remain connected to the grid during these faults.

If the voltage measured at the reference point exceeds a defined limit value, the ENERCON wind energy converter changes from normal operation to a specific fault operating mode.

Once the fault has been cleared, the wind energy converter returns to normal operation and feeds the available power into the grid. If the voltage does not return to the operating range admissible for normal operation within an adjustable time frame (5 seconds max.), the wind energy converter is disconnected from the grid.

While the system is riding through a grid fault, various fault modes using different grid feed strategies are available, including feeding in additional reactive current in the event of a fault. The control strategies include different options for setting fault types.

Selection of a suitable control strategy depends on specific grid code and project requirements that must be confirmed by the particular grid operator.

FTS configuration

FACTS Transmission (FRT) with STATCOM option

Same as FT configuration; however, the STATCOM (**Stat**ic **Com**pensator) option additionally enables the wind energy converter to output and absorb reactive power regardless of whether it generates and feeds active power into the grid. It is thus able to actively support the power grid at any time, similar to a power plant. Whether or not this configuration can be used needs to be determined for each individual project.

FTQ configuration

FACTS Transmission (FRT) with Q+ option

The FTQ configuration comprises all features of the FT configuration. In addition, it has an extended reactive power range.

FTQS configuration

FACTS Transmission (FRT) with Q+ and STATCOM options

The FTQS configuration comprises all features of the FTQ and FTS configurations.

Frequency protection

ENERCON wind energy converters can be used in grids with a nominal frequency of 50 Hz or 60 Hz.

The range of operation of the E-138 EP3 is defined by a lower and upper frequency limit value. Overfrequency and underfrequency events at the WEC reference point trigger frequency protection and cause the WEC to shut down after the maximum delay time of 60 seconds has elapsed.

Power-frequency control

If temporary overfrequency occurs as a result of a grid fault, ENERCON wind energy converters can reduce their power feed dynamically to contribute to restoring the balance between the generating and transmission networks.
As a pre-emptive measure, the active power feed of ENERCON wind energy converters

can be limited during normal operation. During an underfrequency event, the power reserved by this limitation is made available to stabilise the frequency. The characteristics of this control system can be easily adapted to different specifications.

5 Safety system

The E-138 EP3 comes with a large number of safety features whose purpose is to permanently keep the wind energy converter inside a safe operating range. In addition to components that ensure safe stopping of the wind energy converter, these include a complex sensor system. It continuously captures all relevant operating states of the wind energy converter and makes the relevant information available through the ENERCON SCADA remote monitoring system.

If any safety-relevant operating parameters are out of the permitted range, the wind energy converter continues running at limited power, or is stopped.

5.1 Safety equipment

Emergency stop button

In an ENERCON wind energy converter there are emergency stop buttons in the vicinity of the tower door, on the control cabinet in the tower base, on the nacelle control cabinet and, if required, on further levels of the E-module. Actuating an emergency stop button in the tower base activates emergency pitching of the rotor blades. This brakes the rotor aerodynamically. Actuating an emergency stop button in the nacelle activates the rotor brake in addition to emergency pitching. This stops the rotor as quickly as possible. An emergency stop does not de-energise or only partly de-energises the wind energy converter.

The following are still supplied with power:

- Rotor brake
- Beacon system components
- Lighting
- Sockets

Main switch

In an ENERCON wind energy converter, main switches are installed at the WEC main distribution system (tower base) and at the nacelle control cabinet. When actuated, they de-energise virtually the entire wind energy converter.

The following are still supplied with power:

- Beacon system components
- Service hoist
- Sockets
- Lighting
- Medium-voltage area

5.2 Sensor system

A large number of sensors continuously monitor the current status of the wind energy converter and the relevant ambient parameters (e.g. rotor speed, temperature, blade load, etc.). The control system analyses the signals and regulates the wind energy converter such that the wind energy available at any given time is always optimally exploited and at the same time operating safety is ensured.

Redundant sensors

To be able to check plausibility by comparing the reported values, redundant sensors are installed for some operating states. This applies to temperature measurement in the generator, wind speed measurement or measuring the current rotor blade angle. Defective sensors are reliably detected and can be repaired or replaced by activating spare sensors. This way, the wind energy converter can safely continue its operation without having to replace major components.

Sensor checks

Proper functioning of all sensors is either regularly checked by the WEC control system itself during normal WEC operation or, where this is not possible, in the course of WEC maintenance work.

Speed monitoring

The control system of the ENERCON wind energy converter regulates the rotor speed by adjusting the blade angle such that the speed does not significantly exceed nominal speed even during very high winds. However, pitch control may not be able to react quickly enough to sudden events such as strong gusts of wind or a sudden drop of the generator load. If nominal speed is exceeded by more than 15 %, the control system stops the rotor. After 3 minutes the wind energy converter automatically attempts to restart. If this fault occurs more than 5 times within a 24 hour period, a defect is assumed. There are no further restart attempts.

In addition to the electronic monitoring system there are 3 electromechanical overspeed switches in the rotor head. They are spaced evenly along the circumference of the rotor. Each of these switches can stop the wind energy converter by means of emergency pitching. The switches respond if the rotor speed exceeds the nominal speed by more than 25 %. To enable the wind energy converter to restart, the overspeed switches must be reset manually after the cause of the overspeed has been identified and eliminated.

Air gap monitoring

Microswitches distributed along the rotor circumference monitor the width of the air gap between the rotor and the stator of the annular generator. If any of the switches are triggered because the distance has dropped below the minimum distance, the wind energy converter stops and restarts automatically after a brief delay.

If the fault recurs within 24 hours, the wind energy converter remains stopped until the cause has been eliminated.

Oscillation monitoring

Oscillation monitoring detects excessive oscillation or excursion of the wind energy converter tower top. Sensors detect the acceleration of the nacelle along the direction of the hub axis (longitudinal oscillation) and perpendicular to this axis (transverse oscillation). The control system uses this input to calculate the tower excursion compared to its idle position.
In addition, excessive vibrations and shocks such as those that may occur e.g. in the event of a fault in the rectifier are detected by an integrated oscillation monitoring function. If the oscillations or excursion exceed the permissible limit, the wind energy converter stops. It restarts automatically after a short delay. If non-permissible vibrations are detected or if non-permissible tower oscillations occur repeatedly, the wind energy converter stops and does not make any further restart attempts.

Temperature monitoring

Some components in ENERCON wind energy converters are cooled. For this purpose, temperature sensors continuously measure the temperature of the components of the wind energy converter that need to be protected from excessive heat.

In the event of excessive temperatures, the power output of the wind energy converter is reduced. If necessary, the wind energy converter stops. The wind energy converter cools down and generally restarts automatically as soon as the temperature falls below a predefined limit.

Some measuring points are equipped with additional overtemperature switches. These also initiate a stop of the wind energy converter once the temperature exceeds a specific limit, in certain cases without an automatic restart after cooling down.

At low temperatures, some assemblies such as the hazard beacon energy storage and the generator are heated in order to keep them operational.

Nacelle-internal noise monitoring

Sensors located in the rotor head respond to loud knocking sounds such as might be caused by loose or defective components. If any of these sensors detect noise and there is nothing to indicate a different cause, the wind energy converter stops.

In order to rule out exterior causes for the noise (mainly the impact of hail during a thunderstorm), the signals from all wind energy converters in a wind farm are matched against each other. For stand-alone WECs, an additional noise sensor in the machine house is used. If the sensors in multiple WECs or the noise sensor in the machine house detect noise simultaneously, an exterior cause is assumed. The noise sensors are deactivated briefly so that none of the wind energy converters in the wind farm stop.

Cable twist monitoring

If the nacelle of the wind energy converter has turned around its own axis more than 3 times and twisted the cables running down inside the tower, the WEC control system uses the next opportunity to automatically untwist the cables.

The cable twist monitoring feature is equipped with sensors that cut the power supply to the yaw motors if the permitted adjusting range is exceeded.

6 Control system

The E-138 EP3 control system is based on a microprocessor system developed by ENERCON and uses sensors to query all WEC components and collect data such as wind direction and wind speed. Using this information, it adjusts the operating mode of the E-138 EP3 accordingly. The WEC display of the control cabinet in the tower base shows the current status of the wind energy converter and any fault that may have occurred.

6.1 Yaw system

The yaw bearing with an externally geared rim is mounted on top of the tower. The yaw bearing allows the nacelle to rotate, thus providing for yaw control.

If the difference between the wind direction and the rotor axis direction exceeds the maximum permissible value, the yaw drives are activated and adjust the nacelle position according to the wind direction. The yaw motor control system ensures smooth starting and stopping of the yawing motion. The WEC control system monitors the yaw system. If it detects any irregularities it deactivates yaw control and stops the wind energy converter.

6.2 Pitch control

Functional principle

The pitch system modifies the angle of attack, that is the angle at which the air flow meets the blade profile. Changes to the blade angle change the lift at the rotor blade and thus the force with which the rotor blade turns the rotor.

During normal operation (automatic mode) the blade angle is adjusted in a way that ensures optimal exploitation of the energy contained in the wind while avoiding overload of the wind energy converter. Wherever possible, boundary conditions such as noise optimisation are also fulfilled in the process. In addition, blade angle adjustment is used to decelerate the rotor aerodynamically.

If the wind energy converter achieves nominal power output and the wind speed continues to increase, the pitch system turns the rotor blades just far enough out of the wind to keep the rotor speed and the amount of energy extracted from the wind and to be converted by the generator, within or just slightly above the nominal limits.

Design

Each rotor blade is fitted with a pitch unit. The pitch unit consists of a pitch control box, a blade relay box, tow pitch motors and a capacitor unit. The pitch control box and the blade relay box control the pitch motors. The capacitor unit stores the energy required for emergency pitching; during WEC operation, it is kept charged and tested continually.

Blade angle

Special rotor blade positions (blade angles) of the E-138 EP3:

A: 0° Normal position during partial load operation: maximum exploitation of available wind.

B: ≥60° Idle mode (wind energy converter does not feed any power into the grid because the wind speed is too low): Depending on the wind speed, the rotor spins at low speed or stands still (if there is no wind at all).

C: 92° Feathered position (rotor has been stopped manually or automatically): The rotor blades do not generate any lift even in the presence of wind; the rotor stands still or moves very slowly.

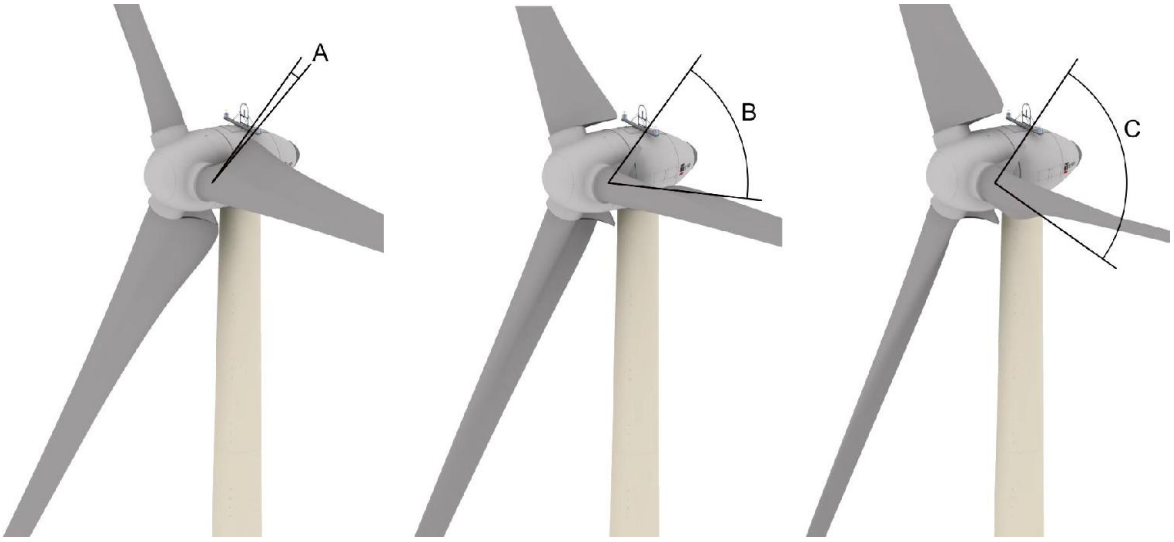


Fig. 4: Special blade positions

6.3 WEC start

6.3.1 Start lead-up

As long as the main status is > 0, the wind energy converter remains stopped. As soon as the main status changes to 0, the wind energy converter is ready and the start-up procedure is initiated. If certain boundary conditions for start-up, e.g. charging of the capacitor units of the emergency pitching capacitor units, have not yet been fulfilled, status `0:3 - Start lead-up` is displayed.

During start lead-up, a wind measurement and alignment phase of 150 seconds begins.

6.3.2 Wind measurement and nacelle alignment

After completing start lead-up, status `0:2 - Turbine operational` is displayed.

If the control system is in automatic mode, the average wind speed is above 1.8 m/s and the wind direction deviation is sufficient for yawing, the wind energy converter starts alignment with the prevailing wind direction. 60 seconds after completing start lead-up the wind energy converter goes into idle mode. The rotor blades are slowly pitched in while a check is performed on the emergency pitching capacitor units.

If the wind energy converter is equipped with load control sensors, the rotor blades stop at an angle of 70° and adjust the load measurement points, which may take several minutes. During this time, status `0:5 - Calibration of load control` is displayed.

If the mean wind speed during the wind measurement and alignment phase of 150 seconds is above the current cut-in wind speed (about 2.0 m/s), the start-up procedure is initiated (status `0:1`). Otherwise, the wind energy converter remains in idle mode (status `2:1 - Lack of wind : Wind speed too low`).

Power consumption

As the wind energy converter is not generating any active power at that moment, the electrical energy consumed by the wind energy converter is taken from the grid.

6.3.3 Generator excitation

Once the rotor reaches a certain rotational speed that depends on the wind turbine type, generator excitation is initiated. The electricity required for this purpose is temporarily taken from the grid. Once the generator reaches a sufficient speed the wind energy converter supplies itself with power. The electricity for self-excitation is then taken from the DC link; the energy taken from the grid is reduced to zero.

6.3.4 Power feed

As soon as the DC link voltage is sufficient and the excitation controller is no longer connected to the grid, power feed is initiated. After the rotational speed has increased due to sufficient wind and with a power setpoint $P_{set} > 0$, the line contactors on the low-voltage side are closed and the E-138 EP3 starts feeding power into the grid at approx. 5 rpm.

Power control regulates the excitation current so that power is fed according to the required power curve.

The power increase gradient (dP/dt) after a grid fault or a regular start-up can be defined in the control system within a certain range. For more detailed information, see the *Grid Performance* data sheet for the particular ENERCON wind energy converter type.

6.4 Operating modes

After completion of the E-138 EP3 start-up procedure the wind energy converter switches to automatic mode (normal operation). While in operation, the wind energy converter constantly monitors wind conditions, optimises rotor speed, generator excitation and generator power output, aligns the nacelle position with the wind direction, and records all sensor statuses.

In order to optimise power generation under highly diverse wind conditions when in automatic mode, the wind energy converter changes between 3 operating modes, depending on the wind speed. In certain circumstances the wind energy converter stops if provided for by the configuration of the wind energy converter (e.g. shadow casting). In addition, the utility company into whose grid the generated power is being fed can be given the option to directly intervene in the operation of the wind energy converter by remote control, e.g. for temporary reduction of the power feed.

The E-138 EP3 switches between the following operating modes:

- Full load operation
- Partial load operation
- Idle mode

6.4.1 Full load operation

Wind speed
v ≥ 13 m/s

At wind speeds at and above the rated wind speed, the wind energy converter uses pitch control to maintain the rotor speed at the setpoint (approx. 10.8 rpm), thereby limiting the power to its nominal value of 3500 kW.

Storm control enabled (normal case)

Storm control enables WEC operation even at very high wind speeds; however, the rotor speed and the power output are reduced.

If wind speeds exceed approx. 22 m/s (12-second mean) and keep increasing, the rotational speed will be reduced linearly from 10.8 rpm to idle speed at about 28 m/s by pitching the rotor blades out of the wind accordingly. The power fed into the grid decreases in accordance with the speed/power curve in the process.

At wind speeds above 28 m/s (10-minute mean) the rotor blades are almost in the feathered position. The WEC runs in idle mode and without any power output; it does, however, remain connected to the receiving grid. Once the wind speed falls below 28 m/s, the WEC restarts its power feed.

Storm control is enabled by default and can only be deactivated by remote control or on site by ENERCON Service.

6.4.2 Partial load operation

Wind speed
2.5 m/s ≤ v < 13 m/s

During partial load operation (i.e., the wind speed is between the cut-in wind speed and the rated wind speed) the maximum possible power is extracted from the wind. Rotor speed and power output are determined by the current wind speed. Pitch control already starts as the WEC approaches full load operation so as to achieve a smooth transition.

6.4.3 Idle mode

Wind speed
v < 2.5 m/s

At wind speeds below 2.5 m/s no power can be fed into the grid. The wind energy converter runs in idle mode, i.e., the rotor blades are turned almost completely out of the wind (blade angle ≥ 60°) and the rotor turns slowly or stops completely if there is no wind at all.

Slow movement (idling) puts less strain on the rotor bearings than longer periods of complete standstill; in addition, the WEC can resume power generation and power feed more quickly as soon as the wind picks up.

6.5 Safe stopping of the wind energy converter

The ENERCON wind energy converter can be stopped by manual intervention or automatically by the control system.

The causes are divided into groups by risk.

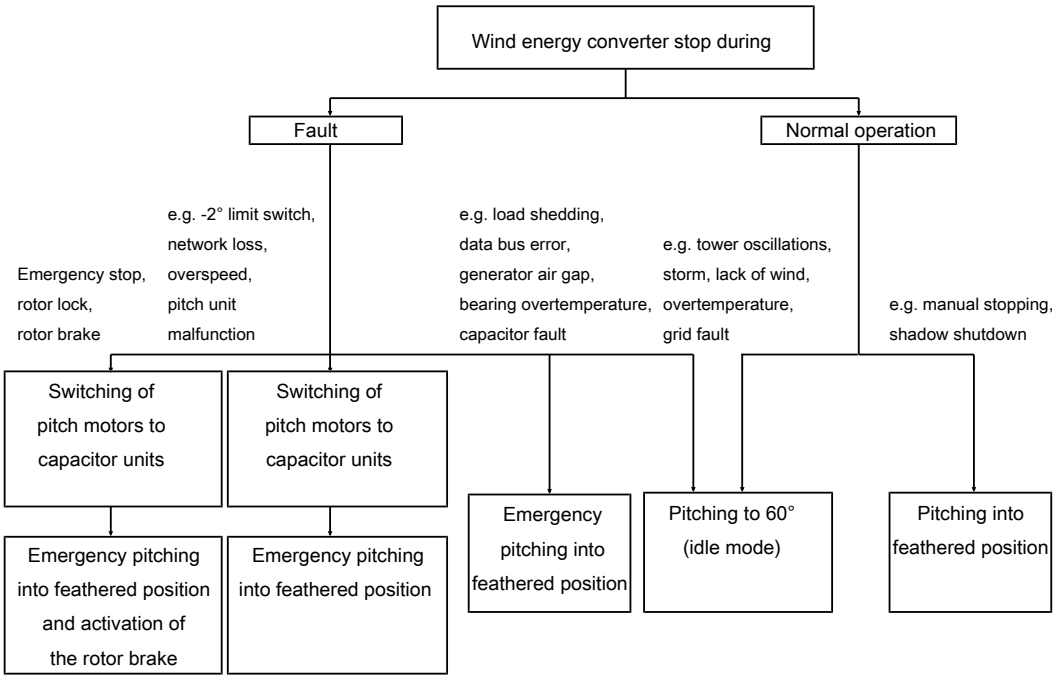


Fig. 5: Overview of shutdown procedures

Stopping the wind energy converter by means of pitch control

In the event of a fault that is not safety-relevant, the wind energy converter control system pitches the rotor blades out of the wind, causing the rotor blades not to generate any lift and bringing the wind energy converter to a safe stop.

Emergency pitching

The pitch unit's energy storage system provides the energy required for emergency pitching. During operation of the wind energy converter, it is kept charged and continually tested. For emergency pitching, the drive units are supplied with power from the corresponding energy storage. The rotor blades move automatically and independently of each other into a position in which they do not generate any lift; this is called the feathered position.

Since the 3 pitch units are interconnected but also operate independently of each other, if one component fails, the remaining pitch units can still function and stop the rotor.

Emergency braking

If an emergency stop button is pressed in the nacelle, or if the rotor lock is actuated while the rotor is turning, the control system initiates an emergency braking procedure.

In this case, the rotor brake is applied in addition to emergency pitching of the rotor blades. The rotor decelerates from nominal speed to a standstill within 10 to 15 seconds.

7 Remote monitoring

By default, all ENERCON wind energy converters are equipped with the ENERCON SCADA (Supervisory Control And Data Acquisition) system that connects them to Technical Service Dispatch. Technical Service Dispatch can retrieve each wind energy converter's operating data at any time and instantly respond to any irregularities or malfunctions.

The ENERCON SCADA system also transmits all status messages to Technical Service Dispatch, where they are permanently stored. This ensures that the practical experience gained through the long-term operation of ENERCON wind energy converters is taken into account for their continued development.

Connection of the individual wind energy converters is through a dedicated personal computer (ENERCON SCADA Server), which is typically located in the transmission substation or in the associated substation. There is one ENERCON SCADA Server in every wind farm.

The ENERCON SCADA system, its properties and its operation are described in separate documentation.

At the operator/owner's request, monitoring of the wind energy converters can be performed by a third party.

8 Maintenance

In order to ensure optimum and safe long-term operation of the wind energy converter, maintenance is required at regular intervals.

ENERCON wind energy converters are regularly serviced at least once a year, depending on requirements.
During maintenance, all safety-relevant components and features are inspected, e.g. pitch control, yaw control, safety systems, lightning protection system, anchorage points, and safety ladders. The bolt connections are checked on load-bearing joints (main components). All other components are visually inspected to check for any irregularities or damage. Lubrication systems are refilled.
Maintenance intervals may deviate, depending on regional regulations and standards.

9 Technical specifications – E-138 EP3

General	
Manufacturer	ENERCON GmbH Dreekamp 5 26605 Aurich Germany
Type designation	E-138 EP3
Nominal power	3500 kW
Hub heights	81 m, 111 m, 131 m, 160 m
Rotor diameter	138.6 m
IEC wind class (ed. 3)	IIIA
Extreme wind speed at hub height (10-minute mean)	37.5 m/s
	Corresponds to a load equivalent of approx. 52.5 m/s (3-second gust)
Annual average wind speed at hub height	7.5 m/s

Rotor with pitch control	
Type	Upwind rotor with active pitch control
Rotational direction	Clockwise
Number of rotor blades	3
Rotor blade length	66.89 m
Swept area	15085 m^2
Rotor blade material	GRP/epoxy resin/balsa wood/foam
Lowest power feed speed to nominal speed	4.4 to 10.5 rpm (81 m and 131 m (hybrid tower) hub height); 5 to 10.5 rpm (111 m, 131 m (steel tower) and 160 m hub height)
Speed setpoint	10.8 rpm
Tip speed at speed setpoint	Up to 78.38 m/s
Power reduction wind speed	22 to 28 m/s (with ENERCON storm control)
Conical angle	2.5°
Rotor axis angle	7°
Pitch control	One independent electrical pitch system per rotor blade with dedicated emergency power supply

Drive train with generator	
Wind energy converter concept	Gearless; variable speed; full-scale converter
Hub	Rigid

Drive train with generator	
Bearing	2 tapered roller bearings
Generator	Direct-drive ENERCON annular generator
Grid feed	ENERCON inverters with high clock speed and sinusoidal current
IP Code/insulation class	At least IP 23/F

Brake system	
Aerodynamic brake	Three independent pitch systems with emergency power supply
Rotor brake	Hydraulic
Rotor lock	Latching every 10°

Yaw system	
Type	Electrical with yaw motors
Control	Active via yaw gears

Control system	
Type	Microprocessor
Grid feed	ENERCON inverter
Remote monitoring system	ENERCON SCADA
Uninterruptible power supply (UPS)	Integrated

Tower types			
Hub height	Total height	Type	Wind class
81 m	150 m	Tubular steel tower	IEC IIIA[1] DIBt WZ2 GK II[2]
111 m	180 m	Tubular steel tower	IEC IIIA[1] DIBt WZ2 GK II[2]
131 m	200 m	Tubular steel tower	IEC IIIA[1] DIBt WZ2 GK II[2]
131 m	200 m	Hybrid tower	IEC IIIA[1] DIBt WZ2 GK II[2]
160 m	230 m	Hybrid tower	IEC IIIA[1] DIBt WZ2 GK II[2]

[1]Edition 3
[2]Edition 2012

Projekt:

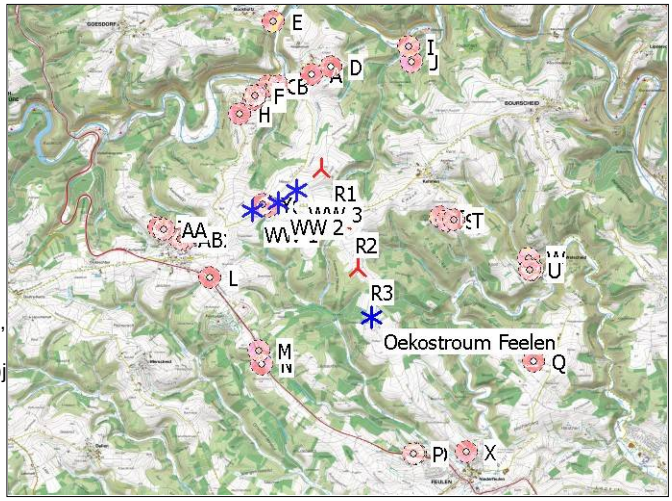
Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Hauptergebnis

Berechnung: Schall Repowering

Schallberechnungs-Modell:
ISO 9613-2 Allgemein
Windgeschwindigkeit:
6,0 m/s
Bodeneffekt:
Keiner
Meteorlogischer Koeffizient, C0:
0,0 dB
Art der Anforderung in der Berechnung:
1: WEA-Geräusch vs. Schallrichtwert (DK, DE, SE, NL etc.)
Schallleistungspegel in der Berechnung:
Schallwerte sind Lwa-Werte (Mittlere Schallleistungspegel; Standard)
Einzeltöne:
Fester Zuschlag wird zu Schallemission von WEA mit Einzeltönen zugefügt: 0,
Aufpunkthöhe ü.Gr.:
1,5 m Aufpunkthöhe im Modell hat Vorrang vor Angabe im Immissionsort-Obj
verlangte Unter- (negativ) oder zulässige Überschreitung (positiv) des Schallrichtwerts:
0,0 dB(A)



Maßstab 1:125.000

Neue WEA Existierende WEA Schall-Immissionsort

WEA

	X(Ost)	Y(Nord)	Z [m]	Beschreibung	WEA-Typ Aktuell	Hersteller	Typ	Nenn-leistung [kW]	Rotor-durchmesser [m]	Nabenhöhe [m]	Schallwerte Quelle	Name	Windgesch-windigkeit [m/s]	Status	LWA [dB(A)]	Einzelton
1	68.779	107.340	495,3	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	6,0	Anwenderwert	105,7	Nein
2	69.123	106.471	500,9	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	6,0	Anwenderwert	105,7	Nein
3	69.381	105.702	485,0	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	6,0	Anwenderwert	105,7	Nein
4	67.636	106.654	505,0	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	6,0	Anwenderwert	97,0	Nein
5	68.062	106.779	507,1	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	6,0	Anwenderwert	97,0	Nein
6	68.364	106.989	509,1	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	6,0	Anwenderwert	97,0	Nein
7	69.610	104.889	475,0	Siemens SWT-3.0-11...	Ja	Siemens	SWT-3.0-113 -LJ-3.000	3.000	113,0	127,5	USER	Level 0 - Calculated - Std. 105.5dB - 04-2016	6,0	Anwenderwert	105,0	Nein

Berechnungsergebnisse

Beurteilungspegel

Schall-Immissionsort Nr.	Name	X(Ost)	Y(Nord)	Z [m]	Aufpunkthöhe [m]	Anforderung Schall [dB(A)]	Beurteilungspegel Von WEA [dB(A)]	Distanz z.Richtwert [m]	Anforderung erfüllt? Schall
A	Schall-Immissionsort: Benutzerdefiniert (52)	68.619	108.900	386,8	1,5	37,0	32,7	568	Ja
B	Schall-Immissionsort: Benutzerdefiniert (53)	68.060	108.706	267,7	1,5	37,0	32,9	530	Ja
C	Schall-Immissionsort: Benutzerdefiniert (54)	67.906	108.706	273,0	1,5	37,0	32,4	605	Ja
D	Schall-Immissionsort: Benutzerdefiniert (55)	68.928	109.015	415,1	1,5	37,0	32,0	680	Ja
E	Schall-Immissionsort: Benutzerdefiniert (56)	67.988	109.767	299,9	1,5	37,0	27,3	1.543	Ja
F	Schall-Immissionsort: Benutzerdefiniert (57)	67.688	108.548	313,8	1,5	37,0	32,6	603	Ja
G	Schall-Immissionsort: Benutzerdefiniert (58)	67.669	108.472	324,7	1,5	37,0	33,0	553	Ja
H	Schall-Immissionsort: Benutzerdefiniert (59)	67.421	108.244	374,1	1,5	37,0	33,1	551	Ja
I	Schall-Immissionsort: Benutzerdefiniert (60)	70.218	109.350	268,6	1,5	37,0	28,0	1.440	Ja
J	Schall-Immissionsort: Benutzerdefiniert (61)	70.262	109.103	316,6	1,5	37,0	29,0	1.268	Ja
K	Schall-Immissionsort: Benutzerdefiniert (62)	67.901	106.724	509,3	1,5	39,0	46,0	-566	Nein
L	Schall-Immissionsort: Benutzerdefiniert (63)	66.937	105.535	504,1	1,5	39,0	32,2	914	Ja
M	Schall-Immissionsort: Benutzerdefiniert (65)	67.744	104.340	467,8	1,5	39,0	32,2	1.062	Ja
N	Schall-Immissionsort: Benutzerdefiniert (66)	67.798	104.116	455,0	1,5	39,0	31,6	1.128	Ja
O	Schall-Immissionsort: Benutzerdefiniert (67)	70.339	102.643	332,0	1,5	39,0	27,4	1.622	Ja
P	Schall-Immissionsort: Benutzerdefiniert (68)	70.300	102.636	333,9	1,5	39,0	27,5	1.617	Ja
Q	Schall-Immissionsort: Benutzerdefiniert (69)	72.288	104.161	368,5	1,5	37,0	26,3	1.801	Ja
R	Schall-Immissionsort: Benutzerdefiniert (70)	70.745	106.539	460,4	1,5	37,0	35,2	276	Ja
S	Schall-Immissionsort: Benutzerdefiniert (71)	70.857	106.476	447,0	1,5	37,0	34,7	367	Ja
T	Schall-Immissionsort: Benutzerdefiniert (72)	70.974	106.492	441,5	1,5	37,0	34,0	484	Ja
U	Schall-Immissionsort: Benutzerdefiniert (73)	72.221	105.673	306,1	1,5	37,0	28,1	1.590	Ja
V	Schall-Immissionsort: Benutzerdefiniert (74)	72.263	105.663	304,5	1,5	37,0	27,9	1.631	Ja
W	Schall-Immissionsort: Benutzerdefiniert (75)	72.209	105.856	286,0	1,5	37,0	28,1	1.585	Ja
X	Schall-Immissionsort: Benutzerdefiniert (76)	71.167	102.663	333,2	1,5	39,0	25,8	1.974	Ja
Y	Schall-Immissionsort: Benutzerdefiniert (77)	67.807	106.741	510,0	1,5	39,0	45,5	-487	Nein
Z	Schall-Immissionsort: Benutzerdefiniert (78)	66.097	106.363	479,0	1,5	37,0	29,3	1.047	Ja
AA	Schall-Immissionsort: Benutzerdefiniert (79)	66.171	106.329	476,2	1,5	37,0	29,7	982	Ja
AB	Schall-Immissionsort: Benutzerdefiniert (80)	66.438	106.173	494,3	1,5	37,0	31,0	769	Ja
AC	Schall-Immissionsort: Benutzerdefiniert (81)	66.502	106.162	493,8	1,5	37,0	31,4	713	Ja

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
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DECIBEL - Hauptergebnis

Berechnung: Schall Repowering

Abstände (m)

Schall-Immissionsort	WEA 1	2	3	4	5	6	7
A	1568	2481	3288	2452	2193	1928	4132
B	1544	2475	3282	2096	1927	1744	4120
C	1622	2545	3347	2070	1934	1778	4181
D	1682	2552	3345	2692	2398	2103	4183
E	2553	3486	4297	3133	2989	2803	5141
F	1627	2524	3311	1894	1808	1699	4133
G	1585	2474	3256	1818	1738	1638	4075
H	1632	2458	3210	1604	1599	1570	4006
I	2472	3080	3743	3734	3356	3002	4503
J	2304	2868	3514	3591	3200	2841	4265
K	1073	1248	1799	274	171	534	2508
L	2580	2379	2450	1320	1678	2038	2750
M	3174	2539	2130	2317	2460	2721	1946
N	3371	2703	2241	2544	2677	2929	1970
O	4950	4017	3206	4838	4722	4775	2362
P	4944	4012	3201	4822	4710	4765	2357
Q	4736	3919	3291	5279	4972	4838	2776
R	2123	1623	1600	3111	2694	2423	2002
S	2251	1734	1667	3227	2812	2546	2018
T	2354	1851	1778	3342	2927	2657	2105
U	3825	3200	2841	4690	4304	4076	2726
V	3867	3243	2883	4733	4347	4119	2764
W	3738	3147	2833	4643	4249	4009	2774
X	5252	4322	3525	5330	5156	5155	2717
Y	1142	1344	1886	192	258	610	2585
Z	2855	3028	3350	1566	2009	2352	3810
AA	2798	2956	3271	1501	1945	2291	3729
AB	2617	2702	2981	1292	1734	2092	3423
AC	2564	2640	2916	1237	1678	2038	3359

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
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20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Annahmen

Berechneter L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(Wenn mit Bodeneffekt gerechnet ist Dc = Domega)

LWA,ref:	Schalldruckpegel an WEA
K:	Einzeltöne
Dc:	Richtwirkungskorrektur
Adiv:	Dämpfung aufgrund geometrischer Ausbreitung
Aatm:	Dämpfung aufgrund von Luftabsorption
Agr:	Dämpfung aufgrund des Bodeneffekts
Abar:	Dämpfung aufgrund von Abschirmung
Amisc:	Dämpfung aufgrund verschiedener anderer Effekte
Cmet:	Meteorologische Korrektur

Berechnungsergebnisse

Schall-Immissionsort: A Schall-Immissionsort: Benutzerdefiniert (52)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.569	1.591	30,66	105,7	3,00	75,03	3,02	0,00	0,00	0,00	78,06
2	2.481	2.496	25,03	105,7	3,00	78,95	4,74	0,00	0,00	0,00	83,69
3	3.288	3.298	21,08	105,7	3,00	81,37	6,27	0,00	0,00	0,00	87,63
4	2.452	2.459	16,51	97,0	3,00	78,81	4,67	0,00	0,00	0,00	83,49
5	2.193	2.201	17,97	97,0	3,00	77,85	4,18	0,00	0,00	0,00	82,03
6	1.928	1.937	19,58	97,0	3,00	76,74	3,68	0,00	0,00	0,00	80,42
7	4.132	4.138	16,78	105,0	3,00	83,34	7,86	0,00	0,00	0,00	91,20

Summe 32,68

Schall-Immissionsort: B Schall-Immissionsort: Benutzerdefiniert (53)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.544	1.591	30,66	105,7	3,00	75,03	3,02	0,00	0,00	0,00	78,06
2	2.475	2.506	24,97	105,7	3,00	78,98	4,76	0,00	0,00	0,00	83,74
3	3.282	3.303	21,06	105,7	3,00	81,38	6,28	0,00	0,00	0,00	87,66
4	2.096	2.117	18,46	97,0	3,00	77,51	4,02	0,00	0,00	0,00	81,54
5	1.927	1.951	19,49	97,0	3,00	76,80	3,71	0,00	0,00	0,00	80,51
6	1.744	1.770	20,68	97,0	3,00	75,96	3,36	0,00	0,00	0,00	79,32
7	4.120	4.134	16,80	105,0	3,00	83,33	7,85	0,00	0,00	0,00	91,18

Summe 32,85

Schall-Immissionsort: C Schall-Immissionsort: Benutzerdefiniert (54)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.622	1.666	30,12	105,7	3,00	75,43	3,16	0,00	0,00	0,00	78,60
2	2.546	2.575	24,61	105,7	3,00	79,21	4,89	0,00	0,00	0,00	84,11
3	3.347	3.368	20,77	105,7	3,00	81,55	6,40	0,00	0,00	0,00	87,95
4	2.070	2.091	18,62	97,0	3,00	77,41	3,97	0,00	0,00	0,00	81,38
5	1.934	1.957	19,45	97,0	3,00	76,83	3,72	0,00	0,00	0,00	80,55
6	1.778	1.803	20,46	97,0	3,00	76,12	3,43	0,00	0,00	0,00	79,54
7	4.181	4.194	16,56	105,0	3,00	83,45	7,97	0,00	0,00	0,00	91,42

Summe 32,44

Schall-Immissionsort: D Schall-Immissionsort: Benutzerdefiniert (55)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.682	1.699	29,88	105,7	3,00	75,60	3,23	0,00	0,00	0,00	78,83
2	2.552	2.564	24,67	105,7	3,00	79,18	4,87	0,00	0,00	0,00	84,05

(Fortsetzung nächste Seite)...

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
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DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

...(Fortsetzung von letzter Seite)

Schall-Immissionsort: E Schall-Immissionsort: Benutzerdefiniert (56)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.553	2.577	24,60	105,7	3,00	79,22	4,90	0,00	0,00	0,00	84,12
2	3.486	3.505	20,16	105,7	3,00	81,89	6,66	0,00	0,00	0,00	88,55
3	4.297	4.311	16,83	105,7	3,00	83,69	8,19	0,00	0,00	0,00	91,88
4	3.133	3.144	13,08	97,0	3,00	80,95	5,97	0,00	0,00	0,00	86,92
5	2.989	3.001	13,75	97,0	3,00	80,55	5,70	0,00	0,00	0,00	86,25
6	2.803	2.817	14,65	97,0	3,00	79,99	5,35	0,00	0,00	0,00	85,35
7	5.141	5.150	12,96	105,0	3,00	85,24	9,78	0,00	0,00	0,00	95,02

Summe 27,27

Schall-Immissionsort: F Schall-Immissionsort: Benutzerdefiniert (57)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.627	1.662	30,14	105,7	3,00	75,41	3,16	0,00	0,00	0,00	78,57
2	2.524	2.548	24,75	105,7	3,00	79,12	4,84	0,00	0,00	0,00	83,96
3	3.311	3.328	20,95	105,7	3,00	81,44	6,32	0,00	0,00	0,00	87,77
4	1.894	1.911	19,74	97,0	3,00	76,63	3,63	0,00	0,00	0,00	80,26
5	1.808	1.826	20,30	97,0	3,00	76,23	3,47	0,00	0,00	0,00	79,70
6	1.699	1.718	21,03	97,0	3,00	75,70	3,26	0,00	0,00	0,00	78,97
7	4.133	4.143	16,76	105,0	3,00	83,35	7,87	0,00	0,00	0,00	91,22

Summe 32,63

Schall-Immissionsort: G Schall-Immissionsort: Benutzerdefiniert (58)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.585	1.619	30,45	105,7	3,00	75,19	3,08	0,00	0,00	0,00	78,26
2	2.474	2.496	25,03	105,7	3,00	78,95	4,74	0,00	0,00	0,00	83,69
3	3.257	3.272	21,20	105,7	3,00	81,30	6,22	0,00	0,00	0,00	87,51
4	1.818	1.834	20,24	97,0	3,00	76,27	3,49	0,00	0,00	0,00	79,76
5	1.738	1.755	20,78	97,0	3,00	75,89	3,33	0,00	0,00	0,00	79,22
6	1.638	1.656	21,47	97,0	3,00	75,38	3,15	0,00	0,00	0,00	78,53
7	4.075	4.085	17,00	105,0	3,00	83,22	7,76	0,00	0,00	0,00	90,98

Summe 32,96

Schall-Immissionsort: H Schall-Immissionsort: Benutzerdefiniert (59)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.632	1.655	30,19	105,7	3,00	75,38	3,15	0,00	0,00	0,00	78,52
2	2.458	2.474	25,14	105,7	3,00	78,87	4,70	0,00	0,00	0,00	83,57
3	3.210	3.221	21,43	105,7	3,00	81,16	6,12	0,00	0,00	0,00	87,28
4	1.604	1.616	21,76	97,0	3,00	75,17	3,07	0,00	0,00	0,00	78,24
5	1.599	1.611	21,80	97,0	3,00	75,14	3,06	0,00	0,00	0,00	78,20
6	1.570	1.582	22,01	97,0	3,00	74,99	3,01	0,00	0,00	0,00	77,99
7	4.006	4.013	17,29	105,0	3,00	83,07	7,62	0,00	0,00	0,00	90,69

Summe 33,06

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: I Schall-Immissionsort: Benutzerdefiniert (60)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.472	2.502	24,99	105,7	3,00	78,97	4,75	0,00	0,00	0,00	83,72
2	3.080	3.105	21,97	105,7	3,00	80,84	5,90	0,00	0,00	0,00	86,74
3	3.743	3.762	19,06	105,7	3,00	82,51	7,15	0,00	0,00	0,00	89,66
4	3.734	3.746	10,41	97,0	3,00	82,47	7,12	0,00	0,00	0,00	89,59
5	3.356	3.369	12,05	97,0	3,00	81,55	6,40	0,00	0,00	0,00	87,95
6	3.002	3.018	13,67	97,0	3,00	80,59	5,73	0,00	0,00	0,00	86,33
7	4.503	4.515	15,31	105,0	3,00	84,09	8,58	0,00	0,00	0,00	92,67

Summe 28,05

Schall-Immissionsort: J Schall-Immissionsort: Benutzerdefiniert (61)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.304	2.328	25,95	105,7	3,00	78,34	4,42	0,00	0,00	0,00	82,77
2	2.868	2.889	23,01	105,7	3,00	80,21	5,49	0,00	0,00	0,00	85,70
3	3.514	3.529	20,06	105,7	3,00	81,95	6,70	0,00	0,00	0,00	88,66
4	3.591	3.600	11,03	97,0	3,00	82,13	6,84	0,00	0,00	0,00	88,97
5	3.200	3.210	12,77	97,0	3,00	81,13	6,10	0,00	0,00	0,00	87,23
6	2.841	2.853	14,47	97,0	3,00	80,11	5,42	0,00	0,00	0,00	85,53
7	4.265	4.274	16,24	105,0	3,00	83,62	8,12	0,00	0,00	0,00	91,74

Summe 29,01

Schall-Immissionsort: K Schall-Immissionsort: Benutzerdefiniert (62)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.073	1.083	34,96	105,7	3,00	71,69	2,06	0,00	0,00	0,00	73,75
2	1.248	1.257	33,33	105,7	3,00	72,99	2,39	0,00	0,00	0,00	75,38
3	1.799	1.804	29,16	105,7	3,00	76,12	3,43	0,00	0,00	0,00	79,55
4	274	280	39,53	97,0	3,00	59,94	0,53	0,00	0,00	0,00	60,47
5	171	181	43,48	97,0	3,00	56,18	0,34	0,00	0,00	0,00	56,52
6	534	538	33,36	97,0	3,00	65,62	1,02	0,00	0,00	0,00	66,64
7	2.508	2.510	24,22	105,0	3,00	78,99	4,77	0,00	0,00	0,00	83,76

Summe 46,00

Schall-Immissionsort: L Schall-Immissionsort: Benutzerdefiniert (63)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.580	2.584	24,56	105,7	3,00	79,25	4,91	0,00	0,00	0,00	84,16
2	2.379	2.384	25,64	105,7	3,00	78,54	4,53	0,00	0,00	0,00	83,07
3	2.450	2.454	25,25	105,7	3,00	78,80	4,66	0,00	0,00	0,00	83,46
4	1.320	1.321	24,07	97,0	3,00	73,42	2,51	0,00	0,00	0,00	75,93
5	1.678	1.679	21,31	97,0	3,00	75,50	3,19	0,00	0,00	0,00	78,69
6	2.038	2.039	18,94	97,0	3,00	77,19	3,87	0,00	0,00	0,00	81,06
7	2.750	2.752	22,96	105,0	3,00	79,79	5,23	0,00	0,00	0,00	85,02

Summe 32,18

Schall-Immissionsort: M Schall-Immissionsort: Benutzerdefiniert (65)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.174	3.179	21,63	105,7	3,00	81,05	6,04	0,00	0,00	0,00	87,09
2	2.539	2.546	24,76	105,7	3,00	79,12	4,84	0,00	0,00	0,00	83,95
3	2.130	2.137	27,06	105,7	3,00	77,60	4,06	0,00	0,00	0,00	81,66
4	2.317	2.319	17,29	97,0	3,00	78,31	4,41	0,00	0,00	0,00	82,71
5	2.460	2.462	16,50	97,0	3,00	78,83	4,68	0,00	0,00	0,00	83,50
6	2.721	2.723	15,13	97,0	3,00	79,70	5,17	0,00	0,00	0,00	84,87
7	1.946	1.950	27,47	105,0	3,00	76,80	3,71	0,00	0,00	0,00	80,51

Summe 32,15

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: N Schall-Immissionsort: Benutzerdefiniert (66)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.371	3.377	20,73	105,7	3,00	81,57	6,42	0,00	0,00	0,00	87,99
2	2.703	2.711	23,90	105,7	3,00	79,66	5,15	0,00	0,00	0,00	84,81
3	2.241	2.249	26,40	105,7	3,00	78,04	4,27	0,00	0,00	0,00	82,31
4	2.544	2.546	16,04	97,0	3,00	79,12	4,84	0,00	0,00	0,00	83,96
5	2.677	2.679	15,35	97,0	3,00	79,56	5,09	0,00	0,00	0,00	84,65
6	2.929	2.931	14,09	97,0	3,00	80,34	5,57	0,00	0,00	0,00	85,91
7	1.970	1.976	27,31	105,0	3,00	76,92	3,75	0,00	0,00	0,00	80,67

Summe 31,58

Schall-Immissionsort: O Schall-Immissionsort: Benutzerdefiniert (67)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.950	4.961	14,38	105,7	3,00	84,91	9,43	0,00	0,00	0,00	94,34
2	4.017	4.031	17,95	105,7	3,00	83,11	7,66	0,00	0,00	0,00	90,77
3	3.206	3.221	21,43	105,7	3,00	81,16	6,12	0,00	0,00	0,00	87,28
4	4.838	4.843	6,09	97,0	3,00	84,70	9,20	0,00	0,00	0,00	93,91
5	4.722	4.728	6,52	97,0	3,00	84,49	8,98	0,00	0,00	0,00	93,48
6	4.775	4.781	6,33	97,0	3,00	84,59	9,08	0,00	0,00	0,00	93,67
7	2.362	2.377	24,94	105,0	3,00	78,52	4,52	0,00	0,00	0,00	83,04

Summe 27,43

Schall-Immissionsort: P Schall-Immissionsort: Benutzerdefiniert (68)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.944	4.955	14,40	105,7	3,00	84,90	9,41	0,00	0,00	0,00	94,31
2	4.012	4.025	17,97	105,7	3,00	83,10	7,65	0,00	0,00	0,00	90,74
3	3.201	3.216	21,46	105,7	3,00	81,15	6,11	0,00	0,00	0,00	87,26
4	4.822	4.827	6,15	97,0	3,00	84,67	9,17	0,00	0,00	0,00	93,85
5	4.710	4.715	6,57	97,0	3,00	84,47	8,96	0,00	0,00	0,00	93,43
6	4.765	4.771	6,36	97,0	3,00	84,57	9,06	0,00	0,00	0,00	93,64
7	2.357	2.372	24,97	105,0	3,00	78,50	4,51	0,00	0,00	0,00	83,01

Summe 27,46

Schall-Immissionsort: Q Schall-Immissionsort: Benutzerdefiniert (69)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.736	4.744	15,18	105,7	3,00	84,52	9,01	0,00	0,00	0,00	93,54
2	3.919	3.930	18,36	105,7	3,00	82,89	7,47	0,00	0,00	0,00	90,35
3	3.291	3.302	21,06	105,7	3,00	81,38	6,27	0,00	0,00	0,00	87,65
4	5.279	5.283	4,51	97,0	3,00	85,46	10,04	0,00	0,00	0,00	95,49
5	4.972	4.976	5,61	97,0	3,00	84,94	9,45	0,00	0,00	0,00	94,39
6	4.838	4.842	6,10	97,0	3,00	84,70	9,20	0,00	0,00	0,00	93,90
7	2.776	2.785	22,79	105,0	3,00	79,90	5,29	0,00	0,00	0,00	85,19

Summe 26,33

Schall-Immissionsort: R Schall-Immissionsort: Benutzerdefiniert (70)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.123	2.132	27,09	105,7	3,00	77,57	4,05	0,00	0,00	0,00	81,63
2	1.623	1.635	30,33	105,7	3,00	75,27	3,11	0,00	0,00	0,00	78,38
3	1.600	1.610	30,52	105,7	3,00	75,14	3,06	0,00	0,00	0,00	78,20
4	3.111	3.113	13,22	97,0	3,00	80,86	5,91	0,00	0,00	0,00	86,78
5	2.694	2.696	15,26	97,0	3,00	79,61	5,12	0,00	0,00	0,00	84,74
6	2.423	2.426	16,69	97,0	3,00	78,70	4,61	0,00	0,00	0,00	83,31
7	2.002	2.007	27,11	105,0	3,00	77,05	3,81	0,00	0,00	0,00	80,87

Summe 35,23

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: S Schall-Immissionsort: Benutzerdefiniert (71)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.251	2.261	26,33	105,7	3,00	78,08	4,29	0,00	0,00	0,00	82,38
2	1.734	1.747	29,55	105,7	3,00	75,85	3,32	0,00	0,00	0,00	79,17
3	1.667	1.678	30,03	105,7	3,00	75,50	3,19	0,00	0,00	0,00	78,68
4	3.226	3.229	12,68	97,0	3,00	81,18	6,13	0,00	0,00	0,00	87,32
5	2.812	2.815	14,66	97,0	3,00	79,99	5,35	0,00	0,00	0,00	85,34
6	2.546	2.549	16,03	97,0	3,00	79,13	4,84	0,00	0,00	0,00	83,97
7	2.018	2.024	27,01	105,0	3,00	77,12	3,85	0,00	0,00	0,00	80,97

Summe 34,67

Schall-Immissionsort: T Schall-Immissionsort: Benutzerdefiniert (72)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.354	2.363	25,75	105,7	3,00	78,47	4,49	0,00	0,00	0,00	82,96
2	1.851	1.864	28,76	105,7	3,00	76,41	3,54	0,00	0,00	0,00	79,95
3	1.778	1.790	29,26	105,7	3,00	76,06	3,40	0,00	0,00	0,00	79,46
4	3.342	3.345	12,16	97,0	3,00	81,49	6,36	0,00	0,00	0,00	87,84
5	2.927	2.929	14,10	97,0	3,00	80,34	5,57	0,00	0,00	0,00	85,90
6	2.657	2.661	15,45	97,0	3,00	79,50	5,06	0,00	0,00	0,00	84,55
7	2.105	2.111	26,48	105,0	3,00	77,49	4,01	0,00	0,00	0,00	81,50

Summe 33,97

Schall-Immissionsort: U Schall-Immissionsort: Benutzerdefiniert (73)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.825	3.841	18,73	105,7	3,00	82,69	7,30	0,00	0,00	0,00	89,99
2	3.200	3.219	21,44	105,7	3,00	81,15	6,12	0,00	0,00	0,00	87,27
3	2.841	2.861	23,15	105,7	3,00	80,13	5,44	0,00	0,00	0,00	85,56
4	4.690	4.697	6,64	97,0	3,00	84,44	8,92	0,00	0,00	0,00	93,36
5	4.304	4.312	8,11	97,0	3,00	83,69	8,19	0,00	0,00	0,00	91,89
6	4.076	4.085	9,02	97,0	3,00	83,22	7,76	0,00	0,00	0,00	90,98
7	2.726	2.742	23,01	105,0	3,00	79,76	5,21	0,00	0,00	0,00	84,97

Summe 28,06

Schall-Immissionsort: V Schall-Immissionsort: Benutzerdefiniert (74)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.867	3.883	18,55	105,7	3,00	82,78	7,38	0,00	0,00	0,00	90,16
2	3.243	3.262	21,25	105,7	3,00	81,27	6,20	0,00	0,00	0,00	87,47
3	2.883	2.902	22,94	105,7	3,00	80,26	5,51	0,00	0,00	0,00	85,77
4	4.733	4.740	6,48	97,0	3,00	84,52	9,01	0,00	0,00	0,00	93,52
5	4.347	4.355	7,94	97,0	3,00	83,78	8,28	0,00	0,00	0,00	92,06
6	4.119	4.128	8,84	97,0	3,00	83,31	7,84	0,00	0,00	0,00	91,16
7	2.764	2.780	22,82	105,0	3,00	79,88	5,28	0,00	0,00	0,00	85,16

Summe 27,86

Schall-Immissionsort: W Schall-Immissionsort: Benutzerdefiniert (75)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.738	3.756	19,08	105,7	3,00	82,49	7,14	0,00	0,00	0,00	89,63
2	3.147	3.169	21,67	105,7	3,00	81,02	6,02	0,00	0,00	0,00	87,04
3	2.833	2.855	23,18	105,7	3,00	80,11	5,42	0,00	0,00	0,00	85,54
4	4.643	4.652	6,81	97,0	3,00	84,35	8,84	0,00	0,00	0,00	93,19
5	4.249	4.259	8,32	97,0	3,00	83,59	8,09	0,00	0,00	0,00	91,68
6	4.009	4.019	9,28	97,0	3,00	83,08	7,64	0,00	0,00	0,00	90,72
7	2.774	2.791	22,76	105,0	3,00	79,92	5,30	0,00	0,00	0,00	85,22

Summe 28,09

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: X Schall-Immissionsort: Benutzerdefiniert (76)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	5.252	5.262	13,29	105,7	3,00	85,42	10,00	0,00	0,00	0,00	95,42
2	4.322	4.335	16,74	105,7	3,00	83,74	8,24	0,00	0,00	0,00	91,98
3	3.525	3.539	20,01	105,7	3,00	81,98	6,72	0,00	0,00	0,00	88,70
4	5.329	5.335	4,32	97,0	3,00	85,54	10,14	0,00	0,00	0,00	95,68
5	5.156	5.162	4,94	97,0	3,00	85,26	9,81	0,00	0,00	0,00	95,06
6	5.155	5.161	4,94	97,0	3,00	85,25	9,81	0,00	0,00	0,00	95,06
7	2.717	2.730	23,07	105,0	3,00	79,72	5,19	0,00	0,00	0,00	84,91

Summe 25,80

Schall-Immissionsort: Y Schall-Immissionsort: Benutzerdefiniert (77)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.142	1.151	34,31	105,7	3,00	72,22	2,19	0,00	0,00	0,00	74,41
2	1.344	1.352	32,53	105,7	3,00	73,62	2,57	0,00	0,00	0,00	76,19
3	1.886	1.891	28,59	105,7	3,00	76,53	3,59	0,00	0,00	0,00	80,13
4	192	201	42,56	97,0	3,00	57,06	0,38	0,00	0,00	0,00	57,44
5	258	265	40,04	97,0	3,00	59,46	0,50	0,00	0,00	0,00	59,96
6	610	613	32,09	97,0	3,00	66,75	1,16	0,00	0,00	0,00	67,91
7	2.585	2.587	23,81	105,0	3,00	79,26	4,92	0,00	0,00	0,00	84,17

Summe 45,47

Schall-Immissionsort: Z Schall-Immissionsort: Benutzerdefiniert (78)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.855	2.860	23,15	105,7	3,00	80,13	5,43	0,00	0,00	0,00	85,56
2	3.028	3.034	22,31	105,7	3,00	80,64	5,76	0,00	0,00	0,00	86,40
3	3.350	3.354	20,83	105,7	3,00	81,51	6,37	0,00	0,00	0,00	87,88
4	1.566	1.569	22,11	97,0	3,00	74,91	2,98	0,00	0,00	0,00	77,89
5	2.009	2.011	19,11	97,0	3,00	77,07	3,82	0,00	0,00	0,00	80,89
6	2.352	2.354	17,09	97,0	3,00	78,44	4,47	0,00	0,00	0,00	82,91
7	3.810	3.812	18,11	105,0	3,00	82,62	7,24	0,00	0,00	0,00	89,87

Summe 29,33

Schall-Immissionsort: AA Schall-Immissionsort: Benutzerdefiniert (79)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.798	2.804	23,43	105,7	3,00	79,95	5,33	0,00	0,00	0,00	85,28
2	2.956	2.962	22,65	105,7	3,00	80,43	5,63	0,00	0,00	0,00	86,06
3	3.271	3.276	21,18	105,7	3,00	81,31	6,22	0,00	0,00	0,00	87,53
4	1.501	1.504	22,60	97,0	3,00	74,55	2,86	0,00	0,00	0,00	77,40
5	1.945	1.947	19,51	97,0	3,00	76,79	3,70	0,00	0,00	0,00	80,49
6	2.291	2.293	17,44	97,0	3,00	78,21	4,36	0,00	0,00	0,00	82,56
7	3.729	3.731	18,45	105,0	3,00	82,44	7,09	0,00	0,00	0,00	89,53

Summe 29,70

Schall-Immissionsort: AB Schall-Immissionsort: Benutzerdefiniert (80)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.617	2.621	24,36	105,7	3,00	79,37	4,98	0,00	0,00	0,00	84,35
2	2.702	2.707	23,92	105,7	3,00	79,65	5,14	0,00	0,00	0,00	84,79
3	2.981	2.985	22,54	105,7	3,00	80,50	5,67	0,00	0,00	0,00	86,17
4	1.292	1.294	24,31	97,0	3,00	73,24	2,46	0,00	0,00	0,00	75,69
5	1.734	1.736	20,91	97,0	3,00	75,79	3,30	0,00	0,00	0,00	79,09
6	2.092	2.094	18,60	97,0	3,00	77,42	3,98	0,00	0,00	0,00	81,40
7	3.423	3.425	19,78	105,0	3,00	81,69	6,51	0,00	0,00	0,00	88,20

Summe 31,00

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: AC Schall-Immissionsort: Benutzerdefiniert (81)

WEA Windgeschwindigkeit: 6,0 m/s

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.564	2.569	24,64	105,7	3,00	79,20	4,88	0,00	0,00	0,00	84,08
2	2.640	2.645	24,24	105,7	3,00	79,45	5,03	0,00	0,00	0,00	84,47
3	2.916	2.920	22,86	105,7	3,00	80,31	5,55	0,00	0,00	0,00	85,86
4	1.237	1.239	24,79	97,0	3,00	72,86	2,35	0,00	0,00	0,00	75,21
5	1.678	1.680	21,30	97,0	3,00	75,51	3,19	0,00	0,00	0,00	78,70
6	2.038	2.040	18,93	97,0	3,00	77,19	3,88	0,00	0,00	0,00	81,07
7	3.359	3.361	20,07	105,0	3,00	81,53	6,39	0,00	0,00	0,00	87,92

Summe 31,35

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall Repowering

Schallberechnungs-Modell:
ISO 9613-2 Allgemein
Windgeschwindigkeit:
6,0 m/s
Bodeneffekt:
Keiner
Meteorlogischer Koeffizient, C0:
0,0 dB
Art der Anforderung in der Berechnung:
1: WEA-Geräusch vs. Schallrichtwert (DK, DE, SE, NL etc.)
Schallleistungspegel in der Berechnung:
Schallwerte sind Lwa-Werte (Mittlere Schallleistungspegel; Standard)
Einzeltöne:
Fester Zuschlag wird zu Schallemission von WEA mit Einzeltönen zugefügt: 0,0 dB(A)
Aufpunkthöhe ü.Gr.:
1,5 m Aufpunkthöhe im Modell hat Vorrang vor Angabe im Immissionsort-Objekt
verlangte Unter- (negativ) oder zulässige Überschreitung (positiv) des Schallrichtwerts:
0,0 dB(A)
Keine Oktavbanddaten verwendet
Luftdämpfung: 1,9 dB/km

WEA: ENERCON E-138 EP3 3500 138.6 !O!
Schall: Level 0 - OM 0s - 3500 kW

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
ENERCON GmbH	07.05.2018	EMD	05.07.2018 10:19

The sound power levels do not include uncertainties.
According to manufacturer specification document (D0605806-5/D0630221-3).
Enercon reserves the right to change the above specifications without prior notice.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	160,0	6,0	105,7	Nein

WEA: ENERCON E-40/5.40 500 40.3 !O!
Schall: 8m/s Man. guaranteed Hub55m 12/98

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
Manufacturer	01.12.1998	EMD	08.08.2003 16:40

Refers to measuring report KÖTTER 23554-2.002 from 03.03.1998
For older turbines, there may be a tonality due to a different generator type. If in doubt, please ask Enercon.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	65,0	6,0	97,0	Nein

WEA: Siemens SWT-3.0-113 -LJ 3000 113.0 !O!
Schall: Level 0 - Calculated - Std. 105.5dB - 04-2016

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
Manufacturer	26.04.2016	USER	09.04.2018 11:25

Noise Curve Rev. 0
Siemens Wind Power and its affiliates reserve the right to change the above specifications without prior notice.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	127,5	6,0	105,0	Nein

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (52)-A
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (53)-B
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (54)-C
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (55)-D
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (56)-E
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (57)-F
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (58)-G
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (59)-H
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (60)-I
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (61)-J
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (62)-K
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (63)-L
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (65)-M
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (66)-N
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (67)-O
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (68)-P
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (69)-Q
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (70)-R
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (71)-S
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (72)-T
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (73)-U
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (74)-V
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (75)-W
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (76)-X
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (77)-Y
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (78)-Z
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (79)-AA
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (80)-AB
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (81)-AC
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

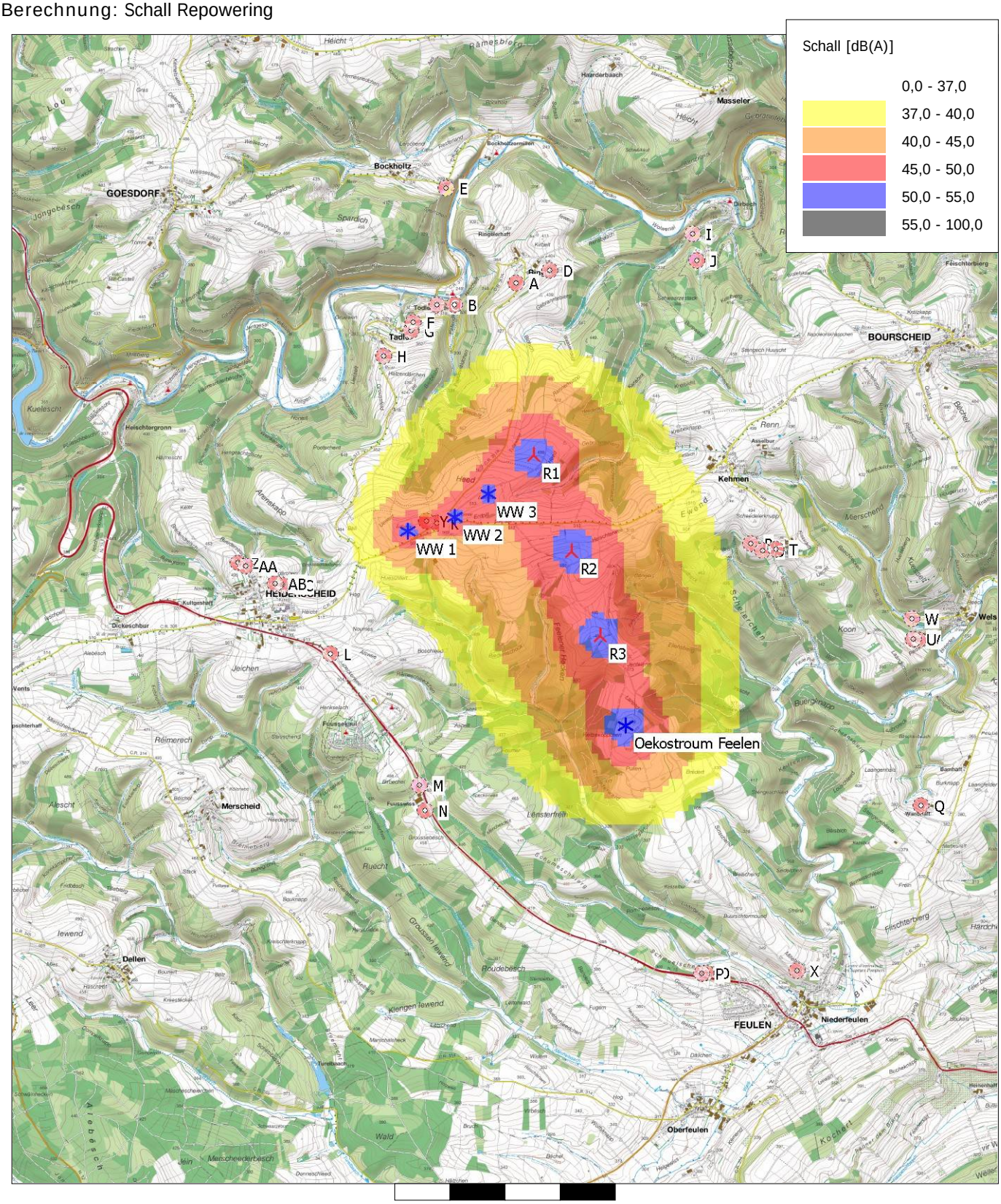
Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Projekt:
Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:52/3.1.633

DECIBEL - Karte 6,0 m/s

Berechnung: Schall Repowering



0 500 1000 1500 2000 m

Karte: Bitmap-Karte: SERIE_R_TOPO_TC06.tif , Maßstab 1:50.000, Mitte: LUREF Ost: 68.712 Nord: 106.115

Neue WEA Existierende WEA Schall-Immissionsort

Schallberechnungs-Modell: ISO 9613-2 Allgemein. Windgesch- windigkeit: 6,0 m/s

Projekt:

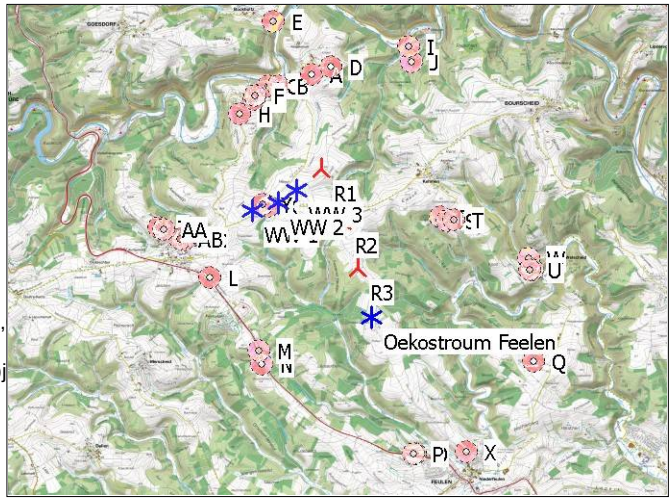
Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Hauptergebnis

Berechnung: Schall PV Repowering

Schallberechnungs-Modell:
ISO 9613-2 Allgemein
Windgeschwindigkeit:
95% der Nennleistung
Bodeneffekt:
Keiner
Meteorlogischer Koeffizient, C0:
0,0 dB
Art der Anforderung in der Berechnung:
1: WEA-Geräusch vs. Schallrichtwert (DK, DE, SE, NL etc.)
Schallleistungspegel in der Berechnung:
Schallwerte sind Lwa-Werte (Mittlere Schallleistungspegel; Standard)
Einzeltöne:
Fester Zuschlag wird zu Schallemission von WEA mit Einzeltönen zugefügt: 0,
Aufpunkthöhe ü.Gr.:
1,5 m Aufpunkthöhe im Modell hat Vorrang vor Angabe im Immissionsort-Obj
verlangte Unter- (negativ) oder zulässige Überschreitung (positiv) des Schallrichtwerts:
0,0 dB(A)



Maßstab 1:125.000

Neue WEA Existierende WEA Schall-Immissionsort

WEA

	X(Ost)	Y(Nord)	Z [m]	Beschreibung	WEA-Typ Aktuell	Hersteller	Typ	Nenn-leistung [kW]	Rotor-durchmesser [m]	Nabenhöhe [m]	Schallwerte Quelle	Name	Windgesch-windigkeit [m/s]	Status	LWA [dB(A)]	Einzelton
1	68.779	107.340	495,3	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	(95%)	Anwenderwert	106,0	Nein
2	69.123	106.471	500,9	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	(95%)	Anwenderwert	106,0	Nein
3	69.381	105.702	485,0	ENERCON E-138 EP3 ...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	EMD	Level 0 - OM 0s - 3500 kW	(95%)	Anwenderwert	106,0	Nein
4	67.636	106.654	505,0	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	(95%)	Anwenderwert	90,0	Nein
5	68.062	106.779	507,1	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	(95%)	Anwenderwert	90,0	Nein
6	68.364	106.989	509,1	ENERCON E-40/5.40 ...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	EMD	8m/s Man. guaranteed Hub55m 12/98	(95%)	Anwenderwert	90,0	Nein
7	69.610	104.889	475,0	Siemens SWT-3.0-11...	Ja	Siemens	SWT-3.0-113 -LJ-3.000	3.000	113,0	127,5	USER	Level 0 - Calculated - Std. 105.5dB - 04-2016	(95%)	Anwenderwert	105,5	Nein

Berechnungsergebnisse

Beurteilungspegel

Schall-Immissionsort Nr.	Name	X(Ost)	Y(Nord)	Z [m]	Aufpunkthöhe [m]	Anforderung Schall [dB(A)]	Beurteilungspegel Von WEA [dB(A)]	Distanz z.Richtwert [m]	Anforderung erfüllt? Schall
A	Schall-Immissionsort: Benutzerdefiniert (52)	68.619	108.900	386,8	1,5	37,0	32,6	572	Ja
B	Schall-Immissionsort: Benutzerdefiniert (53)	68.060	108.706	267,7	1,5	37,0	32,6	546	Ja
C	Schall-Immissionsort: Benutzerdefiniert (54)	67.906	108.706	273,0	1,5	37,0	32,1	627	Ja
D	Schall-Immissionsort: Benutzerdefiniert (55)	68.928	109.015	415,1	1,5	37,0	31,9	679	Ja
E	Schall-Immissionsort: Benutzerdefiniert (56)	67.988	109.767	299,9	1,5	37,0	27,0	1.554	Ja
F	Schall-Immissionsort: Benutzerdefiniert (57)	67.688	108.548	313,8	1,5	37,0	32,2	637	Ja
G	Schall-Immissionsort: Benutzerdefiniert (58)	67.669	108.472	324,7	1,5	37,0	32,5	593	Ja
H	Schall-Immissionsort: Benutzerdefiniert (59)	67.421	108.244	374,1	1,5	37,0	32,5	620	Ja
I	Schall-Immissionsort: Benutzerdefiniert (60)	70.218	109.350	268,6	1,5	37,0	28,1	1.432	Ja
J	Schall-Immissionsort: Benutzerdefiniert (61)	70.262	109.103	316,6	1,5	37,0	29,0	1.259	Ja
K	Schall-Immissionsort: Benutzerdefiniert (62)	67.901	106.724	509,3	1,5	39,0	41,3	-276	Nein
L	Schall-Immissionsort: Benutzerdefiniert (63)	66.937	105.535	504,1	1,5	39,0	31,4	1.138	Ja
M	Schall-Immissionsort: Benutzerdefiniert (65)	67.744	104.340	467,8	1,5	39,0	32,2	1.025	Ja
N	Schall-Immissionsort: Benutzerdefiniert (66)	67.798	104.116	455,0	1,5	39,0	31,7	1.089	Ja
O	Schall-Immissionsort: Benutzerdefiniert (67)	70.339	102.643	332,0	1,5	39,0	27,8	1.584	Ja
P	Schall-Immissionsort: Benutzerdefiniert (68)	70.300	102.636	333,9	1,5	39,0	27,8	1.579	Ja
Q	Schall-Immissionsort: Benutzerdefiniert (69)	72.288	104.161	368,5	1,5	37,0	26,6	1.755	Ja
R	Schall-Immissionsort: Benutzerdefiniert (70)	70.745	106.539	460,4	1,5	37,0	35,4	244	Ja
S	Schall-Immissionsort: Benutzerdefiniert (71)	70.857	106.476	447,0	1,5	37,0	34,9	334	Ja
T	Schall-Immissionsort: Benutzerdefiniert (72)	70.974	106.492	441,5	1,5	37,0	34,2	451	Ja
U	Schall-Immissionsort: Benutzerdefiniert (73)	72.221	105.673	306,1	1,5	37,0	28,3	1.542	Ja
V	Schall-Immissionsort: Benutzerdefiniert (74)	72.263	105.663	304,5	1,5	37,0	28,1	1.584	Ja
W	Schall-Immissionsort: Benutzerdefiniert (75)	72.209	105.856	286,0	1,5	37,0	28,3	1.541	Ja
X	Schall-Immissionsort: Benutzerdefiniert (76)	71.167	102.663	333,2	1,5	39,0	26,1	1.936	Ja
Y	Schall-Immissionsort: Benutzerdefiniert (77)	67.807	106.741	510,0	1,5	39,0	40,7	-205	Nein
Z	Schall-Immissionsort: Benutzerdefiniert (78)	66.097	106.363	479,0	1,5	37,0	28,2	1.295	Ja
AA	Schall-Immissionsort: Benutzerdefiniert (79)	66.171	106.329	476,2	1,5	37,0	28,6	1.230	Ja
AB	Schall-Immissionsort: Benutzerdefiniert (80)	66.438	106.173	494,3	1,5	37,0	29,8	1.019	Ja
AC	Schall-Immissionsort: Benutzerdefiniert (81)	66.502	106.162	493,8	1,5	37,0	30,1	963	Ja

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Hauptergebnis

Berechnung: Schall PV Repowering

Abstände (m)

Schall-Immissionsort	WEA 1	2	3	4	5	6	7
A	1568	2481	3288	2452	2193	1928	4132
B	1544	2475	3282	2096	1927	1744	4120
C	1622	2545	3347	2070	1934	1778	4181
D	1682	2552	3345	2692	2398	2103	4183
E	2553	3486	4297	3133	2989	2803	5141
F	1627	2524	3311	1894	1808	1699	4133
G	1585	2474	3256	1818	1738	1638	4075
H	1632	2458	3210	1604	1599	1570	4006
I	2472	3080	3743	3734	3356	3002	4503
J	2304	2868	3514	3591	3200	2841	4265
K	1073	1248	1799	274	171	534	2508
L	2580	2379	2450	1320	1678	2038	2750
M	3174	2539	2130	2317	2460	2721	1946
N	3371	2703	2241	2544	2677	2929	1970
O	4950	4017	3206	4838	4722	4775	2362
P	4944	4012	3201	4822	4710	4765	2357
Q	4736	3919	3291	5279	4972	4838	2776
R	2123	1623	1600	3111	2694	2423	2002
S	2251	1734	1667	3227	2812	2546	2018
T	2354	1851	1778	3342	2927	2657	2105
U	3825	3200	2841	4690	4304	4076	2726
V	3867	3243	2883	4733	4347	4119	2764
W	3738	3147	2833	4643	4249	4009	2774
X	5252	4322	3525	5330	5156	5155	2717
Y	1142	1344	1886	192	258	610	2585
Z	2855	3028	3350	1566	2009	2352	3810
AA	2798	2956	3271	1501	1945	2291	3729
AB	2617	2702	2981	1292	1734	2092	3423
AC	2564	2640	2916	1237	1678	2038	3359

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
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+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
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DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Annahmen

Berechneter L(DW) = LWA,ref + K + Dc - (Adiv + Aatm + Agr + Abar + Amisc) - Cmet
(Wenn mit Bodeneffekt gerechnet ist Dc = Domega)

LWA,ref:	Schalldruckpegel an WEA
K:	Einzeltöne
Dc:	Richtwirkungskorrektur
Adiv:	Dämpfung aufgrund geometrischer Ausbreitung
Aatm:	Dämpfung aufgrund von Luftabsorption
Agr:	Dämpfung aufgrund des Bodeneffekts
Abar:	Dämpfung aufgrund von Abschirmung
Amisc:	Dämpfung aufgrund verschiedener anderer Effekte
Cmet:	Meteorologische Korrektur

Berechnungsergebnisse

Schall-Immissionsort: A Schall-Immissionsort: Benutzerdefiniert (52)

WEA			95% der Nennleistung								
Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.569	1.591	30,94	106,0	3,00	75,03	3,02	0,00	0,00	0,00	78,06
2	2.481	2.496	25,31	106,0	3,00	78,95	4,74	0,00	0,00	0,00	83,69
3	3.288	3.298	21,37	106,0	3,00	81,37	6,27	0,00	0,00	0,00	87,63
4	2.452	2.459	9,51	90,0	3,00	78,81	4,67	0,00	0,00	0,00	83,49
5	2.193	2.201	10,97	90,0	3,00	77,85	4,18	0,00	0,00	0,00	82,03
6	1.928	1.937	12,58	90,0	3,00	76,74	3,68	0,00	0,00	0,00	80,42
7	4.132	4.138	17,30	105,5	3,00	83,34	7,86	0,00	0,00	0,00	91,20

Summe 32,58

Schall-Immissionsort: B Schall-Immissionsort: Benutzerdefiniert (53)

WEA			95% der Nennleistung								
Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.544	1.591	30,94	106,0	3,00	75,03	3,02	0,00	0,00	0,00	78,06
2	2.475	2.506	25,26	106,0	3,00	78,98	4,76	0,00	0,00	0,00	83,74
3	3.282	3.303	21,34	106,0	3,00	81,38	6,28	0,00	0,00	0,00	87,66
4	2.096	2.117	11,46	90,0	3,00	77,51	4,02	0,00	0,00	0,00	81,54
5	1.927	1.951	12,49	90,0	3,00	76,80	3,71	0,00	0,00	0,00	80,51
6	1.744	1.770	13,68	90,0	3,00	75,96	3,36	0,00	0,00	0,00	79,32
7	4.120	4.134	17,32	105,5	3,00	83,33	7,85	0,00	0,00	0,00	91,18

Summe 32,61

Schall-Immissionsort: C Schall-Immissionsort: Benutzerdefiniert (54)

WEA			95% der Nennleistung								
Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.622	1.666	30,40	106,0	3,00	75,43	3,16	0,00	0,00	0,00	78,60
2	2.546	2.575	24,89	106,0	3,00	79,21	4,89	0,00	0,00	0,00	84,11
3	3.347	3.368	21,05	106,0	3,00	81,55	6,40	0,00	0,00	0,00	87,95
4	2.070	2.091	11,62	90,0	3,00	77,41	3,97	0,00	0,00	0,00	81,38
5	1.934	1.957	12,45	90,0	3,00	76,83	3,72	0,00	0,00	0,00	80,55
6	1.778	1.803	13,46	90,0	3,00	76,12	3,43	0,00	0,00	0,00	79,54
7	4.181	4.194	17,08	105,5	3,00	83,45	7,97	0,00	0,00	0,00	91,42

Summe 32,14

Schall-Immissionsort: D Schall-Immissionsort: Benutzerdefiniert (55)

WEA			95% der Nennleistung								
Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.682	1.699	30,17	106,0	3,00	75,60	3,23	0,00	0,00	0,00	78,83
2	2.552	2.564	24,95	106,0	3,00	79,18	4,87	0,00	0,00	0,00	84,05

(Fortsetzung nächste Seite)...

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

...(Fortsetzung von letzter Seite)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
3	3.345	3.352	21,12	106,0	3,00	81,51	6,37	0,00	0,00	0,00	87,88
4	2.692	2.696	8,26	90,0	3,00	79,62	5,12	0,00	0,00	0,00	84,74
5	2.398	2.403	9,82	90,0	3,00	78,62	4,57	0,00	0,00	0,00	83,18
6	2.103	2.109	11,51	90,0	3,00	77,48	4,01	0,00	0,00	0,00	81,49
7	4.183	4.187	17,11	105,5	3,00	83,44	7,96	0,00	0,00	0,00	91,39

Summe 31,94

Schall-Immissionsort: E Schall-Immissionsort: Benutzerdefiniert (56)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.553	2.577	24,88	106,0	3,00	79,22	4,90	0,00	0,00	0,00	84,12
2	3.486	3.505	20,45	106,0	3,00	81,89	6,66	0,00	0,00	0,00	88,55
3	4.297	4.311	17,12	106,0	3,00	83,69	8,19	0,00	0,00	0,00	91,88
4	3.133	3.144	6,08	90,0	3,00	80,95	5,97	0,00	0,00	0,00	86,92
5	2.989	3.001	6,75	90,0	3,00	80,55	5,70	0,00	0,00	0,00	86,25
6	2.803	2.817	7,65	90,0	3,00	79,99	5,35	0,00	0,00	0,00	85,35
7	5.141	5.150	13,48	105,5	3,00	85,24	9,78	0,00	0,00	0,00	95,02

Summe 27,05

Schall-Immissionsort: F Schall-Immissionsort: Benutzerdefiniert (57)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.627	1.662	30,43	106,0	3,00	75,41	3,16	0,00	0,00	0,00	78,57
2	2.524	2.548	25,04	106,0	3,00	79,12	4,84	0,00	0,00	0,00	83,96
3	3.311	3.328	21,23	106,0	3,00	81,44	6,32	0,00	0,00	0,00	87,77
4	1.894	1.911	12,74	90,0	3,00	76,63	3,63	0,00	0,00	0,00	80,26
5	1.808	1.826	13,30	90,0	3,00	76,23	3,47	0,00	0,00	0,00	79,70
6	1.699	1.718	14,03	90,0	3,00	75,70	3,26	0,00	0,00	0,00	78,97
7	4.133	4.143	17,28	105,5	3,00	83,35	7,87	0,00	0,00	0,00	91,22

Summe 32,24

Schall-Immissionsort: G Schall-Immissionsort: Benutzerdefiniert (58)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.585	1.619	30,74	106,0	3,00	75,19	3,08	0,00	0,00	0,00	78,26
2	2.474	2.496	25,31	106,0	3,00	78,95	4,74	0,00	0,00	0,00	83,69
3	3.257	3.272	21,49	106,0	3,00	81,30	6,22	0,00	0,00	0,00	87,51
4	1.818	1.834	13,24	90,0	3,00	76,27	3,49	0,00	0,00	0,00	79,76
5	1.738	1.755	13,78	90,0	3,00	75,89	3,33	0,00	0,00	0,00	79,22
6	1.638	1.656	14,47	90,0	3,00	75,38	3,15	0,00	0,00	0,00	78,53
7	4.075	4.085	17,52	105,5	3,00	83,22	7,76	0,00	0,00	0,00	90,98

Summe 32,54

Schall-Immissionsort: H Schall-Immissionsort: Benutzerdefiniert (59)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.632	1.655	30,48	106,0	3,00	75,38	3,15	0,00	0,00	0,00	78,52
2	2.458	2.474	25,43	106,0	3,00	78,87	4,70	0,00	0,00	0,00	83,57
3	3.210	3.221	21,72	106,0	3,00	81,16	6,12	0,00	0,00	0,00	87,28
4	1.604	1.616	14,76	90,0	3,00	75,17	3,07	0,00	0,00	0,00	78,24
5	1.599	1.611	14,80	90,0	3,00	75,14	3,06	0,00	0,00	0,00	78,20
6	1.570	1.582	15,01	90,0	3,00	74,99	3,01	0,00	0,00	0,00	77,99
7	4.006	4.013	17,81	105,5	3,00	83,07	7,62	0,00	0,00	0,00	90,69

Summe 32,47

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: I Schall-Immissionsort: Benutzerdefiniert (60)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.472	2.502	25,28	106,0	3,00	78,97	4,75	0,00	0,00	0,00	83,72
2	3.080	3.105	22,26	106,0	3,00	80,84	5,90	0,00	0,00	0,00	86,74
3	3.743	3.762	19,34	106,0	3,00	82,51	7,15	0,00	0,00	0,00	89,66
4	3.734	3.746	3,41	90,0	3,00	82,47	7,12	0,00	0,00	0,00	89,59
5	3.356	3.369	5,05	90,0	3,00	81,55	6,40	0,00	0,00	0,00	87,95
6	3.002	3.018	6,67	90,0	3,00	80,59	5,73	0,00	0,00	0,00	86,33
7	4.503	4.515	15,83	105,5	3,00	84,09	8,58	0,00	0,00	0,00	92,67

Summe 28,06

Schall-Immissionsort: J Schall-Immissionsort: Benutzerdefiniert (61)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.304	2.328	26,23	106,0	3,00	78,34	4,42	0,00	0,00	0,00	82,77
2	2.868	2.889	23,30	106,0	3,00	80,21	5,49	0,00	0,00	0,00	85,70
3	3.514	3.529	20,34	106,0	3,00	81,95	6,70	0,00	0,00	0,00	88,66
4	3.591	3.600	4,03	90,0	3,00	82,13	6,84	0,00	0,00	0,00	88,97
5	3.200	3.210	5,77	90,0	3,00	81,13	6,10	0,00	0,00	0,00	87,23
6	2.841	2.853	7,47	90,0	3,00	80,11	5,42	0,00	0,00	0,00	85,53
7	4.265	4.274	16,76	105,5	3,00	83,62	8,12	0,00	0,00	0,00	91,74

Summe 29,04

Schall-Immissionsort: K Schall-Immissionsort: Benutzerdefiniert (62)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.073	1.083	35,25	106,0	3,00	71,69	2,06	0,00	0,00	0,00	73,75
2	1.248	1.257	33,62	106,0	3,00	72,99	2,39	0,00	0,00	0,00	75,38
3	1.799	1.804	29,45	106,0	3,00	76,12	3,43	0,00	0,00	0,00	79,55
4	274	280	32,53	90,0	3,00	59,94	0,53	0,00	0,00	0,00	60,47
5	171	181	36,48	90,0	3,00	56,18	0,34	0,00	0,00	0,00	56,52
6	534	538	26,36	90,0	3,00	65,62	1,02	0,00	0,00	0,00	66,64
7	2.508	2.510	24,74	105,5	3,00	78,99	4,77	0,00	0,00	0,00	83,76

Summe 41,30

Schall-Immissionsort: L Schall-Immissionsort: Benutzerdefiniert (63)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.580	2.584	24,84	106,0	3,00	79,25	4,91	0,00	0,00	0,00	84,16
2	2.379	2.384	25,93	106,0	3,00	78,54	4,53	0,00	0,00	0,00	83,07
3	2.450	2.454	25,54	106,0	3,00	78,80	4,66	0,00	0,00	0,00	83,46
4	1.320	1.321	17,07	90,0	3,00	73,42	2,51	0,00	0,00	0,00	75,93
5	1.678	1.679	14,31	90,0	3,00	75,50	3,19	0,00	0,00	0,00	78,69
6	2.038	2.039	11,94	90,0	3,00	77,19	3,87	0,00	0,00	0,00	81,06
7	2.750	2.752	23,48	105,5	3,00	79,79	5,23	0,00	0,00	0,00	85,02

Summe 31,37

Schall-Immissionsort: M Schall-Immissionsort: Benutzerdefiniert (65)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.174	3.179	21,91	106,0	3,00	81,05	6,04	0,00	0,00	0,00	87,09
2	2.539	2.546	25,05	106,0	3,00	79,12	4,84	0,00	0,00	0,00	83,95
3	2.130	2.137	27,34	106,0	3,00	77,60	4,06	0,00	0,00	0,00	81,66
4	2.317	2.319	10,29	90,0	3,00	78,31	4,41	0,00	0,00	0,00	82,71
5	2.460	2.462	9,50	90,0	3,00	78,83	4,68	0,00	0,00	0,00	83,50
6	2.721	2.723	8,13	90,0	3,00	79,70	5,17	0,00	0,00	0,00	84,87
7	1.946	1.950	27,99	105,5	3,00	76,80	3,71	0,00	0,00	0,00	80,51

Summe 32,24

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: N Schall-Immissionsort: Benutzerdefiniert (66)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.371	3.377	21,01	106,0	3,00	81,57	6,42	0,00	0,00	0,00	87,99
2	2.703	2.711	24,19	106,0	3,00	79,66	5,15	0,00	0,00	0,00	84,81
3	2.241	2.249	26,69	106,0	3,00	78,04	4,27	0,00	0,00	0,00	82,31
4	2.544	2.546	9,04	90,0	3,00	79,12	4,84	0,00	0,00	0,00	83,96
5	2.677	2.679	8,35	90,0	3,00	79,56	5,09	0,00	0,00	0,00	84,65
6	2.929	2.931	7,09	90,0	3,00	80,34	5,57	0,00	0,00	0,00	85,91
7	1.970	1.976	27,83	105,5	3,00	76,92	3,75	0,00	0,00	0,00	80,67

Summe 31,71

Schall-Immissionsort: O Schall-Immissionsort: Benutzerdefiniert (67)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.950	4.961	14,66	106,0	3,00	84,91	9,43	0,00	0,00	0,00	94,34
2	4.017	4.031	18,23	106,0	3,00	83,11	7,66	0,00	0,00	0,00	90,77
3	3.206	3.221	21,72	106,0	3,00	81,16	6,12	0,00	0,00	0,00	87,28
4	4.838	4.843	-0,91	90,0	3,00	84,70	9,20	0,00	0,00	0,00	93,91
5	4.722	4.728	-0,48	90,0	3,00	84,49	8,98	0,00	0,00	0,00	93,48
6	4.775	4.781	-0,67	90,0	3,00	84,59	9,08	0,00	0,00	0,00	93,67
7	2.362	2.377	25,46	105,5	3,00	78,52	4,52	0,00	0,00	0,00	83,04

Summe 27,77

Schall-Immissionsort: P Schall-Immissionsort: Benutzerdefiniert (68)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.944	4.955	14,69	106,0	3,00	84,90	9,41	0,00	0,00	0,00	94,31
2	4.012	4.025	18,26	106,0	3,00	83,10	7,65	0,00	0,00	0,00	90,74
3	3.201	3.216	21,74	106,0	3,00	81,15	6,11	0,00	0,00	0,00	87,26
4	4.822	4.827	-0,85	90,0	3,00	84,67	9,17	0,00	0,00	0,00	93,85
5	4.710	4.715	-0,43	90,0	3,00	84,47	8,96	0,00	0,00	0,00	93,43
6	4.765	4.771	-0,64	90,0	3,00	84,57	9,06	0,00	0,00	0,00	93,64
7	2.357	2.372	25,49	105,5	3,00	78,50	4,51	0,00	0,00	0,00	83,01

Summe 27,80

Schall-Immissionsort: Q Schall-Immissionsort: Benutzerdefiniert (69)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	4.736	4.744	15,46	106,0	3,00	84,52	9,01	0,00	0,00	0,00	93,54
2	3.919	3.930	18,65	106,0	3,00	82,89	7,47	0,00	0,00	0,00	90,35
3	3.291	3.302	21,35	106,0	3,00	81,38	6,27	0,00	0,00	0,00	87,65
4	5.279	5.283	-2,49	90,0	3,00	85,46	10,04	0,00	0,00	0,00	95,49
5	4.972	4.976	-1,39	90,0	3,00	84,94	9,45	0,00	0,00	0,00	94,39
6	4.838	4.842	-0,90	90,0	3,00	84,70	9,20	0,00	0,00	0,00	93,90
7	2.776	2.785	23,31	105,5	3,00	79,90	5,29	0,00	0,00	0,00	85,19

Summe 26,64

Schall-Immissionsort: R Schall-Immissionsort: Benutzerdefiniert (70)

WEA 95% der Nennleistung

Nr.	Abstand [m]	Schallweg [m]	Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.123	2.132	27,37	106,0	3,00	77,57	4,05	0,00	0,00	0,00	81,63
2	1.623	1.635	30,62	106,0	3,00	75,27	3,11	0,00	0,00	0,00	78,38
3	1.600	1.610	30,80	106,0	3,00	75,14	3,06	0,00	0,00	0,00	78,20
4	3.111	3.113	6,22	90,0	3,00	80,86	5,91	0,00	0,00	0,00	86,78
5	2.694	2.696	8,26	90,0	3,00	79,61	5,12	0,00	0,00	0,00	84,74
6	2.423	2.426	9,69	90,0	3,00	78,70	4,61	0,00	0,00	0,00	83,31
7	2.002	2.007	27,63	105,5	3,00	77,05	3,81	0,00	0,00	0,00	80,87

Summe 35,44

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: S Schall-Immissionsort: Benutzerdefiniert (71)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.251	2.261	26,62	106,0	3,00	78,08	4,29	0,00	0,00	0,00	82,38
2	1.734	1.747	29,83	106,0	3,00	75,85	3,32	0,00	0,00	0,00	79,17
3	1.667	1.678	30,32	106,0	3,00	75,50	3,19	0,00	0,00	0,00	78,68
4	3.226	3.229	5,68	90,0	3,00	81,18	6,13	0,00	0,00	0,00	87,32
5	2.812	2.815	7,66	90,0	3,00	79,99	5,35	0,00	0,00	0,00	85,34
6	2.546	2.549	9,03	90,0	3,00	79,13	4,84	0,00	0,00	0,00	83,97
7	2.018	2.024	27,53	105,5	3,00	77,12	3,85	0,00	0,00	0,00	80,97

Summe 34,89

Schall-Immissionsort: T Schall-Immissionsort: Benutzerdefiniert (72)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.354	2.363	26,04	106,0	3,00	78,47	4,49	0,00	0,00	0,00	82,96
2	1.851	1.864	29,05	106,0	3,00	76,41	3,54	0,00	0,00	0,00	79,95
3	1.778	1.790	29,54	106,0	3,00	76,06	3,40	0,00	0,00	0,00	79,46
4	3.342	3.345	5,16	90,0	3,00	81,49	6,36	0,00	0,00	0,00	87,84
5	2.927	2.929	7,10	90,0	3,00	80,34	5,57	0,00	0,00	0,00	85,90
6	2.657	2.661	8,45	90,0	3,00	79,50	5,06	0,00	0,00	0,00	84,55
7	2.105	2.111	27,00	105,5	3,00	77,49	4,01	0,00	0,00	0,00	81,50

Summe 34,19

Schall-Immissionsort: U Schall-Immissionsort: Benutzerdefiniert (73)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.825	3.841	19,01	106,0	3,00	82,69	7,30	0,00	0,00	0,00	89,99
2	3.200	3.219	21,73	106,0	3,00	81,15	6,12	0,00	0,00	0,00	87,27
3	2.841	2.861	23,44	106,0	3,00	80,13	5,44	0,00	0,00	0,00	85,56
4	4.690	4.697	-0,36	90,0	3,00	84,44	8,92	0,00	0,00	0,00	93,36
5	4.304	4.312	1,11	90,0	3,00	83,69	8,19	0,00	0,00	0,00	91,89
6	4.076	4.085	2,02	90,0	3,00	83,22	7,76	0,00	0,00	0,00	90,98
7	2.726	2.742	23,53	105,5	3,00	79,76	5,21	0,00	0,00	0,00	84,97

Summe 28,31

Schall-Immissionsort: V Schall-Immissionsort: Benutzerdefiniert (74)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.867	3.883	18,84	106,0	3,00	82,78	7,38	0,00	0,00	0,00	90,16
2	3.243	3.262	21,53	106,0	3,00	81,27	6,20	0,00	0,00	0,00	87,47
3	2.883	2.902	23,23	106,0	3,00	80,26	5,51	0,00	0,00	0,00	85,77
4	4.733	4.740	-0,52	90,0	3,00	84,52	9,01	0,00	0,00	0,00	93,52
5	4.347	4.355	0,94	90,0	3,00	83,78	8,28	0,00	0,00	0,00	92,06
6	4.119	4.128	1,84	90,0	3,00	83,31	7,84	0,00	0,00	0,00	91,16
7	2.764	2.780	23,34	105,5	3,00	79,88	5,28	0,00	0,00	0,00	85,16

Summe 28,12

Schall-Immissionsort: W Schall-Immissionsort: Benutzerdefiniert (75)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	3.738	3.756	19,37	106,0	3,00	82,49	7,14	0,00	0,00	0,00	89,63
2	3.147	3.169	21,96	106,0	3,00	81,02	6,02	0,00	0,00	0,00	87,04
3	2.833	2.855	23,46	106,0	3,00	80,11	5,42	0,00	0,00	0,00	85,54
4	4.643	4.652	-0,19	90,0	3,00	84,35	8,84	0,00	0,00	0,00	93,19
5	4.249	4.259	1,32	90,0	3,00	83,59	8,09	0,00	0,00	0,00	91,68
6	4.009	4.019	2,28	90,0	3,00	83,08	7,64	0,00	0,00	0,00	90,72
7	2.774	2.791	23,28	105,5	3,00	79,92	5,30	0,00	0,00	0,00	85,22

Summe 28,34

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: X Schall-Immissionsort: Benutzerdefiniert (76)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	5.252	5.262	13,58	106,0	3,00	85,42	10,00	0,00	0,00	0,00	95,42
2	4.322	4.335	17,02	106,0	3,00	83,74	8,24	0,00	0,00	0,00	91,98
3	3.525	3.539	20,30	106,0	3,00	81,98	6,72	0,00	0,00	0,00	88,70
4	5.329	5.335	-2,68	90,0	3,00	85,54	10,14	0,00	0,00	0,00	95,68
5	5.156	5.162	-2,06	90,0	3,00	85,26	9,81	0,00	0,00	0,00	95,06
6	5.155	5.161	-2,06	90,0	3,00	85,25	9,81	0,00	0,00	0,00	95,06
7	2.717	2.730	23,59	105,5	3,00	79,72	5,19	0,00	0,00	0,00	84,91

Summe 26,14

Schall-Immissionsort: Y Schall-Immissionsort: Benutzerdefiniert (77)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	1.142	1.151	34,59	106,0	3,00	72,22	2,19	0,00	0,00	0,00	74,41
2	1.344	1.352	32,81	106,0	3,00	73,62	2,57	0,00	0,00	0,00	76,19
3	1.886	1.891	28,87	106,0	3,00	76,53	3,59	0,00	0,00	0,00	80,13
4	192	201	35,56	90,0	3,00	57,06	0,38	0,00	0,00	0,00	57,44
5	258	265	33,04	90,0	3,00	59,46	0,50	0,00	0,00	0,00	59,96
6	610	613	25,09	90,0	3,00	66,75	1,16	0,00	0,00	0,00	67,91
7	2.585	2.587	24,33	105,5	3,00	79,26	4,92	0,00	0,00	0,00	84,17

Summe 40,71

Schall-Immissionsort: Z Schall-Immissionsort: Benutzerdefiniert (78)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.855	2.860	23,44	106,0	3,00	80,13	5,43	0,00	0,00	0,00	85,56
2	3.028	3.034	22,60	106,0	3,00	80,64	5,76	0,00	0,00	0,00	86,40
3	3.350	3.354	21,12	106,0	3,00	81,51	6,37	0,00	0,00	0,00	87,88
4	1.566	1.569	15,11	90,0	3,00	74,91	2,98	0,00	0,00	0,00	77,89
5	2.009	2.011	12,11	90,0	3,00	77,07	3,82	0,00	0,00	0,00	80,89
6	2.352	2.354	10,09	90,0	3,00	78,44	4,47	0,00	0,00	0,00	82,91
7	3.810	3.812	18,63	105,5	3,00	82,62	7,24	0,00	0,00	0,00	89,87

Summe 28,22

Schall-Immissionsort: AA Schall-Immissionsort: Benutzerdefiniert (79)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.798	2.804	23,72	106,0	3,00	79,95	5,33	0,00	0,00	0,00	85,28
2	2.956	2.962	22,94	106,0	3,00	80,43	5,63	0,00	0,00	0,00	86,06
3	3.271	3.276	21,47	106,0	3,00	81,31	6,22	0,00	0,00	0,00	87,53
4	1.501	1.504	15,60	90,0	3,00	74,55	2,86	0,00	0,00	0,00	77,40
5	1.945	1.947	12,51	90,0	3,00	76,79	3,70	0,00	0,00	0,00	80,49
6	2.291	2.293	10,44	90,0	3,00	78,21	4,36	0,00	0,00	0,00	82,56
7	3.729	3.731	18,97	105,5	3,00	82,44	7,09	0,00	0,00	0,00	89,53

Summe 28,55

Schall-Immissionsort: AB Schall-Immissionsort: Benutzerdefiniert (80)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.617	2.621	24,65	106,0	3,00	79,37	4,98	0,00	0,00	0,00	84,35
2	2.702	2.707	24,21	106,0	3,00	79,65	5,14	0,00	0,00	0,00	84,79
3	2.981	2.985	22,83	106,0	3,00	80,50	5,67	0,00	0,00	0,00	86,17
4	1.292	1.294	17,31	90,0	3,00	73,24	2,46	0,00	0,00	0,00	75,69
5	1.734	1.736	13,91	90,0	3,00	75,79	3,30	0,00	0,00	0,00	79,09
6	2.092	2.094	11,60	90,0	3,00	77,42	3,98	0,00	0,00	0,00	81,40
7	3.423	3.425	20,30	105,5	3,00	81,69	6,51	0,00	0,00	0,00	88,20

Summe 29,76

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Detaillierte Ergebnisse

Berechnung: Schall PV RepoweringSchallberechnungs-Modell: ISO 9613-2 Allgemein 6,0 m/s

Schall-Immissionsort: AC Schall-Immissionsort: Benutzerdefiniert (81)

WEA Nr.	Abstand [m]	Schallweg [m]	95% der Nennleistung Berechnet [dB(A)]	LWA [dB(A)]	Dc [dB]	Adiv [dB]	Aatm [dB]	Agr [dB]	Abar [dB]	Amisc [dB]	A [dB]
1	2.564	2.569	24,92	106,0	3,00	79,20	4,88	0,00	0,00	0,00	84,08
2	2.640	2.645	24,53	106,0	3,00	79,45	5,03	0,00	0,00	0,00	84,47
3	2.916	2.920	23,14	106,0	3,00	80,31	5,55	0,00	0,00	0,00	85,86
4	1.237	1.239	17,79	90,0	3,00	72,86	2,35	0,00	0,00	0,00	75,21
5	1.678	1.680	14,30	90,0	3,00	75,51	3,19	0,00	0,00	0,00	78,70
6	2.038	2.040	11,93	90,0	3,00	77,19	3,88	0,00	0,00	0,00	81,07
7	3.359	3.361	20,58	105,5	3,00	81,53	6,39	0,00	0,00	0,00	87,92

Summe 30,07

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
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DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall PV Repowering

Schallberechnungs-Modell:
ISO 9613-2 Allgemein
Windgeschwindigkeit:
95% der Nennleistung
Bodeneffekt:
Keiner
Meteorlogischer Koeffizient, C0:
0,0 dB
Art der Anforderung in der Berechnung:
1: WEA-Geräusch vs. Schallrichtwert (DK, DE, SE, NL etc.)
Schallleistungspegel in der Berechnung:
Schallwerte sind Lwa-Werte (Mittlere Schallleistungspegel; Standard)
Einzeltöne:
Fester Zuschlag wird zu Schallemission von WEA mit Einzeltönen zugefügt: 0,0 dB(A)
Aufpunkthöhe ü.Gr.:
1,5 m Aufpunkthöhe im Modell hat Vorrang vor Angabe im Immissionsort-Objekt
verlangte Unter- (negativ) oder zulässige Überschreitung (positiv) des Schallrichtwerts:
0,0 dB(A)
Keine Oktavbanddaten verwendet
Luftdämpfung: 1,9 dB/km

WEA: ENERCON E-138 EP3 3500 138.6 !O!
Schall: Level 0 - OM 0s - 3500 kW

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
ENERCON GmbH	07.05.2018	EMD	05.07.2018 10:19

The sound power levels do not include uncertainties.
According to manufacturer specification document (D0605806-5/D0630221-3).
Enercon reserves the right to change the above specifications without prior notice.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	160,0	95% der Nennleistung	106,0	Nein

WEA: ENERCON E-40/5.40 500 40.3 !O!
Schall: 8m/s Man. guaranteed Hub55m 12/98

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
Manufacturer	01.12.1998	EMD	08.08.2003 16:40

Refers to measuring report KÖTTER 23554-2.002 from 03.03.1998
For older turbines, there may be a tonality due to a different generator type. If in doubt, please ask Enercon.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	65,0	95% der Nennleistung	90,0	Nein

WEA: Siemens SWT-3.0-113 -LJ 3000 113.0 !O!
Schall: Level 0 - Calculated - Std. 105.5dB - 04-2016

Datenquelle	Quelle/Datum	Quelle	Bearbeitet
Manufacturer	26.04.2016	USER	09.04.2018 11:25

Noise Curve Rev. 0
Siemens Wind Power and its affiliates reserve the right to change the above specifications without prior notice.

Status	Nabenhöhe [m]	Windgesch- windigkeit [m/s]	LWA [dB(A)]	Einzelton
Anwenderwert	127,5	95% der Nennleistung	105,5	Nein

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (52)-A
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall PV Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (53)-B
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (54)-C
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (55)-D
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (56)-E
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (57)-F
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (58)-G
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (59)-H
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (60)-I
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (61)-J
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (62)-K
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

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2, rue Pierre d'Aspelt, P.B. 37
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Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall PV Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (63)-L
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (65)-M
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (66)-N
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (67)-O
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (68)-P
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (69)-Q
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (70)-R
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (71)-S
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (72)-T
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (73)-U
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

DECIBEL - Annahmen für Schallberechnung

Berechnung: Schall PV Repowering

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (74)-V
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (75)-W
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (76)-X
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (77)-Y
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 39,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (78)-Z
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (79)-AA
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (80)-AB
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Schall-Immissionsort: Schall-Immissionsort: Benutzerdefiniert (81)-AC
Vordefinierter Berechnungsstandard:
Höhe Aufpunkt (ü.Gr.): Standardwert des Berechnungsmodells

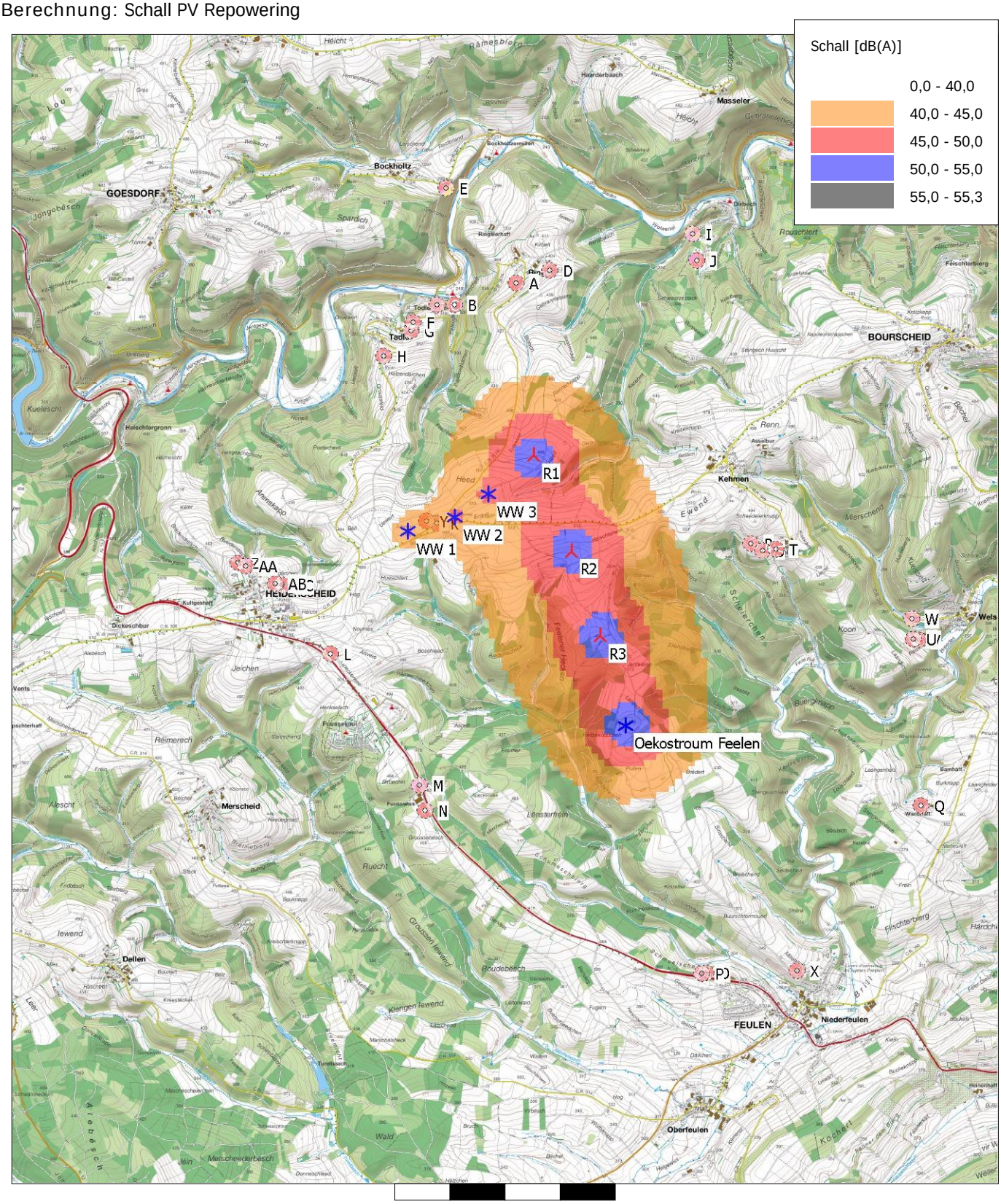
Schallrichtwert: 37,0 dB(A)
Keine Abstandsanforderung

Projekt:
Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:59/3.1.633

DECIBEL - Karte 95% der Nennleistung

Berechnung: Schall PV Repowering



0 500 1000 1500 2000 m

Karte: Bitmap-Karte: SERIE_R_TOPO_TC06.tif , Maßstab 1:50.000, Mitte: LUREF Ost: 68.712 Nord: 106.115

Neue WEA Existierende WEA Schall-Immissionsort

Schallberechnungs-Modell: ISO 9613-2 Allgemein. Windgesch- windigkeit: 95% der Nennleistung

Projekt:

Repowering WP Kehmen-Heischent Phase 1

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Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Hauptergebnis

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

Voraussetzungen für Berechnung des Schattenwurfs

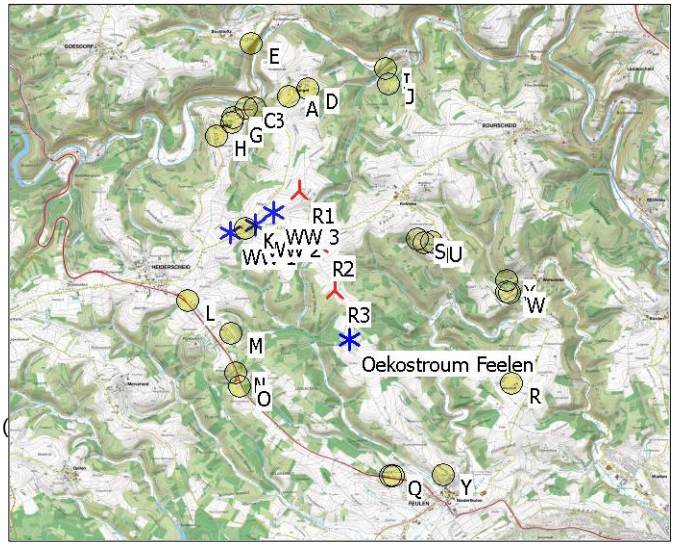
Beschattungsbereich der WEA
Schatten nur relevant, wo Rotorblatt mind. 20% der Sonne verdeckt
Siehe WEA-Tabelle

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 Sonneneinfallsrichtung
- Die Windenergieanlage/n ist/sind immer in Betrieb

Eine WEA wird nicht berücksichtigt, wenn sie von keinem Teil der Rezeptorfläche aus sichtbar ist. Die Sichtbarkeitsberechnung basiert auf den folgenden Annahmen:
Verwendete Höhenlinien: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (
Hindernisse in Berechnung verwendet
Augenhöhe: 1,5 m
Rasterauflösung: 10,0 m

Alle Koordinatenangaben in:
LUREF



Maßstab 1:125.000
Neue WEA | Existierende WEA | Schattenrezeptor

WEA

	X(Ost)	Y(Nord)	Z	Beschreibung	WEA-Typ Aktuell	Hersteller	Typ	Nenn-leistung	Rotor-durchmesser	Nabenhöhe	Schattendaten Beschatt.-Bereich	U/min
			[m]					[kW]	[m]	[m]	[m]	[U/min]
1	68.779	107.340	495,3	ENERCON E-138 EP...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	1.689	10,8
2	69.123	106.471	500,9	ENERCON E-138 EP...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	1.689	10,8
3	69.381	105.702	485,0	ENERCON E-138 EP...	Ja	ENERCON	E-138 EP3-3.500	3.500	138,6	160,0	1.689	10,8
4	67.636	106.654	505,0	ENERCON E-40/5.4...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	897	38,0
5	68.062	106.779	507,1	ENERCON E-40/5.4...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	897	38,0
6	68.364	106.989	509,1	ENERCON E-40/5.4...	Nein	ENERCON	E-40/5.40-500	500	40,3	65,0	897	38,0
7	69.610	104.889	475,0	Siemens SWT-3.0-1...	Ja	Siemens	SWT-3.0-113 -LJ-3.000	3.000	113,0	127,5	1.733	0,0

Schattenrezeptor-Eingabe

Nr.	X(Ost)	Y(Nord)	Z	Breite	Höhe	Höhe über Grund	Azimutwinkel (von Süd)	Neigung des Fensters	Ausrichtungsmodus
			[m]	[m]	[m]	[m]	[°]	[°]	
A	68.619	108.900	386,8	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
B	68.060	108.706	267,7	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
C	67.906	108.706	273,1	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
D	68.928	109.015	415,1	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
E	67.988	109.766	299,9	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
F	67.688	108.547	313,8	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
G	67.669	108.472	324,7	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
H	67.421	108.243	374,1	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
I	70.218	109.350	268,6	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
J	70.262	109.103	316,6	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
K	67.901	106.723	509,3	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
L	66.937	105.535	504,1	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
M	67.656	104.991	487,0	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
N	67.744	104.340	467,8	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
O	67.798	104.116	455,0	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
P	70.339	102.643	332,0	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
Q	70.300	102.636	333,9	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
R	72.288	104.161	368,6	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
S	70.745	106.539	460,4	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
T	70.857	106.475	447,0	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
U	70.974	106.492	441,5	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
V	72.221	105.672	306,1	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
W	72.263	105.663	304,5	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
X	72.209	105.856	286,0	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"
Y	71.167	102.663	333,2	0,1	0,1	2,0	0,0	90,0	"Gewächshaus-Modus"

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SHADOW - Hauptergebnis

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

Berechnungsergebnisse

Schattenrezeptor

Nr.	astron. max. mögl. Beschattungsdauer Stunden/Jahr [Std/Jahr]	Schattentage/a [Tage/Jahr]	Max.Schatten Stunden/Tag [Std/Tag]
A	0:00	0	0:00
B	0:00	0	0:00
C	13:36	54	0:21
D	0:00	0	0:00
E	0:00	0	0:00
F	9:35	36	0:20
G	9:15	35	0:21
H	7:15	28	0:20
I	0:00	0	0:00
J	0:00	0	0:00
K	73:15	103	1:04
L	0:00	0	0:00
M	0:00	0	0:00
N	0:00	0	0:00
O	0:00	0	0:00
P	0:00	0	0:00
Q	0:00	0	0:00
R	0:00	0	0:00
S	14:37	58	0:21
T	6:55	27	0:20
U	0:00	0	0:00
V	0:00	0	0:00
W	0:00	0	0:00
X	0:00	0	0:00
Y	0:00	0	0:00

Gesamtmenge der max. mögl. Beschattung an Rezeptoren pro WEA

Nr.	Name	Maximal [Std/Jahr]
1	ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (99)	35:49
2	ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (100)	17:01
3	ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (101)	14:15
4	ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (11)	17:59
5	ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (12)	34:22
6	ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (13)	10:19
7	Siemens SWT-3.0-113 -LJ 3000 113.0 !O! NH: 127,5 m (Ges:184,0 m) (14)	0:00

Summen in Rezeptortabelle und WEA-Tabelle können sich unterscheiden, da eine WEA gleichzeitig an zwei oder mehr Rezeptoren Beschattung verursachen kann und/oder ein Rezeptor gleichzeitig von zwei oder mehr WEA beschattet werden kann.

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: A - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (19)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15	16:38
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:37	21:49	21:19	20:20	19:15	17:13	16:38
3	08:35	08:08	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	16:37
4	08:35	08:07	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08	16:36
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:01	07:07	07:00	06:03	05:29	05:36	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:22
	16:54	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:33	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	16:35
12	08:32	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52	07:43	08:25
	16:58	17:48	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44	08:26
	16:59	17:50	18:37	20:26	21:12	21:45	21:42	21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48	08:27
	17:02	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:33	21:19	21:48	21:38	20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:56	08:31
	17:10	18:02	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:32
	17:11	18:04	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	16:37
22	08:23	07:36	06:37	06:32	05:43	05:28	05:51	06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05	08:34
	17:20	18:12	18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:13		07:18		05:34		06:03	06:49		07:23		08:35
	17:28		20:05		21:34		21:22	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
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+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: B - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (20)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

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	16:45	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15	17:13	16:38
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	16:47	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	16:37
4	08:35	08:07	07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:11	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08	16:37
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:10	19:04	17:05	16:36
8	08:33	08:01	07:07	07:00	06:03	05:29	05:36	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:22
	16:54	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:33	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	16:35
12	08:32	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43	08:25
	16:58	17:49	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44	08:26
	17:00	17:50	18:37	20:26	21:12	21:46	21:42	21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48	08:27
	17:02	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:33	21:19	21:48	21:38	20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
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	17:10	18:02	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:32
	17:11	18:04	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	16:37
22	08:23	07:36	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:33	16:46	16:37
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	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
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26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05	08:34
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27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:35
	17:25		20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40	16:42
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	17:26		20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39	16:43
31	08:13		07:18		05:34		06:03	06:49		07:23		08:35
	17:28		20:05		21:35		21:22	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
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Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: C - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (21)

Voraussetzungen für Berechnung des Schattenwurfs

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang
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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	08:35		10:21 (1)	08:11	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24			08:12		09:59 (1)
	16:45	2	10:23 (1)	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15			16:39	18	10:17 (1)
2	08:35		10:20 (1)	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26			08:13		10:00 (1)
	16:46	5	10:25 (1)	17:31	18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15	17:13			16:38	17	10:17 (1)
3	08:35		10:18 (1)	08:08	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28			08:14		10:00 (1)
	16:47	8	10:26 (1)	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12			16:37	16	10:16 (1)
4	08:35		10:18 (1)	08:07	07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29			08:16		10:02 (1)
	16:48	10	10:28 (1)	17:35	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:11	17:10			16:37	15	10:17 (1)
5	08:34		10:18 (1)	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31			08:17		10:02 (1)
	16:49	11	10:29 (1)	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08			16:37	14	10:16 (1)
6	08:34		10:17 (1)	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33			08:18		10:03 (1)
	16:50	13	10:30 (1)	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07			16:36	13	10:16 (1)
7	08:34		10:17 (1)	08:02	07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34			08:19		10:05 (1)
	16:52	14	10:31 (1)	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:10	19:04	17:05			16:36	11	10:16 (1)
8	08:33		10:17 (1)	08:01	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46	07:36			08:20		10:06 (1)
	16:53	15	10:32 (1)	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04			16:36	10	10:16 (1)
9	08:33		10:17 (1)	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38			08:22		10:07 (1)
	16:54	16	10:33 (1)	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02			16:35	8	10:15 (1)
10	08:33		10:17 (1)	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39			08:23		10:09 (1)
	16:55	17	10:34 (1)	17:45	18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01			16:35	6	10:15 (1)
11	08:32		10:17 (1)	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41			08:24		10:11 (1)
	16:57	18	10:35 (1)	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59			16:35	2	10:13 (1)
12	08:32		10:17 (1)	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43			08:25		
	16:58	19	10:36 (1)	17:49	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58			16:35		
13	08:31		10:17 (1)	07:52	06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44			08:26		
	17:00	19	10:36 (1)	17:50	18:37	20:26	21:12	21:46	21:42	21:00	19:56	18:51	16:57			16:35		
14	08:30		10:17 (1)	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46			08:26		
	17:01	19	10:36 (1)	17:52	18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55			16:35		
15	08:30		10:18 (1)	07:49	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48		10:00 (1)	08:27		
	17:02	20	10:38 (1)	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	7	10:07 (1)	16:35		
16	08:29		10:18 (1)	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49		09:57 (1)	08:28		
	17:04	20	10:38 (1)	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	11	10:08 (1)	16:35		
17	08:28		10:18 (1)	07:45	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00	07:51		09:57 (1)	08:29		
	17:05	20	10:38 (1)	17:57	18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	13	10:10 (1)	16:35		
18	08:27		10:18 (1)	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52		09:56 (1)	08:30		
	17:07	21	10:39 (1)	17:59	18:45	20:34	21:19	21:48	21:38	20:51	19:45	18:41	16:50	16	10:12 (1)	16:36		
19	08:26		10:19 (1)	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54		09:56 (1)	08:30		
	17:08	20	10:39 (1)	18:01	18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	17	10:13 (1)	16:36		
20	08:25		10:19 (1)	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:56		09:55 (1)	08:31		
	17:10	20	10:39 (1)	18:02	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	18	10:13 (1)	16:36		
21	08:24		10:20 (1)	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57		09:55 (1)	08:32		
	17:11	19	10:39 (1)	18:04	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	19	10:14 (1)	16:37		
22	08:23		10:20 (1)	07:36	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:59		09:55 (1)	08:32		
	17:13	18	10:38 (1)	18:06	18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:33	16:46	20	10:15 (1)	16:37		
23	08:22		10:21 (1)	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00		09:55 (1)	08:33		
	17:15	17	10:38 (1)	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	20	10:15 (1)	16:38		
24	08:21		10:22 (1)	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02		09:55 (1)	08:33		
	17:16	16	10:38 (1)	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	21	10:16 (1)	16:38		
25	08:20		10:24 (1)	07:30	06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03		09:56 (1)	08:33		
	17:18	13	10:37 (1)	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	20	10:16 (1)	16:39		
26	08:19		10:25 (1)	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05		09:56 (1)	08:34		
	17:20	10	10:35 (1)	18:12	18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42	20	10:16 (1)	16:40		
27	08:18		10:27 (1)	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06		09:57 (1)	08:34		
	17:21	7	10:34 (1)	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	20	10:17 (1)	16:40		
28	08:17			07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08		09:57 (1)	08:34		
	17:23			18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41	19	10:16 (1)	16:41		
29	08:15				07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:20	08:09		09:58 (1)	08:35		
	17:25				20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40	19	10:17 (1)	16:42		
30	08:14				07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10		09:58 (1)	08:35		
	17:26				20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39	19	10:17 (1)	16:43		
31	08:13				07:18		05:34		06:03	06:49		07:23				08:35		
	17:28				20:05		21:35		21:22	20:24		17:17				16:44		
Sonnenscheinstunden	268			282	368	412	477	488	492	448	380	334	273			254		
astr.max.mögl.Beschattung		407												279			130	

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: D - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (22)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15	16:38
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:37	21:48	21:18	20:20	19:15	17:13	16:38
3	08:35	08:08	07:18	07:11	06:11	05:32	05:33	06:07	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08	16:36
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:36	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:33	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:43	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57	05:28	05:40	06:20	07:06	07:52	07:43	08:25
	16:58	17:48	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:27	05:41	06:22	07:08	07:54	07:44	08:26
	16:59	17:50	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51	16:56	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48	08:27
	17:02	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:39	20:53	19:48	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:32
	17:11	18:04	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:27	05:51	06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05	08:34
	17:19	18:12	18:57	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:35
	17:28		20:05		21:34		21:22	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: E - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (23)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15	16:38
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15	17:13	16:38
3	08:35	08:08	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	16:37
4	08:35	08:07	07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:40	21:47	21:14	20:14	19:08	17:08	16:36
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:47	21:11	20:10	19:04	17:05	16:36
8	08:33	08:01	07:07	07:00	06:03	05:29	05:36	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:22
	16:54	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:33	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	16:35
12	08:32	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43	08:25
	16:58	17:49	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55	05:27	05:41	06:22	07:08	07:54	07:44	08:26
	16:59	17:50	18:37	20:26	21:12	21:46	21:43	21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:27
	17:01	17:52	18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48	08:27
	17:02	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:34	21:19	21:48	21:38	20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:56	08:31
	17:10	18:02	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:32
	17:11	18:04	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	16:37
22	08:23	07:36	06:37	06:32	05:43	05:28	05:51	06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:33	16:46	16:37
23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:34
	17:18	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05	08:34
	17:20	18:12	18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:17	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:20	08:09	08:35
	17:25		20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39	16:43
31	08:13		07:18		05:34		06:03	06:49		07:23		08:35
	17:28		20:05		21:35		21:22	20:24		17:17		16:44
Sonnenscheinstunden	267	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: F - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (24)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar			Februar			März	April	Mai	Juni	Juli	August	September	Oktober	November			Dezember
1	08:35			08:11		09:44 (1)	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24			08:12
	16:45			17:30	19	10:03 (1)	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15			16:39
2	08:35			08:10		09:45 (1)	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26			08:13
	16:46			17:31	17	10:02 (1)	18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15	17:13			16:38
3	08:35			08:08		09:46 (1)	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28			08:14
	16:47			17:33	15	10:01 (1)	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12			16:37
4	08:35			08:07		09:48 (1)	07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29			08:16
	16:48			17:35	12	10:00 (1)	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:11	17:10			16:37
5	08:34			08:05		09:51 (1)	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31			08:17
	16:49			17:36	7	09:58 (1)	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:09			16:37
6	08:34			08:04			07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33		09:20 (1)	08:18
	16:50			17:38			18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	8	09:28 (1)	16:36
7	08:34			08:02			07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34		09:18 (1)	08:19
	16:52			17:40			18:27	20:16	21:03	21:41	21:46	21:11	20:10	19:04	17:05	13	09:31 (1)	16:36
8	08:33			08:01			07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46	07:36		09:16 (1)	08:20
	16:53			17:42			18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	15	09:31 (1)	16:36
9	08:33			07:59			07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38		09:16 (1)	08:22
	16:54			17:43			18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16	09:32 (1)	16:35
10	08:33			07:57			07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39		09:15 (1)	08:23
	16:55			17:45			18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01	18	09:33 (1)	16:35
11	08:32			07:56			07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41		09:15 (1)	08:24
	16:57			17:47			18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	19	09:34 (1)	16:35
12	08:32			07:54			06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43		09:14 (1)	08:25
	16:58			17:49			18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	20	09:34 (1)	16:35
13	08:31			07:52			06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44		09:15 (1)	08:26
	17:00			17:50			18:37	20:26	21:12	21:46	21:42	21:00	19:56	18:52	16:57	20	09:35 (1)	16:35
14	08:30			07:50			06:54	06:48	05:54	05:27	05:42	06:24	07:10	07:55	07:46		09:15 (1)	08:26
	17:01			17:52			18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	20	09:35 (1)	16:35
15	08:30			07:49			06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48		09:15 (1)	08:27
	17:02			17:54			18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	20	09:35 (1)	16:35
16	08:29			07:47			06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49		09:15 (1)	08:28
	17:04			17:55			18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	20	09:35 (1)	16:35
17	08:28			07:45			06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:51		09:16 (1)	08:29
	17:05			17:57			18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	19	09:35 (1)	16:36
18	08:27			07:43			06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52		09:17 (1)	08:30
	17:07			17:59			18:45	20:34	21:19	21:48	21:38	20:51	19:45	18:41	16:50	18	09:35 (1)	16:36
19	08:26		09:47 (1)	07:41			06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54		09:18 (1)	08:30
	17:08	7	09:54 (1)	18:01			18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	17	09:35 (1)	16:36
20	08:25		09:46 (1)	07:39			06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:56		09:18 (1)	08:31
	17:10	10	09:56 (1)	18:02			18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48	15	09:33 (1)	16:36
21	08:24		09:45 (1)	07:37			06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57		09:20 (1)	08:32
	17:11	13	09:58 (1)	18:04			18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47	13	09:33 (1)	16:37
22	08:23		09:43 (1)	07:36			06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:59		09:22 (1)	08:32
	17:13	15	09:58 (1)	18:06			18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:33	16:46	10	09:32 (1)	16:37
23	08:22		09:43 (1)	07:34			06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00		09:23 (1)	08:33
	17:15	17	10:00 (1)	18:07			18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	7	09:30 (1)	16:38
24	08:21		09:43 (1)	07:32			06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02			08:33
	17:16	18	10:01 (1)	18:09			18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44			16:38
25	08:20		09:43 (1)	07:30			06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03			08:33
	17:18	19	10:02 (1)	18:11			18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43			16:39
26	08:19		09:42 (1)	07:28			06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05			08:34
	17:20	20	10:02 (1)	18:12			18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42			16:40
27	08:18		09:43 (1)	07:26			06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06			08:34
	17:21	19	10:02 (1)	18:14			18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41			16:40
28	08:17		09:43 (1)	07:24			06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08			08:34
	17:23	20	10:03 (1)	18:16			19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41			16:41
29	08:15		09:43 (1)				07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:20	08:09			08:35
	17:25	20	10:03 (1)				20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40			16:42
30	08:14		09:43 (1)				07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10			08:35
	17:26	20	10:03 (1)				20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39			16:43
31	08:13		09:43 (1)				07:18		05:34		06:03	06:49		07:23				08:35
	17:28	19	10:02 (1)				20:05		21:35		21:22	20:24		17:17				16:44
Sonnenscheinstunden	268			282			368	412	477	488	492	448	380	334	273			254
astr.max.mögl.Beschattung		217			70											288		

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: G - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (25)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar			Februar			März	April	Mai	Juni	Juli	August	September	Oktober	November			Dezember
1	08:35			08:11		09:35 (1)	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24			08:12
	16:45			17:30	20	09:55 (1)	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15			16:39
2	08:35			08:10		09:34 (1)	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26		09:13 (1)	08:13
	16:46			17:31	21	09:55 (1)	18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15	17:13	4	09:17 (1)	16:38
3	08:35			08:08		09:35 (1)	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28		09:09 (1)	08:14
	16:47			17:33	20	09:55 (1)	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	11	09:20 (1)	16:37
4	08:35			08:07		09:35 (1)	07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40	07:29		09:08 (1)	08:16
	16:48			17:35	19	09:54 (1)	18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:11	17:10	14	09:22 (1)	16:37
5	08:34			08:05		09:37 (1)	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31		09:07 (1)	08:17
	16:49			17:36	18	09:55 (1)	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:09	16	09:23 (1)	16:37
6	08:34			08:04		09:37 (1)	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33		09:06 (1)	08:18
	16:50			17:38	16	09:53 (1)	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	18	09:24 (1)	16:36
7	08:34			08:02		09:38 (1)	07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34		09:06 (1)	08:19
	16:52			17:40	14	09:52 (1)	18:27	20:16	21:03	21:41	21:46	21:11	20:10	19:04	17:05	19	09:25 (1)	16:36
8	08:33			08:01		09:40 (1)	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46	07:36		09:05 (1)	08:20
	16:53			17:42	10	09:50 (1)	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	20	09:25 (1)	16:36
9	08:33			07:59			07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38		09:05 (1)	08:22
	16:54			17:43			18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	21	09:26 (1)	16:35
10	08:33			07:57			07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49	07:39		09:06 (1)	08:23
	16:55			17:45			18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58	17:01	20	09:26 (1)	16:35
11	08:32			07:56			07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41		09:06 (1)	08:24
	16:57			17:47			18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	20	09:26 (1)	16:35
12	08:32			07:54			06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43		09:06 (1)	08:25
	16:58			17:49			18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	19	09:25 (1)	16:35
13	08:31			07:52			06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44		09:06 (1)	08:26
	17:00			17:50			18:37	20:26	21:12	21:46	21:42	21:00	19:56	18:52	16:57	19	09:25 (1)	16:35
14	08:30			07:50			06:54	06:48	05:54	05:27	05:42	06:24	07:10	07:55	07:46		09:07 (1)	08:26
	17:01			17:52			18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	18	09:25 (1)	16:35
15	08:30			07:49			06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:48		09:08 (1)	08:27
	17:02			17:54			18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	17	09:25 (1)	16:35
16	08:29			07:47			06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49		09:09 (1)	08:28
	17:04			17:55			18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	15	09:24 (1)	16:35
17	08:28			07:45			06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:51		09:10 (1)	08:29
	17:05			17:57			18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43	16:51	13	09:23 (1)	16:36
18	08:27			07:43			06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02	07:52		09:12 (1)	08:30
	17:07			17:59			18:45	20:34	21:19	21:48	21:38	20:51	19:45	18:41	16:50	10	09:22 (1)	16:36
19	08:26			07:41			06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54		09:15 (1)	08:30
	17:08			18:01			18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	5	09:20 (1)	16:36
20	08:25			07:39			06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:56			08:31
	17:10			18:02			18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37	16:48			16:36
21	08:24			07:37			06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57			08:32
	17:11			18:04			18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35	16:47			16:37
22	08:23			07:36			06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:59			08:32
	17:13			18:06			18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:33	16:46			16:37
23	08:22		09:40 (1)	07:34			06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00			08:33
	17:15	5	09:45 (1)	18:07			18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45			16:38
24	08:21		09:38 (1)	07:32			06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02			08:33
	17:16	10	09:48 (1)	18:09			18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44			16:38
25	08:20		09:37 (1)	07:30			06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03			08:33
	17:18	13	09:50 (1)	18:11			18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43			16:39
26	08:19		09:36 (1)	07:28			06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05			08:34
	17:20	15	09:51 (1)	18:12			18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26	16:42			16:40
27	08:18		09:35 (1)	07:26			06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06			08:34
	17:21	17	09:52 (1)	18:14			18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41			16:40
28	08:17		09:35 (1)	07:24			06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08			08:34
	17:23	18	09:53 (1)	18:16			19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41			16:41
29	08:15		09:34 (1)				07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:20	08:09			08:35
	17:25	20	09:54 (1)				20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20	16:40			16:42
30	08:14		09:35 (1)				07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10			08:35
	17:26	20	09:55 (1)				20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39			16:43
31	08:13		09:34 (1)				07:18		05:34		06:03	06:49		07:23				08:35
	17:28	20	09:54 (1)				20:05		21:35		21:22	20:24		17:17				16:44
Sonnenscheinstunden	268			282			368	412	477	488	492	448	380	334	273			254
astr.max.mögl.Beschattung		138			138											279		

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: H - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (26)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar		März	April	Mai	Juni	Juli	August	September	Oktober		November		Dezember
1	08:35	08:11		07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35		07:24	08:22 (1)	08:12
	16:45	17:30		18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17		17:15 15	08:37 (1)	16:39
2	08:35	08:10		07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37		07:26	08:24 (1)	08:13
	16:46	17:31		18:19	20:09	20:55	21:37	21:49	21:19	20:20	19:15		17:13 11	08:35 (1)	16:38
3	08:35	08:08		07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38		07:28	08:26 (1)	08:14
	16:47	17:33		18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13		17:12 6	08:32 (1)	16:37
4	08:35	08:07		07:16	07:09	06:10	05:31	05:33	06:09	06:55	07:40		07:29		08:16
	16:48	17:35		18:22	20:12	20:58	21:39	21:48	21:15	20:16	19:11		17:10		16:37
5	08:34	08:05		07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41		07:31		08:17
	16:49	17:37		18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08		17:09		16:37
6	08:34	08:04		07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43		07:33		08:18
	16:50	17:38		18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06		17:07		16:36
7	08:34	08:02		07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44		07:34		08:19
	16:52	17:40		18:27	20:16	21:03	21:41	21:46	21:11	20:10	19:04		17:05		16:36
8	08:33	08:01	08:56 (1)	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46		07:36		08:20
	16:53	17:42 7	09:03 (1)	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02		17:04		16:36
9	08:33	07:59	08:54 (1)	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47		07:38		08:22
	16:54	17:43 12	09:06 (1)	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00		17:02		16:35
10	08:33	07:57	08:53 (1)	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49		07:39		08:23
	16:55	17:45 14	09:07 (1)	18:32	20:21	21:07	21:44	21:45	21:05	20:03	18:58		17:01		16:35
11	08:32	07:56	08:51 (1)	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50		07:41		08:24
	16:57	17:47 17	09:08 (1)	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56		16:59		16:35
12	08:32	07:54	08:50 (1)	06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52		07:43		08:25
	16:58	17:49 19	09:09 (1)	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54		16:58		16:35
13	08:31	07:52	08:51 (1)	06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54		07:44		08:26
	17:00	17:50 19	09:10 (1)	18:37	20:26	21:12	21:46	21:42	21:00	19:56	18:52		16:57		16:35
14	08:30	07:50	08:50 (1)	06:54	06:48	05:54	05:27	05:42	06:24	07:10	07:55		07:46		08:27
	17:01	17:52 20	09:10 (1)	18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:49		16:55		16:35
15	08:30	07:49	08:50 (1)	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57		07:48		08:27
	17:02	17:54 20	09:10 (1)	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47		16:54		16:35
16	08:29	07:47	08:50 (1)	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58		07:49		08:28
	17:04	17:55 20	09:10 (1)	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45		16:53		16:35
17	08:28	07:45	08:51 (1)	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00		07:51		08:29
	17:05	17:57 18	09:09 (1)	18:43	20:32	21:17	21:48	21:39	20:53	19:48	18:43		16:51		16:36
18	08:27	07:43	08:51 (1)	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02		07:52		08:30
	17:07	17:59 17	09:08 (1)	18:45	20:34	21:19	21:48	21:38	20:51	19:46	18:41		16:50		16:36
19	08:26	07:41	08:52 (1)	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03		07:54		08:30
	17:08	18:01 15	09:07 (1)	18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39		16:49		16:36
20	08:25	07:39	08:53 (1)	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05		07:56		08:31
	17:10	18:02 12	09:05 (1)	18:48	20:37	21:21	21:49	21:36	20:47	19:41	18:37		16:48		16:36
21	08:24	07:37	08:56 (1)	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	09:25 (1)	07:57		08:32
	17:12	18:04 7	09:03 (1)	18:50	20:38	21:23	21:49	21:35	20:45	19:39	18:35 9	09:34 (1)	16:47		16:37
22	08:23	07:36		06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	09:23 (1)	07:59		08:32
	17:13	18:06		18:51	20:40	21:24	21:49	21:34	20:43	19:37	18:34 13	09:36 (1)	16:46		16:37
23	08:22	07:34		06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	09:22 (1)	08:00		08:33
	17:15	18:07		18:53	20:41	21:25	21:49	21:32	20:41	19:35	18:32 16	09:38 (1)	16:45		16:38
24	08:21	07:32		06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	09:21 (1)	08:02		08:33
	17:16	18:09		18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30 18	09:39 (1)	16:44		16:38
25	08:20	07:30		06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:20 (1)	08:03		08:33
	17:18	18:11		18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28 19	08:39 (1)	16:43		16:39
26	08:19	07:28		06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:20 (1)	08:05		08:34
	17:20	18:12		18:58	20:46	21:29	21:49	21:29	20:35	19:28	17:26 19	08:39 (1)	16:42		16:40
27	08:18	07:26		06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:20 (1)	08:06		08:34
	17:21	18:14		18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24 19	08:39 (1)	16:41		16:40
28	08:17	07:24		06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:20 (1)	08:08		08:34
	17:23	18:16		19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22 20	08:40 (1)	16:41		16:41
29	08:15			07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:20	08:20 (1)	08:09		08:35
	17:25			20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:20 18	08:38 (1)	16:40		16:42
30	08:14			07:20	06:17	05:35	05:31	06:02	06:47	07:34	07:21	08:20 (1)	08:10		08:35
	17:26			20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19 18	08:38 (1)	16:39		16:43
31	08:13			07:18		05:34		06:03	06:49		07:23	08:21 (1)			08:35
	17:28			20:05		21:35		21:22	20:24		17:17 17	08:38 (1)			16:44
Sonnenscheinstunden	268	282		368	412	477	488	492	448	380	334		273		254
astr.max.mögl.Beschattung			217									186		32	

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: I - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (27)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:12
	16:45	17:29	18:17	20:07	20:54	21:35	21:49	21:20	20:22	19:17	17:15	16:38
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:37	21:48	21:18	20:20	19:15	17:13	16:38
3	08:35	08:08	07:17	07:11	06:11	05:32	05:32	06:07	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:37	21:48	21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:09	05:31	05:33	06:09	06:55	07:39	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:38	21:48	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08	16:36
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:57	07:43	07:33	08:18
	16:50	17:38	18:25	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:02	06:04	05:30	05:35	06:13	06:59	07:44	07:34	08:19
	16:51	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:36	06:15	07:00	07:46	07:36	08:20
	16:53	17:41	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:17	07:03	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:43	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:22	21:09	21:44	21:44	21:03	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:56	05:28	05:40	06:20	07:06	07:52	07:43	08:25
	16:58	17:48	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:53	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:27	05:41	06:22	07:08	07:53	07:44	08:25
	16:59	17:50	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51	16:56	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:42	20:58	19:54	18:49	16:55	16:35
15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:52	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01	07:52	08:30
	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:43	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:45	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:37	21:21	21:48	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:32
	17:11	18:04	18:50	20:38	21:22	21:49	21:35	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:27	05:51	06:35	07:21	08:08	07:59	08:32
	17:13	18:05	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:56	06:41	07:27	07:14	08:05	08:34
	17:19	18:12	18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:00	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:20	06:16	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:35
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	267	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: J - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (28)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

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

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: K - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (29)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März			April	Mai			Juni		
1	08:35	08:11	07:22			07:15	06:15			05:34		06:12 (6)
	16:45	17:30	18:17			20:07	20:54			21:35	39	07:45 (5)
2	08:35	08:10	07:20			07:13	06:13			05:33		06:12 (6)
	16:46	17:31	18:19			20:09	20:55			21:37	43	07:46 (5)
3	08:35	08:08	07:18			07:11	06:11			05:32		06:10 (6)
	16:47	17:33	18:21			20:10	20:57			21:38	46	07:46 (5)
4	08:34	08:07	07:16			07:09	06:10			05:31		06:10 (6)
	16:48	17:35	18:22			20:12	20:58			21:38	50	07:48 (5)
5	08:34	08:05	07:13			07:07	06:08			05:31		06:09 (6)
	16:49	17:37	18:24			20:13	21:00			21:39	52	07:48 (5)
6	08:34	08:04	07:11			07:05	06:06			05:30		06:10 (6)
	16:51	17:38	18:26			20:15	21:01			21:40	52	07:49 (5)
7	08:34	08:02	07:09			07:03	06:05			05:30		06:09 (6)
	16:52	17:40	18:27			20:16	21:03			21:41	54	07:49 (5)
8	08:33	08:01	07:07		07:34 (2)	07:00	06:03			05:29		06:09 (6)
	16:53	17:42	18:29	12	07:46 (2)	20:18	21:04			21:42	56	07:50 (5)
9	08:33	07:59	07:05		07:31 (2)	06:58	06:01			05:29		06:08 (6)
	16:54	17:43	18:30	17	07:48 (2)	20:19	21:06			21:43	58	07:50 (5)
10	08:33	07:57	07:03		07:30 (2)	06:56	06:00			05:28		06:08 (6)
	16:56	17:45	18:32	22	17:32 (4)	20:21	21:07			21:43	60	07:51 (5)
11	08:32	07:56	07:01		07:28 (2)	06:54	05:58			05:28		06:09 (6)
	16:57	17:47	18:34	36	17:37 (4)	20:23	21:09			21:44	59	07:51 (5)
12	08:31	07:54	06:59		07:28 (2)	06:52	05:57			05:28		06:09 (6)
	16:58	17:49	18:35	43	17:40 (4)	20:24	21:10			21:45	61	07:52 (5)
13	08:31	07:52	06:57		07:26 (2)	06:50	05:55			05:28		06:09 (6)
	17:00	17:50	18:37	48	17:41 (4)	20:26	21:11			21:45	61	07:53 (5)
14	08:30	07:50	06:54		07:26 (2)	06:48	05:54			05:27		06:08 (6)
	17:01	17:52	18:39	51	17:42 (4)	20:27	21:13			21:46	62	07:52 (5)
15	08:30	07:49	06:52		07:25 (2)	06:46	05:52			05:27		06:09 (6)
	17:02	17:54	18:40	54	17:43 (4)	20:29	21:14			21:47	62	07:53 (5)
16	08:29	07:47	06:50		07:25 (2)	06:44	05:51			05:27		06:09 (6)
	17:04	17:55	18:42	55	17:44 (4)	20:30	21:16			21:47	62	07:53 (5)
17	08:28	07:45	06:48		07:25 (2)	06:42	05:50			05:27		06:09 (6)
	17:05	17:57	18:43	56	17:44 (4)	20:32	21:17			21:47	63	07:53 (5)
18	08:27	07:43	06:46		07:26 (2)	06:40	05:48			05:27		06:09 (6)
	17:07	17:59	18:45	55	17:45 (4)	20:33	21:18			21:48	63	07:53 (5)
19	08:26	07:41	06:44		07:26 (2)	06:38	05:47			05:27		06:10 (6)
	17:08	18:01	18:47	54	17:44 (4)	20:35	21:20			21:48	64	07:55 (5)
20	08:25	07:39	06:41		07:26 (2)	06:36	05:46			05:27		06:10 (6)
	17:10	18:02	18:48	53	17:44 (4)	20:37	21:21			21:48	64	07:55 (5)
21	08:24	07:37	06:39		07:28 (2)	06:34	05:44			05:27		06:10 (6)
	17:12	18:04	18:50	50	17:44 (4)	20:38	21:22			21:49	64	07:55 (5)
22	08:23	07:36	06:37		07:30 (2)	06:32	05:43			05:28		06:10 (6)
	17:13	18:06	18:51	44	17:43 (4)	20:40	21:24			21:49	64	07:55 (5)
23	08:22	07:34	06:35		07:35 (2)	06:30	05:42			05:28		06:10 (6)
	17:15	18:07	18:53	34	17:43 (4)	20:41	21:25			21:49	64	07:55 (5)
24	08:21	07:32	06:33		17:11 (4)	06:28	05:41			05:28		06:11 (6)
	17:16	18:09	18:54	30	17:41 (4)	20:43	21:26			21:49	64	07:56 (5)
25	08:20	07:30	06:31		17:11 (4)	06:26	05:40		07:22 (5)	05:29		06:11 (6)
	17:18	18:11	18:56	30	17:41 (4)	20:44	21:28	11	07:33 (5)	21:49	63	07:55 (5)
26	08:19	07:28	06:28		17:12 (4)	06:24	05:39		07:19 (5)	05:29		06:11 (6)
	17:20	18:12	18:58	28	17:40 (4)	20:46	21:29	17	07:36 (5)	21:49	62	07:55 (5)
27	08:18	07:26	06:26		17:13 (4)	06:22	05:38		07:17 (5)	05:29		06:12 (6)
	17:21	18:14	18:59	25	17:38 (4)	20:47	21:30	21	07:38 (5)	21:49	62	07:56 (5)
28	08:16	07:24	06:24		17:15 (4)	06:20	05:37		07:15 (5)	05:30		06:11 (6)
	17:23	18:16	19:01	22	17:37 (4)	20:49	21:31	25	07:40 (5)	21:49	62	07:55 (5)
29	08:15		07:22		18:17 (4)	06:18	05:36		07:14 (5)	05:30		06:12 (6)
	17:25		20:02	18	18:35 (4)	20:51	21:32	27	07:41 (5)	21:49	61	07:56 (5)
30	08:14		07:20		18:19 (4)	06:17	05:35		07:13 (5)	05:31		06:12 (6)
	17:26		20:04	12	18:31 (4)	20:52	21:33	30	07:43 (5)	21:49	60	07:55 (5)
31	08:12		07:18				05:34		07:12 (5)			
	17:28		20:05				21:34	32	07:44 (5)			
Sonnenscheinstunden	268	282	368			412	477			488		
astr.max.mögl.Beschattung				849				163			1757	

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: K - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (29)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Juli			August	September			Oktober			November	Dezember
1	05:31		06:13 (6)	06:05	06:50			07:35		08:06 (2)	07:24	08:12
	21:49	60	07:56 (5)	21:20	20:22			19:17	46	18:20 (4)	17:15	16:39
2	05:32		06:14 (6)	06:06	06:52			07:37		08:06 (2)	07:26	08:13
	21:48	59	07:56 (5)	21:18	20:20			19:15	39	18:17 (4)	17:14	16:38
3	05:33		06:13 (6)	06:08	06:53			07:38		08:07 (2)	07:28	08:14
	21:48	58	07:55 (5)	21:17	20:18			19:13	31	18:13 (4)	17:12	16:37
4	05:33		06:14 (6)	06:09	06:55			07:40		08:08 (2)	07:29	08:16
	21:48	56	07:55 (5)	21:15	20:16			19:11	18	08:26 (2)	17:10	16:37
5	05:34		06:15 (6)	06:10	06:56			07:41		08:09 (2)	07:31	08:17
	21:47	56	07:56 (5)	21:14	20:14			19:08	15	08:24 (2)	17:09	16:37
6	05:35		06:15 (6)	06:12	06:58			07:43		08:13 (2)	07:33	08:18
	21:47	54	07:55 (5)	21:12	20:12			19:06	8	08:21 (2)	17:07	16:36
7	05:36		06:15 (6)	06:13	06:59			07:44			07:34	08:19
	21:46	52	07:54 (5)	21:10	20:09			19:04			17:05	16:36
8	05:37		06:16 (6)	06:15	07:01			07:46			07:36	08:20
	21:46	50	07:54 (5)	21:09	20:07			19:02			17:04	16:36
9	05:37		06:17 (6)	06:16	07:02			07:47			07:38	08:21
	21:45	48	07:54 (5)	21:07	20:05			19:00			17:02	16:35
10	05:38		06:18 (6)	06:18	07:04			07:49			07:39	08:23
	21:45	45	07:54 (5)	21:05	20:03			18:58			17:01	16:35
11	05:39		06:20 (6)	06:19	07:05			07:50			07:41	08:24
	21:44	41	07:53 (5)	21:04	20:01			18:56			16:59	16:35
12	05:40		06:23 (6)	06:21	07:07			07:52			07:43	08:25
	21:43	34	07:53 (5)	21:02	19:59			18:54			16:58	16:35
13	05:41		07:21 (5)	06:22	07:08		18:11 (4)	07:54			07:44	08:26
	21:42	31	07:52 (5)	21:00	19:56	10	18:21 (4)	18:52			16:57	16:35
14	05:42		07:23 (5)	06:24	07:10		18:08 (4)	07:55			07:46	08:26
	21:42	28	07:51 (5)	20:58	19:54	17	18:25 (4)	18:49			16:55	16:35
15	05:43		07:24 (5)	06:25	07:11		18:05 (4)	07:57			07:48	08:27
	21:41	26	07:50 (5)	20:56	19:52	21	18:26 (4)	18:47			16:54	16:35
16	05:45		07:25 (5)	06:26	07:12		18:03 (4)	07:58			07:49	08:28
	21:40	23	07:48 (5)	20:54	19:50	25	18:28 (4)	18:45			16:53	16:35
17	05:46		07:27 (5)	06:28	07:14		18:01 (4)	08:00			07:51	08:29
	21:39	20	07:47 (5)	20:53	19:48	27	18:28 (4)	18:43			16:51	16:36
18	05:47		07:30 (5)	06:29	07:15		17:59 (4)	08:02			07:52	08:30
	21:38	14	07:44 (5)	20:51	19:45	29	18:28 (4)	18:41			16:50	16:36
19	05:48		07:34 (5)	06:31	07:17		17:58 (4)	08:03			07:54	08:30
	21:37	6	07:40 (5)	20:49	19:43	31	18:29 (4)	18:39			16:49	16:36
20	05:49			06:32	07:18		17:57 (4)	08:05			07:55	08:31
	21:36			20:47	19:41	31	18:28 (4)	18:37			16:48	16:37
21	05:50			06:34	07:20		08:16 (2)	08:06			07:57	08:32
	21:35			20:45	19:39	43	18:29 (4)	18:35			16:47	16:37
22	05:52			06:35	07:21		08:13 (2)	08:08			07:59	08:32
	21:33			20:43	19:37	48	18:28 (4)	18:33			16:46	16:37
23	05:53			06:37	07:23		08:11 (2)	08:10			08:00	08:33
	21:32			20:41	19:34	51	18:28 (4)	18:32			16:45	16:38
24	05:54			06:38	07:24		08:09 (2)	08:11			08:02	08:33
	21:31			20:39	19:32	55	18:28 (4)	18:30			16:44	16:38
25	05:55			06:40	07:26		08:09 (2)	07:13			08:03	08:33
	21:30			20:37	19:30	55	18:27 (4)	17:28			16:43	16:39
26	05:57			06:41	07:27		08:07 (2)	07:15			08:05	08:34
	21:28			20:35	19:28	55	18:26 (4)	17:26			16:42	16:40
27	05:58			06:43	07:29		08:07 (2)	07:16			08:06	08:34
	21:27			20:33	19:26	56	18:26 (4)	17:24			16:41	16:41
28	05:59			06:44	07:30		08:06 (2)	07:18			08:07	08:34
	21:26			20:31	19:24	54	18:24 (4)	17:22			16:41	16:41
29	06:01			06:46	07:32		08:06 (2)	07:19			08:09	08:34
	21:24			20:29	19:21	52	18:23 (4)	17:20			16:40	16:42
30	06:02			06:47	07:33		08:06 (2)	07:21			08:10	08:35
	21:23			20:26	19:19	48	18:21 (4)	17:19			16:39	16:43
31	06:03			06:49				07:23				08:35
	21:21			20:24				17:17				16:44
Sonnenscheinstunden	492			448	380			334			273	254
astr.max.mögl.Beschattung		761				708			157			

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: L - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (30)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:34	05:31	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:36	21:49	21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:09	20:55	21:37	21:48	21:18	20:20	19:15	17:14	16:38
3	08:35	08:08	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:38	21:48	21:17	20:18	19:13	17:12	16:38
4	08:34	08:07	07:16	07:09	06:10	05:32	05:34	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:38	21:48	21:15	20:16	19:11	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:11	06:56	07:41	07:31	08:17
	16:49	17:37	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:09	16:37
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:51	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:10	19:04	17:05	16:36
8	08:33	08:01	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	05:38	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:31	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:36
10	08:33	07:57	07:03	06:56	06:00	05:29	05:38	06:18	07:04	07:49	07:39	08:23
	16:56	17:45	18:32	20:21	21:07	21:43	21:45	21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:51	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:07	07:52	07:43	08:25
	16:58	17:49	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55	05:28	05:41	06:22	07:08	07:54	07:44	08:26
	17:00	17:50	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:52	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:28	05:42	06:24	07:10	07:55	07:46	08:26
	17:01	17:52	18:39	20:27	21:13	21:46	21:42	20:58	19:54	18:50	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52	05:27	05:44	06:25	07:11	07:57	07:48	08:27
	17:03	17:54	18:40	20:29	21:14	21:47	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:45	06:27	07:13	07:58	07:49	08:28
	17:04	17:56	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:39	20:53	19:48	18:43	16:52	16:36
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:30	07:16	08:02	07:52	08:30
	17:07	17:59	18:45	20:34	21:18	21:48	21:38	20:51	19:46	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:09	18:01	18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:37	21:21	21:48	21:36	20:47	19:41	18:37	16:48	16:37
21	08:24	07:37	06:39	06:34	05:45	05:28	05:50	06:34	07:20	08:06	07:57	08:32
	17:12	18:04	18:50	20:38	21:22	21:49	21:35	20:45	19:39	18:36	16:47	16:37
22	08:23	07:36	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:34	16:46	16:38
23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:35	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:39
25	08:20	07:30	06:31	06:26	05:40	05:29	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:15	08:05	08:34
	17:20	18:12	18:58	20:46	21:29	21:49	21:28	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:41
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:08	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41	16:41
29	08:15		07:22	06:19	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:51	21:32	21:49	21:24	20:29	19:21	17:21	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:34	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49	21:23	20:27	19:19	17:19	16:39	16:43
31	08:13		07:18		05:34		06:04	06:49		07:23		08:35
	17:28		20:05		21:34		21:22	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: M - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (31)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: N - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (32)

Voraussetzungen für Berechnung des Schattenwurfs

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

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Die Windenergieanlage/n ist/sind immer in Betrieb

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	16:45	17:30	18:17	20:07	20:54	21:35	21:49	21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:14	16:38
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	16:47	17:33	18:21	20:10	20:57	21:37	21:48	21:17	20:18	19:13	17:12	16:38
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5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:11	06:56	07:41	07:31	08:17
	16:49	17:37	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:09	16:37
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:51	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04	17:05	16:36
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	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	05:38	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:31	20:19	21:06	21:43	21:45	21:07	20:05	19:00	17:02	16:36
10	08:32	07:57	07:03	06:56	06:00	05:29	05:39	06:18	07:04	07:49	07:39	08:22
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	17:12	18:04	18:50	20:38	21:22	21:49	21:35	20:45	19:39	18:35	16:47	16:37
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23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:39
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28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
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Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: O - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (33)

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1	08:35	08:11	07:22	07:15	06:15	05:34	05:32	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:35	21:49	21:20	20:22	19:17	17:15	16:39
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	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:51	08:29
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	17:09	18:01	18:47	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
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	17:10	18:02	18:48	20:37	21:21	21:48	21:36	20:47	19:41	18:37	16:48	16:37
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	17:12	18:04	18:50	20:38	21:22	21:49	21:35	20:45	19:39	18:35	16:47	16:37
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23	08:22	07:34	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:39
25	08:20	07:30	06:31	06:26	05:40	05:29	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:05	08:34
	17:20	18:12	18:58	20:46	21:29	21:49	21:28	20:35	19:28	17:26	16:42	16:40
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	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:41
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:24	17:22	16:41	16:41
29	08:15		07:22	06:19	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
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31	08:12		07:18		05:34		06:04	06:49		07:23		08:35
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
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) Schattenende	(WEA mit letztem Schatten)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: P - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (34)

Voraussetzungen für Berechnung des Schattenwurfs

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:34	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:39
2	08:34	08:09	07:19	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
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3	08:34	08:08	07:17	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:56	21:37	21:48	21:17	20:18	19:13	17:12	16:38
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	16:48	17:35	18:22	20:11	20:58	21:38	21:47	21:15	20:16	19:10	17:10	16:37
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	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	05:38	06:16	07:02	07:47	07:37	08:21
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10	08:32	07:57	07:03	06:56	06:00	05:29	05:38	06:18	07:03	07:49	07:39	08:22
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12	08:31	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52	07:42	08:24
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15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:46	21:40	20:56	19:52	18:47	16:54	16:35
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19	08:26	07:41	06:43	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:47	19:41	18:37	16:48	16:37
21	08:24	07:37	06:39	06:34	05:44	05:28	05:50	06:34	07:20	08:06	07:57	08:31
	17:12	18:04	18:50	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:58	08:32
	17:13	18:06	18:51	20:39	21:23	21:49	21:33	20:43	19:37	18:33	16:46	16:37
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24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:39
25	08:20	07:29	06:30	06:26	05:40	05:29	05:55	06:40	07:26	07:13	08:03	08:33
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27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:26	17:24	16:41	16:41
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
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	17:25		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
astr.max.mögl.Beschattung												

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: Q - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (35)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:34	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:39
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	16:51	17:38	18:25	20:15	21:01	21:40	21:47	21:12	20:11	19:06	17:07	16:36
7	08:33	08:02	07:09	07:02	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04	17:05	16:36
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	16:54	17:43	18:30	20:19	21:05	21:42	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:29	05:38	06:18	07:03	07:49	07:39	08:22
	16:56	17:45	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:23
	16:57	17:47	18:34	20:22	21:08	21:44	21:44	21:03	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52	07:42	08:24
	16:58	17:49	18:35	20:24	21:10	21:44	21:43	21:02	19:58	18:53	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:28	05:41	06:22	07:08	07:53	07:44	08:25
	17:00	17:50	18:37	20:25	21:11	21:45	21:42	21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:28	05:42	06:24	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49	16:55	16:35
15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:46	21:40	20:56	19:52	18:47	16:54	16:35
16	08:28	07:47	06:50	06:44	05:51	05:27	05:45	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:15	21:47	21:39	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:50	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43	16:51	16:36
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01	07:52	08:29
	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41	16:50	16:36
19	08:26	07:41	06:43	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:47	19:41	18:37	16:48	16:37
21	08:24	07:37	06:39	06:34	05:44	05:28	05:50	06:34	07:20	08:06	07:57	08:31
	17:12	18:04	18:50	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:58	08:32
	17:13	18:06	18:51	20:39	21:23	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:39
25	08:20	07:29	06:30	06:26	05:40	05:29	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:27	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:04	08:33
	17:20	18:12	18:57	20:46	21:28	21:49	21:28	20:35	19:28	17:26	16:42	16:40
27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:41
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:30	19:23	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: R - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (36)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:38
2	08:34	08:09	07:19	07:13	06:13	05:33	05:32	06:06	06:51	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:13	16:38
3	08:34	08:08	07:17	07:11	06:11	05:32	05:33	06:07	06:53	07:38	07:27	08:14
	16:47	17:33	18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:12	17:12	16:37
4	08:34	08:06	07:15	07:09	06:09	05:31	05:33	06:09	06:54	07:39	07:29	08:15
	16:48	17:35	18:22	20:11	20:58	21:38	21:47	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:16
	16:49	17:36	18:24	20:13	20:59	21:39	21:47	21:13	20:14	19:08	17:08	16:36
6	08:34	08:03	07:11	07:04	06:06	05:30	05:35	06:12	06:57	07:42	07:32	08:18
	16:50	17:38	18:25	20:14	21:01	21:40	21:47	21:12	20:11	19:06	17:07	16:36
7	08:33	08:02	07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:36	06:15	07:00	07:46	07:36	08:20
	16:53	17:41	18:29	20:18	21:04	21:42	21:45	21:08	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:37	08:21
	16:54	17:43	18:30	20:19	21:05	21:42	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49	07:39	08:22
	16:55	17:45	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:23
	16:57	17:47	18:33	20:22	21:08	21:44	21:44	21:03	20:01	18:55	16:59	16:35
12	08:31	07:54	06:58	06:52	05:57	05:28	05:40	06:20	07:06	07:52	07:42	08:24
	16:58	17:48	18:35	20:24	21:10	21:44	21:43	21:01	19:58	18:53	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:28	05:41	06:22	07:08	07:53	07:44	08:25
	16:59	17:50	18:37	20:25	21:11	21:45	21:42	21:00	19:56	18:51	16:56	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49	16:55	16:35
15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:56	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:46	21:40	20:56	19:52	18:47	16:54	16:35
16	08:28	07:46	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:15	21:47	21:39	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00	07:50	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:38	20:52	19:47	18:43	16:51	16:35
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01	07:52	08:29
	17:07	17:59	18:45	20:33	21:18	21:47	21:37	20:50	19:45	18:41	16:50	16:36
19	08:26	07:41	06:43	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:19	21:48	21:36	20:48	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:04	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:46	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:11	18:04	18:49	20:38	21:22	21:48	21:34	20:44	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	05:51	06:35	07:21	08:08	07:58	08:32
	17:13	18:05	18:51	20:39	21:23	21:49	21:33	20:43	19:36	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:42	21:26	21:49	21:31	20:39	19:32	18:29	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:10	18:56	20:44	21:27	21:49	21:29	20:36	19:30	17:28	16:43	16:39
26	08:19	07:27	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:04	08:33
	17:19	18:12	18:57	20:46	21:28	21:49	21:28	20:34	19:28	17:26	16:42	16:40
27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:25	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:15	19:00	20:49	21:31	21:49	21:25	20:30	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:19	06:16	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:18	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:22		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
astr.max.mögl.Beschattung												

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

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

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
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+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: S - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (37)

Voraussetzungen für Berechnung des Schattenwurfs

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

	Januar	Februar			März			April			Mai	Juni
1	08:35	08:11			07:21			07:15		19:05 (2)	06:15	05:33
	16:45	17:30			18:17			20:07	19	19:24 (2)	20:53	21:35
2	08:35	08:10		16:50 (3)	07:19			07:13		19:06 (2)	06:13	05:33
	16:46	17:31	4	16:54 (3)	18:19			20:08	17	19:23 (2)	20:55	21:36
3	08:34	08:08		16:47 (3)	07:17			07:11		19:07 (2)	06:11	05:32
	16:47	17:33	10	16:57 (3)	18:21			20:10	14	19:21 (2)	20:56	21:37
4	08:34	08:07		16:46 (3)	07:15			07:09		19:07 (2)	06:09	05:31
	16:48	17:35	13	16:59 (3)	18:22			20:11	12	19:19 (2)	20:58	21:38
5	08:34	08:05		16:44 (3)	07:13			07:07		19:10 (2)	06:08	05:31
	16:49	17:36	16	17:00 (3)	18:24			20:13	5	19:15 (2)	20:59	21:39
6	08:34	08:04		16:44 (3)	07:11			07:05			06:06	05:30
	16:50	17:38	18	17:02 (3)	18:25			20:15			21:01	21:40
7	08:34	08:02		16:43 (3)	07:09			07:02			06:04	05:30
	16:52	17:40	19	17:02 (3)	18:27			20:16			21:03	21:41
8	08:33	08:00		16:43 (3)	07:07			07:00			06:03	05:29
	16:53	17:42	20	17:03 (3)	18:29			20:18			21:04	21:42
9	08:33	07:59		16:43 (3)	07:05			06:58			06:01	05:29
	16:54	17:43	21	17:04 (3)	18:30			20:19			21:05	21:43
10	08:32	07:57		16:43 (3)	07:03			06:56			06:00	05:28
	16:55	17:45	20	17:03 (3)	18:32			20:21			21:07	21:43
11	08:32	07:55		16:43 (3)	07:01			06:54			05:58	05:28
	16:57	17:47	20	17:03 (3)	18:34			20:22			21:08	21:44
12	08:31	07:54		16:43 (3)	06:59			06:52			05:57	05:28
	16:58	17:48	20	17:03 (3)	18:35			20:24			21:10	21:45
13	08:31	07:52		16:44 (3)	06:56			06:50			05:55	05:27
	16:59	17:50	18	17:02 (3)	18:37			20:26			21:11	21:45
14	08:30	07:50		16:45 (3)	06:54			06:48			05:54	05:27
	17:01	17:52	17	17:02 (3)	18:38			20:27			21:13	21:46
15	08:29	07:48		16:46 (3)	06:52			06:46			05:52	05:27
	17:02	17:54	15	17:01 (3)	18:40			20:29			21:14	21:46
16	08:29	07:47		16:48 (3)	06:50			06:44			05:51	05:27
	17:04	17:55	11	16:59 (3)	18:42			20:30			21:16	21:47
17	08:28	07:45		16:52 (3)	06:48			06:42			05:49	05:27
	17:05	17:57	3	16:55 (3)	18:43			20:32			21:17	21:47
18	08:27	07:43			06:46			06:40			05:48	05:27
	17:07	17:59			18:45			20:33			21:18	21:48
19	08:26	07:41			06:43			06:38			05:47	05:27
	17:08	18:00			18:46			20:35			21:20	21:48
20	08:25	07:39			06:41			06:36			05:46	05:27
	17:10	18:02			18:48			20:36			21:21	21:48
21	08:24	07:37			06:39			06:34			05:44	05:27
	17:11	18:04			18:50			20:38			21:22	21:49
22	08:23	07:35			06:37			06:32			05:43	05:28
	17:13	18:05			18:51			20:40			21:24	21:49
23	08:22	07:33			06:35			06:30			05:42	05:28
	17:15	18:07			18:53			20:41			21:25	21:49
24	08:21	07:31			06:33		18:14 (2)	06:28			05:41	05:28
	17:16	18:09			18:54	5	18:19 (2)	20:43			21:26	21:49
25	08:20	07:30			06:30		18:11 (2)	06:26			05:40	05:28
	17:18	18:11			18:56	11	18:22 (2)	20:44			21:27	21:49
26	08:19	07:28			06:28		18:09 (2)	06:24			05:39	05:29
	17:19	18:12			18:57	15	18:24 (2)	20:46			21:29	21:49
27	08:18	07:26			06:26		18:08 (2)	06:22			05:38	05:29
	17:21	18:14			18:59	17	18:25 (2)	20:47			21:30	21:49
28	08:16	07:24			06:24		18:07 (2)	06:20			05:37	05:30
	17:23	18:16			19:01	18	18:25 (2)	20:49			21:31	21:49
29	08:15				07:22		19:05 (2)	06:18			05:36	05:30
	17:24				20:02	19	19:24 (2)	20:50			21:32	21:49
30	08:14				07:20		19:05 (2)	06:17			05:35	05:31
	17:26				20:04	19	19:24 (2)	20:52			21:33	21:49
31	08:12				07:17		19:05 (2)				05:34	
	17:28				20:05	19	19:24 (2)				21:34	
Sonnenscheinstunden	268	282			368			412			477	488
astr.max.mögl.Beschattung			245			123			67			

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: S - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (37)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Juli	August	September			Oktober			November			Dezember
1	05:31	06:05	06:50			07:35			07:24		16:13 (3)	08:11
	21:49	21:20	20:22			19:17			17:15	20	16:33 (3)	16:38
2	05:32	06:06	06:52			07:36			07:26		16:12 (3)	08:13
	21:48	21:18	20:20			19:15			17:13	20	16:32 (3)	16:38
3	05:33	06:07	06:53			07:38			07:28		16:13 (3)	08:14
	21:48	21:17	20:18			19:13			17:12	19	16:32 (3)	16:37
4	05:33	06:09	06:55			07:39			07:29		16:13 (3)	08:15
	21:48	21:15	20:16			19:10			17:10	19	16:32 (3)	16:37
5	05:34	06:10	06:56			07:41			07:31		16:14 (3)	08:17
	21:47	21:14	20:14			19:08			17:08	18	16:32 (3)	16:36
6	05:35	06:12	06:57			07:43			07:33		16:14 (3)	08:18
	21:47	21:12	20:11			19:06			17:07	16	16:30 (3)	16:36
7	05:36	06:13	06:59		19:06 (2)	07:44			07:34		16:16 (3)	08:19
	21:46	21:10	20:09	4	19:10 (2)	19:04			17:05	13	16:29 (3)	16:36
8	05:36	06:15	07:00		19:02 (2)	07:46			07:36		16:18 (3)	08:20
	21:46	21:09	20:07	12	19:14 (2)	19:02			17:04	10	16:28 (3)	16:35
9	05:37	06:16	07:02		19:00 (2)	07:47			07:38		16:21 (3)	08:21
	21:45	21:07	20:05	15	19:15 (2)	19:00			17:02	3	16:24 (3)	16:35
10	05:38	06:18	07:03		18:59 (2)	07:49			07:39			08:22
	21:44	21:05	20:03	17	19:16 (2)	18:58			17:01			16:35
11	05:39	06:19	07:05		18:58 (2)	07:50			07:41			08:23
	21:44	21:03	20:01	18	19:16 (2)	18:56			16:59			16:35
12	05:40	06:20	07:06		18:57 (2)	07:52			07:42			08:24
	21:43	21:02	19:58	19	19:16 (2)	18:53			16:58			16:35
13	05:41	06:22	07:08		18:56 (2)	07:53			07:44			08:25
	21:42	21:00	19:56	20	19:16 (2)	18:51			16:56			16:35
14	05:42	06:23	07:09		18:55 (2)	07:55			07:46			08:26
	21:41	20:58	19:54	20	19:15 (2)	18:49			16:55			16:35
15	05:43	06:25	07:11		18:56 (2)	07:57			07:47			08:27
	21:41	20:56	19:52	19	19:15 (2)	18:47			16:54			16:35
16	05:44	06:26	07:12		18:56 (2)	07:58			07:49			08:28
	21:40	20:54	19:50	17	19:13 (2)	18:45			16:53			16:35
17	05:45	06:28	07:14		18:57 (2)	08:00			07:51			08:29
	21:39	20:52	19:48	15	19:12 (2)	18:43			16:51			16:35
18	05:47	06:29	07:15		18:58 (2)	08:01			07:52			08:29
	21:38	20:50	19:45	12	19:10 (2)	18:41			16:50			16:36
19	05:48	06:31	07:17		19:00 (2)	08:03			07:54			08:30
	21:37	20:49	19:43	8	19:08 (2)	18:39			16:49			16:36
20	05:49	06:32	07:18			08:05			07:55			08:31
	21:36	20:47	19:41			18:37			16:48			16:36
21	05:50	06:34	07:20			08:06			07:57			08:31
	21:34	20:45	19:39			18:35			16:47			16:37
22	05:51	06:35	07:21			08:08			07:58			08:32
	21:33	20:43	19:37			18:33			16:46			16:37
23	05:53	06:37	07:23			08:09			08:00			08:32
	21:32	20:41	19:34			18:31			16:45			16:38
24	05:54	06:38	07:24			08:11			08:01			08:33
	21:31	20:39	19:32			18:30			16:44			16:38
25	05:55	06:40	07:26			07:13		16:20 (3)	08:03			08:33
	21:30	20:37	19:30			17:28	6	16:26 (3)	16:43			16:39
26	05:57	06:41	07:27			07:14		16:17 (3)	08:04			08:34
	21:28	20:35	19:28			17:26	12	16:29 (3)	16:42			16:40
27	05:58	06:43	07:29			07:16		16:16 (3)	08:06			08:34
	21:27	20:33	19:26			17:24	15	16:31 (3)	16:41			16:40
28	05:59	06:44	07:30			07:18		16:14 (3)	08:07			08:34
	21:26	20:30	19:23			17:22	17	16:31 (3)	16:40			16:41
29	06:01	06:46	07:32			07:19		16:13 (3)	08:09			08:34
	21:24	20:28	19:21			17:20	19	16:32 (3)	16:40			16:42
30	06:02	06:47	07:33			07:21		16:13 (3)	08:10			08:34
	21:23	20:26	19:19			17:19	19	16:32 (3)	16:39			16:43
31	06:03	06:49				07:23		16:13 (3)				08:34
	21:21	20:24				17:17	20	16:33 (3)				16:44
Sonnenscheinstunden	492	448	380			334			273			254
astr.max.mögl.Beschattung				196			108			138		

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
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Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: T - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (38)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar			März	April	Mai	Juni	Juli	August	September	Oktober			November	Dezember
1	08:35	08:11			07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35			07:24	08:11
	16:45	17:30			18:17	20:07	20:53	21:35	21:49	21:20	20:22	19:17			17:15	16:38
2	08:35	08:10			07:19	07:13	06:13	05:33	05:32	06:06	06:52	07:36			07:26	08:13
	16:46	17:31			18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15			17:13	16:38
3	08:34	08:08			07:17	07:11	06:11	05:32	05:33	06:07	06:53	07:38			07:28	08:14
	16:47	17:33			18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:13			17:12	16:37
4	08:34	08:07			07:15	07:09	06:09	05:31	05:33	06:09	06:55	07:39			07:29	08:15
	16:48	17:35			18:22	20:11	20:58	21:38	21:48	21:15	20:16	19:10			17:10	16:37
5	08:34	08:05			07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41			07:31	08:17
	16:49	17:36			18:24	20:13	20:59	21:39	21:47	21:14	20:14	19:08			17:08	16:36
6	08:34	08:04			07:11	07:05	06:06	05:30	05:35	06:12	06:57	07:43			07:33	08:18
	16:50	17:38			18:25	20:15	21:01	21:40	21:47	21:12	20:11	19:06			17:07	16:36
7	08:34	08:02			07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44			07:34	08:19
	16:52	17:40			18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04			17:05	16:36
8	08:33	08:00			07:07	07:00	06:03	05:29	05:36	06:15	07:00	07:46			07:36	08:20
	16:53	17:42			18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02			17:04	16:35
9	08:33	07:59			07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47			07:38	08:21
	16:54	17:43			18:30	20:19	21:05	21:43	21:45	21:07	20:05	19:00			17:02	16:35
10	08:32	07:57		17:04 (3)	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49			07:39	08:22
	16:55	17:45	3	17:07 (3)	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58			17:01	16:35
11	08:32	07:55		17:00 (3)	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50			07:41	08:23
	16:57	17:47	11	17:11 (3)	18:34	20:22	21:08	21:44	21:44	21:03	20:01	18:56			16:59	16:35
12	08:31	07:54		16:58 (3)	06:59	06:52	05:57	05:28	05:40	06:20	07:06	07:52			07:42	08:24
	16:58	17:48	14	17:12 (3)	18:35	20:24	21:10	21:45	21:43	21:02	19:58	18:53			16:58	16:35
13	08:31	07:52		16:57 (3)	06:56	06:50	05:55	05:27	05:41	06:22	07:08	07:53			07:44	08:25
	16:59	17:50	16	17:13 (3)	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51			16:56	16:35
14	08:30	07:50		16:57 (3)	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55			07:46	08:26
	17:01	17:52	18	17:15 (3)	18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49			16:55	16:35
15	08:29	07:48		16:57 (3)	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57			07:47	08:27
	17:02	17:54	18	17:15 (3)	18:40	20:29	21:14	21:46	21:41	20:56	19:52	18:47			16:54	16:35
16	08:29	07:47		16:56 (3)	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58			07:49	08:28
	17:04	17:55	19	17:15 (3)	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45			16:53	16:35
17	08:28	07:45		16:56 (3)	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00			07:51	08:29
	17:05	17:57	19	17:15 (3)	18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43			16:51	16:35
18	08:27	07:43		16:56 (3)	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01			07:52	08:29
	17:07	17:59	19	17:15 (3)	18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41			16:50	16:36
19	08:26	07:41		16:56 (3)	06:43	06:38	05:47	05:27	05:48	06:31	07:17	08:03		17:32 (3)	07:54	08:30
	17:08	18:00	19	17:15 (3)	18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39	9	17:41 (3)	16:49	16:36
20	08:25	07:39		16:57 (3)	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05		17:30 (3)	07:55	08:31
	17:10	18:02	17	17:14 (3)	18:48	20:36	21:21	21:48	21:36	20:47	19:41	18:37	13	17:43 (3)	16:48	16:36
21	08:24	07:37		16:58 (3)	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06		17:28 (3)	07:57	08:31
	17:11	18:04	15	17:13 (3)	18:50	20:38	21:22	21:49	21:34	20:45	19:39	18:35	16	17:44 (3)	16:47	16:37
22	08:23	07:35		16:59 (3)	06:37	06:32	05:43	05:28	05:51	06:35	07:21	08:08		17:27 (3)	07:58	08:32
	17:13	18:05	12	17:11 (3)	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	17	17:44 (3)	16:46	16:37
23	08:22	07:33		17:02 (3)	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09		17:27 (3)	08:00	08:32
	17:15	18:07	7	17:09 (3)	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	18	17:45 (3)	16:45	16:38
24	08:21	07:31			06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11		17:25 (3)	08:01	08:33
	17:16	18:09			18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	20	17:45 (3)	16:44	16:38
25	08:20	07:29			06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13		16:25 (3)	08:03	08:33
	17:18	18:11			18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	20	16:45 (3)	16:43	16:39
26	08:19	07:28			06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14		16:26 (3)	08:04	08:34
	17:19	18:12			18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26	19	16:45 (3)	16:42	16:40
27	08:18	07:26			06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16		16:26 (3)	08:06	08:34
	17:21	18:14			18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	19	16:45 (3)	16:41	16:40
28	08:16	07:24			06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18		16:26 (3)	08:07	08:34
	17:23	18:16			19:01	20:49	21:31	21:49	21:26	20:30	19:23	17:22	17	16:43 (3)	16:40	16:41
29	08:15				07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19		16:27 (3)	08:09	08:34
	17:24				20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16	16:43 (3)	16:40	16:42
30	08:14				07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21		16:28 (3)	08:10	08:34
	17:26				20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	14	16:42 (3)	16:39	16:43
31	08:12				07:17		05:34		06:03	06:49		07:23		16:30 (3)		08:34
	17:28				20:05		21:34		21:21	20:24		17:17	10	16:40 (3)		16:44
Sonnenscheinstunden	268	282			368	412	477	488	492	448	380	334			273	254
astr.max.mögl.Beschattung			207										208			

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
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Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: U - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (39)

Voraussetzungen für Berechnung des Schattenwurfs

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

Die Sonne scheint täglich von Sonnenauf- bis -untergang
Die Rotorfläche steht immer senkrecht zur Sonneneinfallsrichtung
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	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:49	21:20	20:22	19:17	17:15	16:38
2	08:35	08:09	07:19	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:13	16:38
3	08:34	08:08	07:17	07:11	06:11	05:32	05:33	06:07	06:53	07:38	07:28	08:14
	16:47	17:33	18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:09	05:31	05:33	06:09	06:55	07:39	07:29	08:15
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	16:59	17:50	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51	16:56	16:35
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	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00	07:51	08:29
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	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
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	17:10	18:02	18:48	20:36	21:21	21:48	21:36	20:47	19:41	18:37	16:48	16:36
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	17:11	18:04	18:49	20:38	21:22	21:49	21:34	20:45	19:39	18:35	16:47	16:37
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	17:13	18:05	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:04	08:34
	17:19	18:12	18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
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29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
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	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: V - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (40)

Voraussetzungen für Berechnung des Schattenwurfs

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:29	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:38
2	08:34	08:09	07:19	07:13	06:13	05:33	05:32	06:06	06:51	07:36	07:26	08:13
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	16:47	17:33	18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:12	17:12	16:37
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5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
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9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:37	08:21
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15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
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	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:35	05:45	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:46	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:11	18:04	18:49	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:27	05:51	06:35	07:21	08:08	07:58	08:32
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24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:29	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
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27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:25	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:15	19:00	20:49	21:31	21:49	21:26	20:30	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:00	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:19	06:16	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:18	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
astr.max.mögl.Beschattung												

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: W - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (41)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:29	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:38
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	16:47	17:33	18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:12	17:12	16:37
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	16:48	17:35	18:22	20:11	20:58	21:38	21:47	21:15	20:16	19:10	17:10	16:37
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6	08:34	08:03	07:11	07:04	06:06	05:30	05:35	06:12	06:57	07:42	07:32	08:18
	16:50	17:38	18:25	20:15	21:01	21:40	21:47	21:12	20:11	19:06	17:07	16:36
7	08:33	08:02	07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:36	06:15	07:00	07:46	07:36	08:20
	16:53	17:41	18:29	20:18	21:04	21:42	21:46	21:08	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:37	08:21
	16:54	17:43	18:30	20:19	21:05	21:42	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:17	07:03	07:49	07:39	08:22
	16:55	17:45	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:23
	16:57	17:47	18:33	20:22	21:08	21:44	21:44	21:03	20:01	18:55	16:59	16:35
12	08:31	07:54	06:58	06:52	05:56	05:28	05:40	06:20	07:06	07:52	07:42	08:24
	16:58	17:48	18:35	20:24	21:10	21:45	21:43	21:01	19:58	18:53	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:27	05:41	06:22	07:08	07:53	07:44	08:25
	16:59	17:50	18:37	20:25	21:11	21:45	21:42	21:00	19:56	18:51	16:56	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49	16:55	16:35
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	17:04	17:55	18:41	20:30	21:15	21:47	21:39	20:54	19:50	18:45	16:52	16:35
17	08:28	07:45	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00	07:50	08:29
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18	08:27	07:43	06:46	06:39	05:48	05:27	05:47	06:29	07:15	08:01	07:52	08:29
	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41	16:50	16:36
19	08:26	07:41	06:43	06:37	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
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	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:46	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:11	18:04	18:49	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:27	05:51	06:35	07:21	08:08	07:58	08:32
	17:13	18:05	18:51	20:39	21:23	21:49	21:33	20:43	19:36	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:29	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:10	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:27	06:28	06:24	05:39	05:29	05:56	06:41	07:27	07:14	08:04	08:33
	17:19	18:12	18:57	20:46	21:28	21:49	21:28	20:34	19:28	17:26	16:42	16:40
27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:25	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:15	19:00	20:49	21:31	21:49	21:26	20:30	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:00	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:19	06:16	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:18	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
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) Schattenende	(WEA mit letztem Schatten)

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: X - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (42)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:33	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:29	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:38
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	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:13	16:38
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	16:47	17:33	18:20	20:10	20:56	21:37	21:48	21:17	20:18	19:12	17:12	16:37
4	08:34	08:06	07:15	07:09	06:09	05:31	05:33	06:09	06:54	07:39	07:29	08:15
	16:48	17:35	18:22	20:11	20:58	21:38	21:47	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	20:59	21:39	21:47	21:13	20:14	19:08	17:08	16:36
6	08:34	08:03	07:11	07:04	06:06	05:30	05:35	06:12	06:57	07:42	07:32	08:18
	16:50	17:38	18:25	20:15	21:01	21:40	21:47	21:12	20:11	19:06	17:07	16:36
7	08:33	08:02	07:09	07:02	06:04	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:36	06:15	07:00	07:46	07:36	08:20
	16:53	17:41	18:29	20:18	21:04	21:42	21:46	21:08	20:07	19:02	17:04	16:35
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:37	08:21
	16:54	17:43	18:30	20:19	21:05	21:42	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:17	07:03	07:49	07:39	08:22
	16:55	17:45	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:23
	16:57	17:47	18:33	20:22	21:08	21:44	21:44	21:03	20:01	18:55	16:59	16:35
12	08:31	07:54	06:58	06:52	05:56	05:28	05:40	06:20	07:06	07:52	07:42	08:24
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13	08:31	07:52	06:56	06:50	05:55	05:27	05:41	06:22	07:08	07:53	07:44	08:25
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14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
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15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
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16	08:28	07:46	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58	07:49	08:28
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17	08:28	07:45	06:48	06:42	05:49	05:27	05:45	06:28	07:14	08:00	07:50	08:29
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	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41	16:50	16:36
19	08:26	07:41	06:43	06:37	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:48	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:35	05:45	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:46	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:11	18:04	18:49	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:27	05:51	06:35	07:21	08:08	07:58	08:32
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23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:29	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:10	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:27	06:28	06:24	05:39	05:29	05:56	06:41	07:27	07:14	08:04	08:33
	17:19	18:12	18:57	20:46	21:28	21:49	21:28	20:34	19:28	17:26	16:42	16:40
27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:25	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:15	19:00	20:49	21:31	21:49	21:26	20:30	19:23	17:22	16:40	16:41
29	08:15		07:22	06:18	05:36	05:30	06:00	06:46	07:32	07:19	08:09	08:34
	17:24		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:19	06:16	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:18	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	334	273	254
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) Schattenende	(WEA mit letztem Schatten)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
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+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserSchattenrezeptor: Y - Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (43)

Voraussetzungen für Berechnung des Schattenwurfs

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:34	08:11	07:21	07:15	06:15	05:34	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:48	21:20	20:22	19:17	17:15	16:39
2	08:34	08:09	07:19	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:13	16:38
3	08:34	08:08	07:17	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:27	08:14
	16:47	17:33	18:21	20:10	20:56	21:37	21:48	21:17	20:18	19:13	17:12	16:37
4	08:34	08:06	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:39	07:29	08:15
	16:48	17:35	18:22	20:11	20:58	21:38	21:47	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:16
	16:49	17:36	18:24	20:13	20:59	21:39	21:47	21:13	20:14	19:08	17:08	16:37
6	08:34	08:03	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:42	07:32	08:18
	16:50	17:38	18:25	20:15	21:01	21:40	21:47	21:12	20:11	19:06	17:07	16:36
7	08:33	08:02	07:09	07:02	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:02	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:37	06:15	07:00	07:46	07:36	08:20
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9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:37	08:21
	16:54	17:43	18:30	20:19	21:05	21:42	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49	07:39	08:22
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12	08:31	07:54	06:58	06:52	05:57	05:28	05:40	06:21	07:06	07:52	07:42	08:24
	16:58	17:48	18:35	20:24	21:10	21:44	21:43	21:01	19:58	18:53	16:58	16:35
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	17:02	17:54	18:40	20:29	21:14	21:46	21:40	20:56	19:52	18:47	16:54	16:35
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	17:10	18:02	18:48	20:36	21:21	21:48	21:35	20:46	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:11	18:04	18:49	20:38	21:22	21:48	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:58	08:32
	17:13	18:06	18:51	20:39	21:23	21:49	21:33	20:43	19:36	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:31	16:45	16:38
24	08:21	07:31	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:29	06:30	06:26	05:40	05:29	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:27	21:49	21:29	20:37	19:30	17:28	16:43	16:39
26	08:19	07:27	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:04	08:33
	17:20	18:12	18:57	20:46	21:28	21:49	21:28	20:34	19:28	17:26	16:42	16:40
27	08:17	07:25	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:32	19:26	17:24	16:41	16:40
28	08:16	07:23	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:00	20:49	21:31	21:49	21:25	20:30	19:23	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
astr.max.mögl.Beschattung												

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

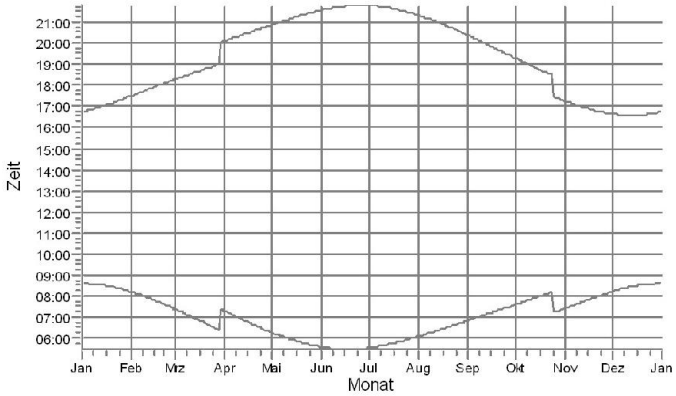
Tag im Monat	Sonnenaufgang (SS:MM)		Zeitpunkt (SS:MM) Schattenanfang	(WEA mit erstem Schatten)
	Sonnenuntergang (SS:MM)	Minuten mit Schatten	Zeitpunkt (SS:MM) Schattenende	(WEA mit letztem Schatten)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

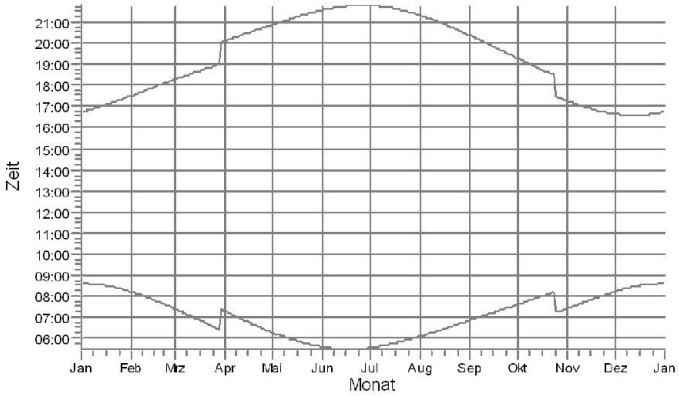
SHADOW - Grafischer Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

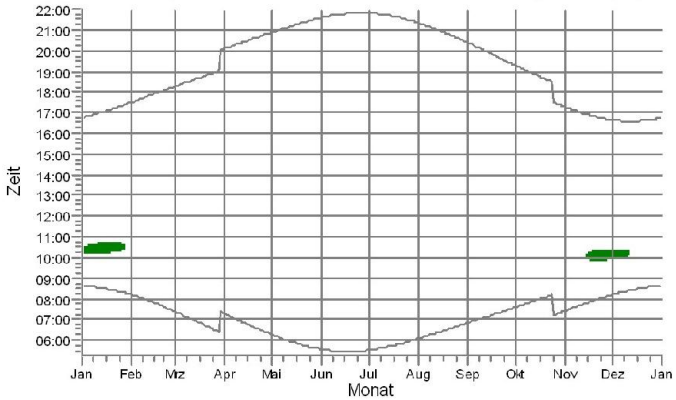
A: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (19)



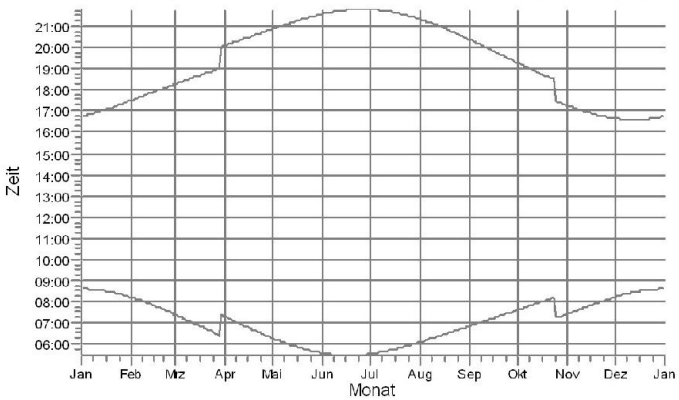
B: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (20)



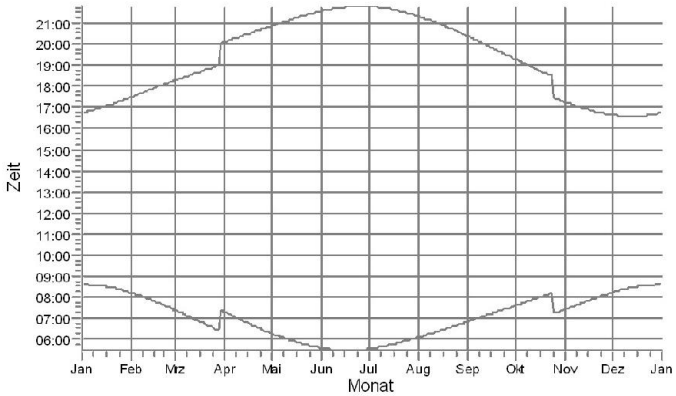
C: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (21)



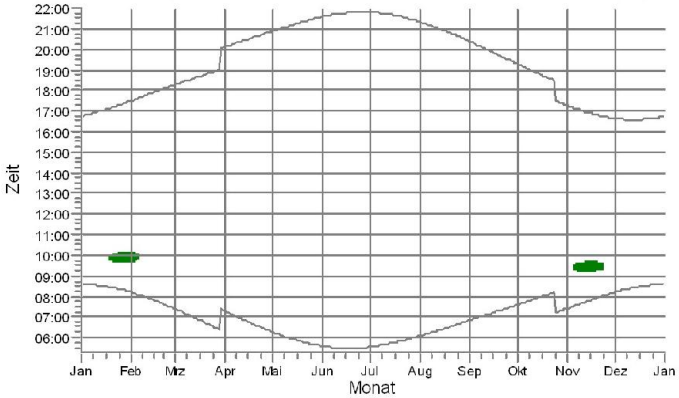
D: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (22)



E: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (23)



F: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (24)



WEA

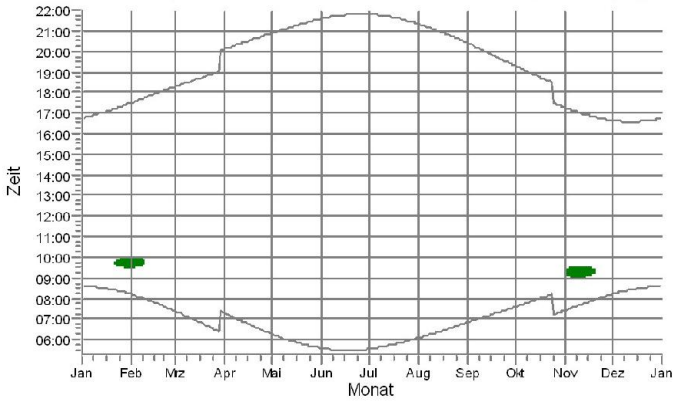
1: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (99)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

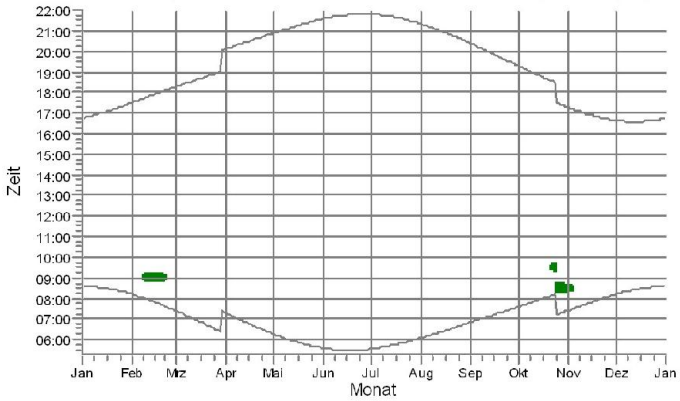
SHADOW - Grafischer Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

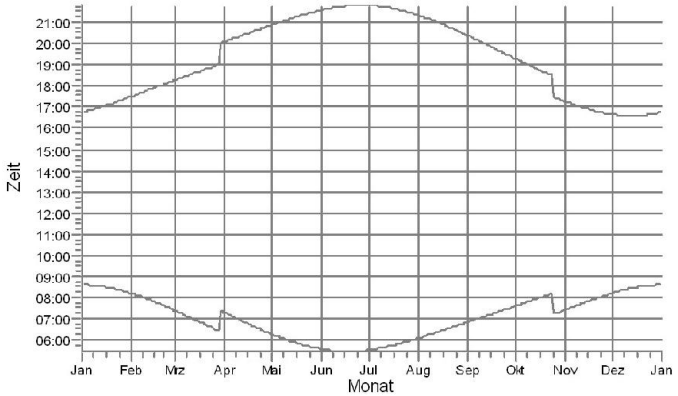
G: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (25)



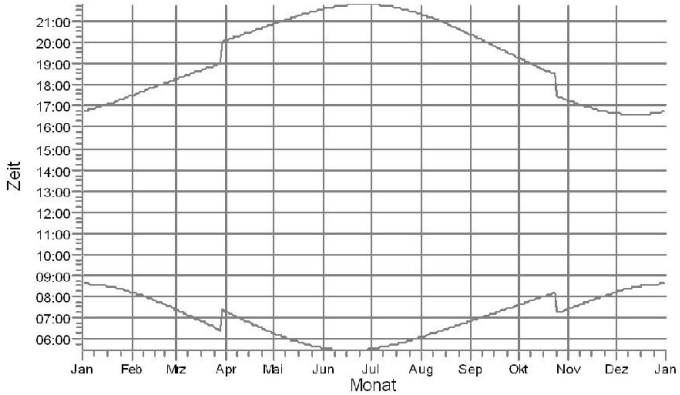
H: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (26)



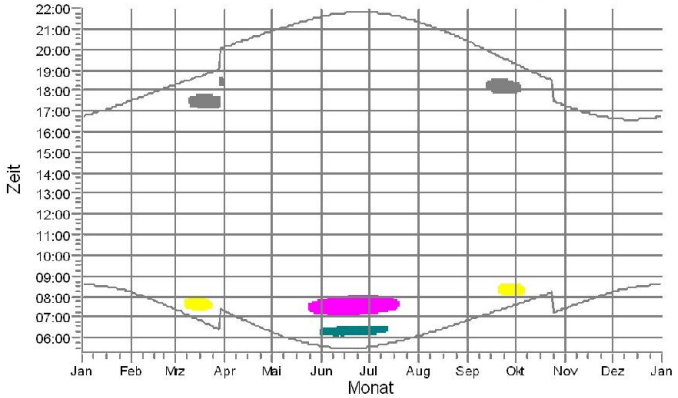
I: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (27)



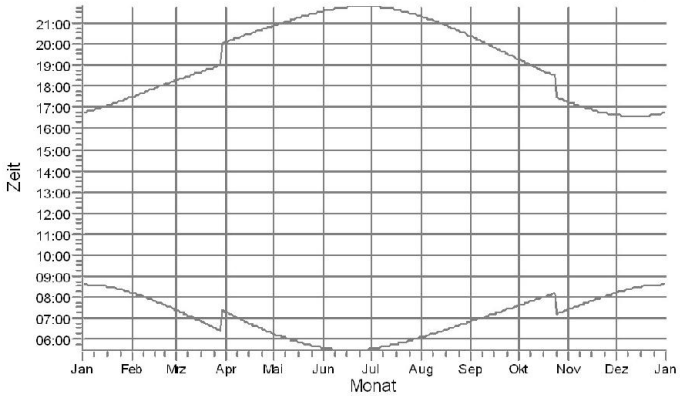
J: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (28)



K: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (29)



L: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (30)



WEA

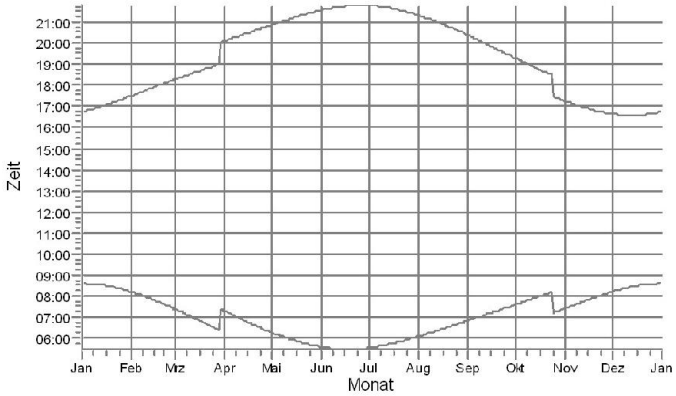
- 1: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (99)
- 2: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (100)
- 4: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (11)
- 5: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (12)
- 6: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (13)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

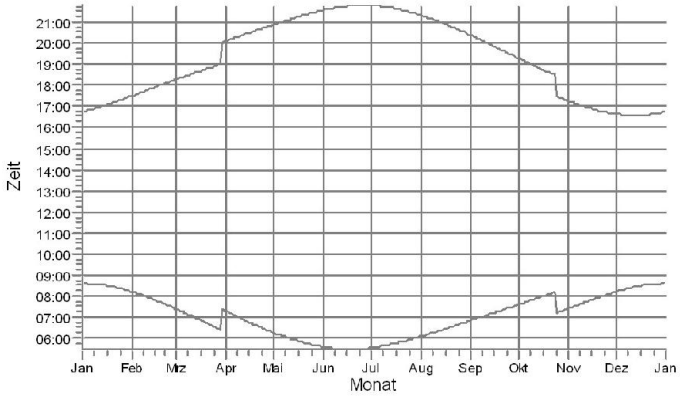
SHADOW - Grafischer Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

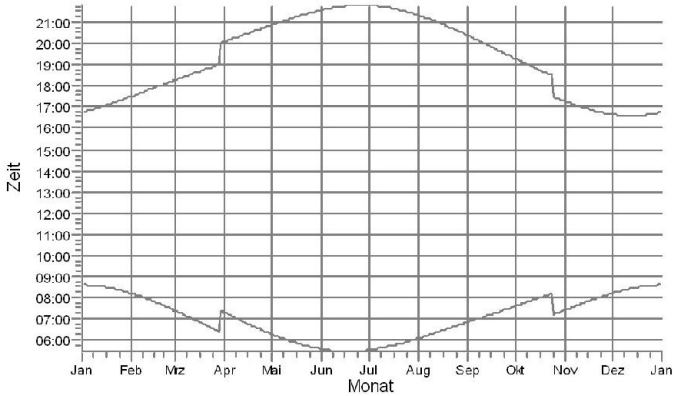
M: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (31)



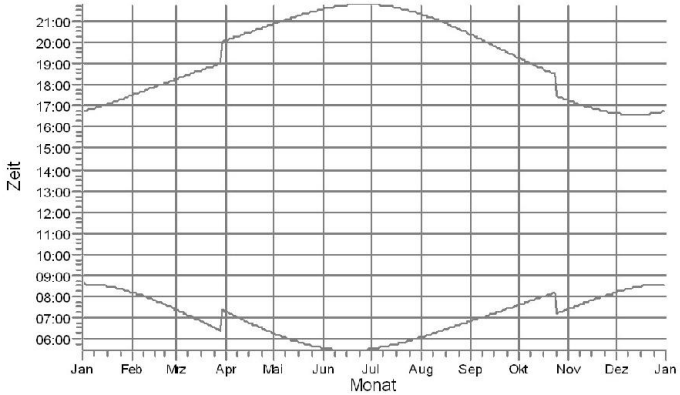
N: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (32)



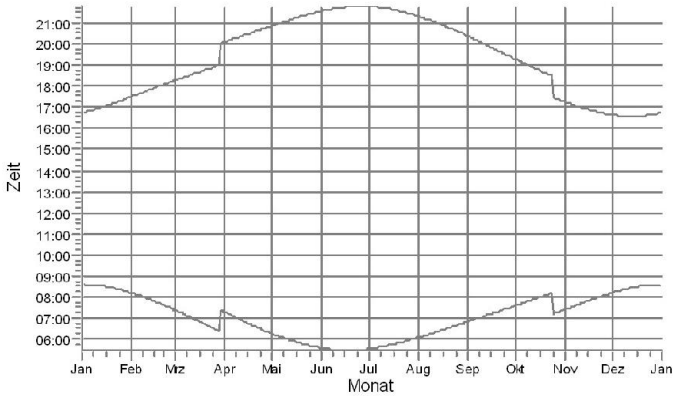
O: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (33)



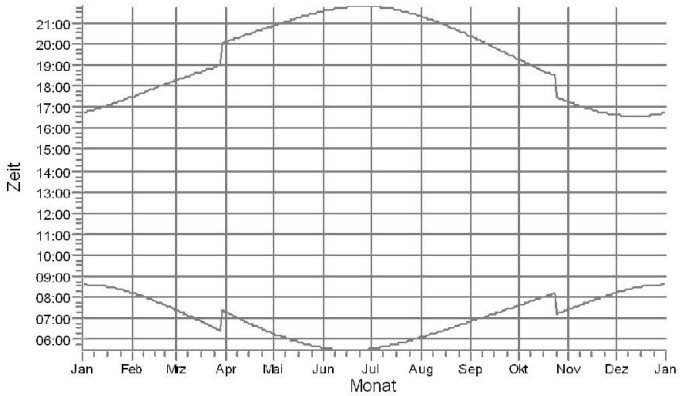
P: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (34)



Q: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (35)



R: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (36)



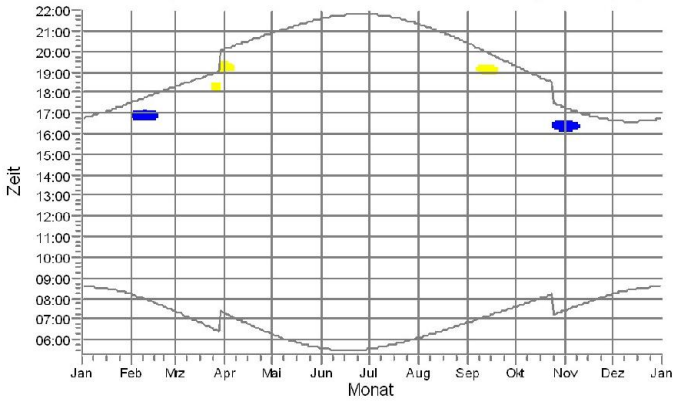
WEA

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

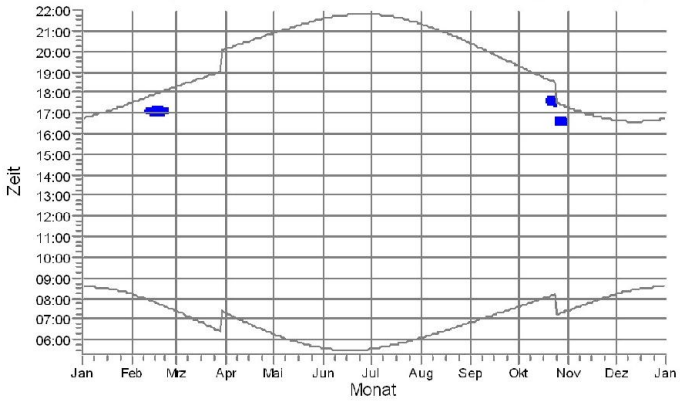
SHADOW - Grafischer Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

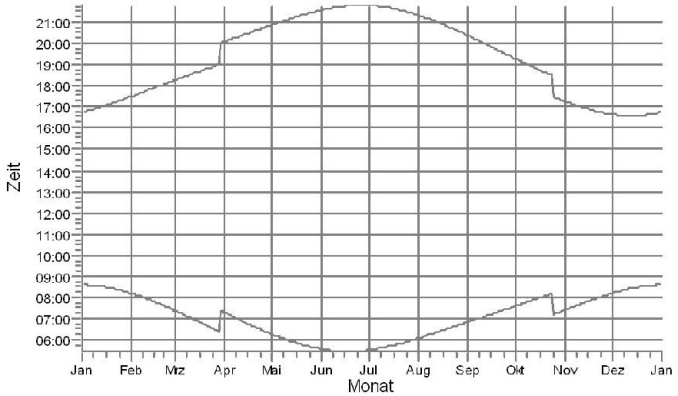
S: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (37)



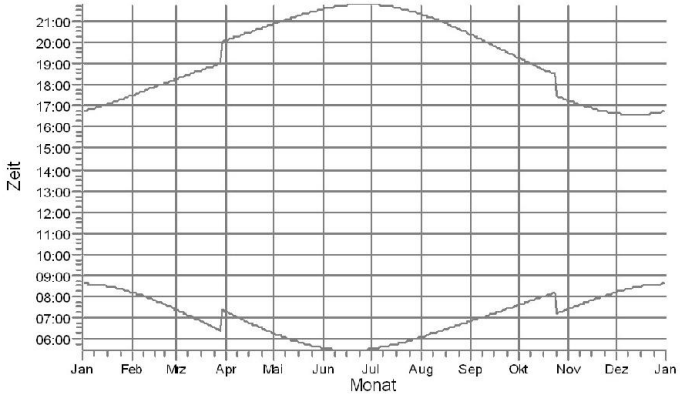
T: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (38)



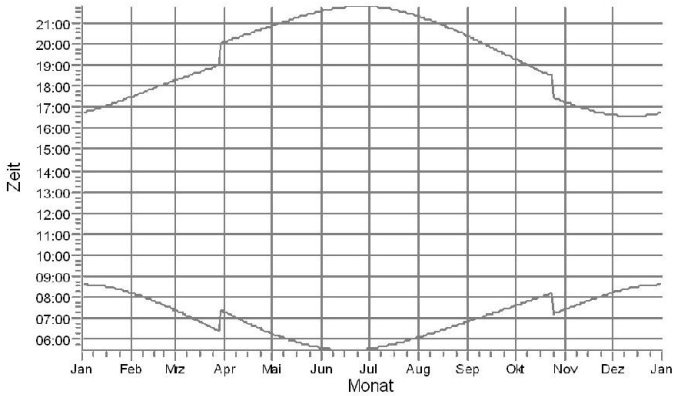
U: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (39)



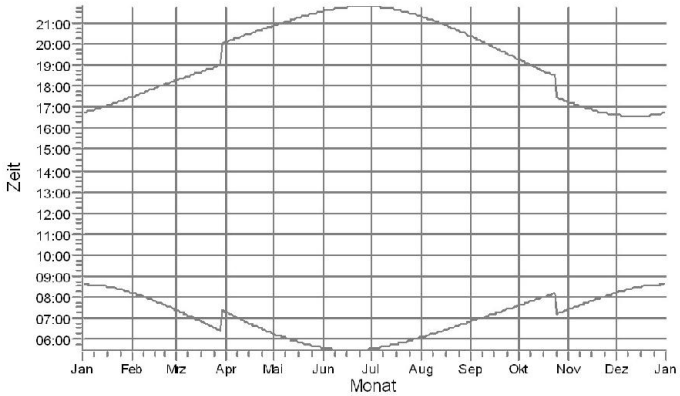
V: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (40)



W: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (41)



X: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (42)



WEA

2: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (100)

3: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (101)

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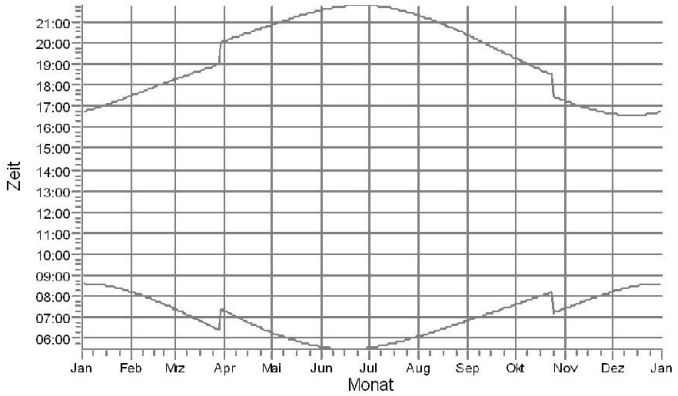
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Grafischer Kalender

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

Y: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (43)



WEA

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserWEA: 1 - ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (99)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar		Februar		März	April	Mai	Juni	Juli	August	Septembe	Oktober		November		Dezember	
1	08:35	10:21-10:23/2	08:11	09:35-10:03/28	07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35		07:24	08:22-08:37/15	08:12	09:59-10:17/18
	16:45		17:30		18:17	20:07	20:54	21:35	21:49	21:20	20:22	19:17		17:15		16:39	
2	08:35	10:20-10:25/5	08:10	09:34-10:02/28	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:36		07:26	08:24-08:35/11	08:13	10:00-10:17/17
	16:46		17:31		18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15		17:13	09:13-09:17/4	16:38	
3	08:35	10:18-10:26/8	08:08	09:35-10:01/26	07:18	07:11	06:11	05:32	05:33	06:08	06:53	07:38		07:28	08:26-08:32/6	08:14	10:00-10:16/16
	16:47		17:33		18:21	20:10	20:57	21:37	21:48	21:17	20:18	19:13		17:12	09:09-09:20/11	16:37	
4	08:34	10:18-10:28/10	08:07	09:35-10:00/25	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:40		07:29	09:08-09:22/14	08:16	10:02-10:17/15
	16:48		17:35		18:22	20:12	20:58	21:38	21:48	21:15	20:16	19:10		17:10		16:37	
5	08:34	10:18-10:29/11	08:05	09:37-09:58/21	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41		07:31	09:07-09:23/16	08:17	10:02-10:16/14
	16:49		17:36		18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08		17:08		16:37	
6	08:34	10:17-10:30/13	08:04	09:37-09:53/16	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43		07:33	09:06-09:28/22	08:18	10:03-10:16/13
	16:50		17:38		18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06		17:07		16:36	
7	08:34	10:17-10:31/14	08:02	09:38-09:52/14	07:09	07:02	06:05	05:30	05:36	06:13	06:59	07:44		07:34	09:06-09:31/25	08:19	10:05-10:16/11
	16:52		17:40		18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04		17:05		16:36	
8	08:33	10:17-10:32/15	08:00	08:56-09:03/7	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46		07:36	09:05-09:31/26	08:20	10:06-10:16/10
	16:53		17:42	09:40-09:50/10	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02		17:04		16:36	
9	08:33	10:17-10:33/16	07:59	08:54-09:06/12	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47		07:38	09:05-09:32/27	08:21	10:07-10:15/8
	16:54		17:43		18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00		17:02		16:35	
10	08:32	10:17-10:34/17	07:57	08:53-09:07/14	07:03	06:56	06:00	05:28	05:38	06:18	07:04	07:49		07:39	09:06-09:33/27	08:23	10:09-10:15/6
	16:55		17:45		18:32	20:21	21:07	21:43	21:45	21:05	20:03	18:58		17:01		16:35	
11	08:32	10:17-10:35/18	07:55	08:51-09:08/17	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50		07:41	09:06-09:34/28	08:24	10:11-10:13/2
	16:57		17:47		18:34	20:23	21:09	21:44	21:44	21:04	20:01	18:56		16:59		16:35	
12	08:31	10:17-10:36/19	07:54	08:50-09:09/19	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52		07:43	09:06-09:34/28	08:25	
	16:58		17:49		18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54		16:58		16:35	
13	08:31	10:17-10:36/19	07:52	08:51-09:10/19	06:56	06:50	05:55	05:28	05:41	06:22	07:08	07:54		07:44	09:06-09:35/29	08:25	
	17:00		17:50		18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51		16:57		16:35	
14	08:30	10:17-10:36/19	07:50	08:50-09:10/20	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55		07:46	09:07-09:35/28	08:26	
	17:01		17:52		18:38	20:27	21:13	21:46	21:42	20:58	19:54	18:49		16:55		16:35	
15	08:29	10:18-10:38/20	07:49	08:50-09:10/20	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57		07:47	09:08-09:35/27	08:27	
	17:02		17:54		18:40	20:29	21:14	21:46	21:41	20:56	19:52	18:47		16:54	10:00-10:07/7	16:35	
16	08:29	10:18-10:38/20	07:47	08:50-09:10/20	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58		07:49	09:09-09:35/26	08:28	
	17:04		17:55		18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45		16:53	09:57-10:08/11	16:35	
17	08:28	10:18-10:38/20	07:45	08:51-09:09/18	06:48	06:42	05:49	05:27	05:46	06:28	07:14	08:00		07:51	09:10-09:35/25	08:29	
	17:05		17:57		18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43		16:51	09:57-10:10/13	16:35	
18	08:27	10:18-10:39/21	07:43	08:51-09:08/17	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:02		07:52	09:12-09:35/23	08:30	
	17:07		17:59		18:45	20:33	21:18	21:48	21:38	20:51	19:45	18:41		16:50	09:56-10:12/16	16:36	
19	08:26	09:47-09:54/7	07:41	08:52-09:07/15	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03		07:54	09:15-09:35/20	08:30	
	17:08	10:19-10:39/20	18:00		18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39		16:49	09:56-10:13/17	16:36	
20	08:25	09:46-09:56/10	07:39	08:53-09:05/12	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05		07:55	09:18-09:33/15	08:31	
	17:10	10:19-10:39/20	18:02		18:48	20:37	21:21	21:48	21:36	20:47	19:41	18:37		16:48	09:55-10:13/18	16:36	
21	08:24	09:45-09:58/13	07:37	08:56-09:03/7	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	09:25-09:34/9	07:57	09:20-09:33/13	08:32	
	17:11	10:20-10:39/19	18:04		18:50	20:38	21:22	21:49	21:35	20:45	19:39	18:35		16:47	09:55-10:14/19	16:37	
22	08:23	09:43-09:58/15	07:35		06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	09:23-09:36/13	07:59	09:22-09:32/10	08:32	
	17:13	10:20-10:38/18	18:06		18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33		16:46	09:55-10:15/20	16:37	
23	08:22	09:40-10:00/20	07:34		06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	09:22-09:38/16	08:00	09:23-09:30/7	08:33	
	17:15	10:21-10:38/17	18:07		18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32		16:45	09:55-10:15/20	16:38	
24	08:21	09:38-10:01/23	07:32		06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	09:21-09:39/18	08:02	09:55-10:16/21	08:33	
	17:16	10:22-10:38/16	18:09		18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30		16:44		16:38	
25	08:20	09:37-10:02/25	07:30		06:31	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:20-08:39/19	08:03	09:56-10:16/20	08:33	
	17:18	10:24-10:37/13	18:11		18:56	20:44	21:28	21:49	21:30	20:37	19:30	17:28		16:43		16:39	
26	08:19	09:36-10:02/26	07:28		06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:20-08:39/19	08:05	09:56-10:16/20	08:34	
	17:20	10:25-10:35/10	18:12		18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26		16:42		16:40	
27	08:18	09:35-10:02/27	07:26		06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:20-08:39/19	08:06	09:57-10:17/20	08:34	
	17:21	10:27-10:34/7	18:14		18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24		16:41		16:40	
28	08:16	09:35-10:03/28	07:24		06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:20-08:40/20	08:07	09:57-10:16/19	08:34	
	17:23		18:16		19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22		16:41		16:41	
29	08:15	09:34-10:03/29			07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:20-08:38/18	08:09	09:58-10:17/19	08:34	
	17:25				20:02	20:50	21:32	21:49	21:24	20:29	19:21	17:20		16:40		16:42	
30	08:14	09:35-10:03/28			07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:20-08:38/18	08:10	09:58-10:17/19	08:35	
	17:26				20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19		16:39		16:43	
31	08:12	09:34-10:02/28			07:18		05:34		06:03	06:49		07:23	08:21-08:38/17			08:35	
	17:28				20:05		21:34		21:21	20:24		17:17				16:44	
Sonnenscheinstunden	268		282		368	412	477	488	492	448	380	334		273		254	
Anzahl Minuten mit Schatten		686		385	0	0	0	0	0	0	0		186		762		130

Tabellen-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:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserWEA: 2 - ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (100)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März		April		Mai	Juni	Juli	August	September		Oktober		November	Dezember
1	08:35	08:11	07:22		07:15	19:05-19:24/19	06:15	05:33	05:31	06:05	06:50		07:35	08:06-08:30/24	07:24	08:12
	16:45	17:30	18:17		20:07		20:54	21:35	21:49	21:20	20:22		19:17		17:15	16:39
2	08:35	08:10	07:20		07:13	19:06-19:23/17	06:13	05:33	05:32	06:06	06:52		07:36	08:06-08:28/22	07:26	08:13
	16:46	17:31	18:19		20:08		20:55	21:36	21:48	21:18	20:20		19:15		17:13	16:38
3	08:35	08:08	07:17		07:11	19:07-19:21/14	06:11	05:32	05:33	06:08	06:53		07:38	08:07-08:28/21	07:28	08:14
	16:47	17:33	18:21		20:10		20:57	21:37	21:48	21:17	20:18		19:13		17:12	16:37
4	08:34	08:07	07:15		07:09	19:07-19:19/12	06:10	05:31	05:33	06:09	06:55		07:40	08:08-08:26/18	07:29	08:15
	16:48	17:35	18:22		20:12		20:58	21:38	21:48	21:15	20:16		19:10		17:10	16:37
5	08:34	08:05	07:13		07:07	19:10-19:15/5	06:08	05:31	05:34	06:10	06:56		07:41	08:09-08:24/15	07:31	08:17
	16:49	17:36	18:24		20:13		21:00	21:39	21:47	21:14	20:14		19:08		17:08	16:37
6	08:34	08:04	07:11		07:05		06:06	05:30	05:35	06:12	06:58		07:43	08:13-08:21/8	07:33	08:18
	16:50	17:38	18:26		20:15		21:01	21:40	21:47	21:12	20:12		19:06		17:07	16:36
7	08:34	08:02	07:09		07:02		06:05	05:30	05:36	06:13	06:59	19:06-19:10/4	07:44		07:34	08:19
	16:52	17:40	18:27		20:16		21:03	21:41	21:46	21:10	20:09		19:04		17:05	16:36
8	08:33	08:00	07:07	07:34-07:46/12	07:00		06:03	05:29	05:37	06:15	07:01	19:02-19:14/12	07:46		07:36	08:20
	16:53	17:42	18:29		20:18		21:04	21:42	21:46	21:09	20:07		19:02		17:04	16:36
9	08:33	07:59	07:05	07:31-07:48/17	06:58		06:01	05:29	05:37	06:16	07:02	19:00-19:15/15	07:47		07:38	08:21
	16:54	17:43	18:30		20:19		21:06	21:43	21:45	21:07	20:05		19:00		17:02	16:35
10	08:32	07:57	07:03	07:30-07:49/19	06:56		06:00	05:28	05:38	06:18	07:04	18:59-19:16/17	07:49		07:39	08:22
	16:55	17:45	18:32		20:21		21:07	21:43	21:45	21:05	20:03		18:58		17:01	16:35
11	08:32	07:55	07:01	07:28-07:50/22	06:54		05:58	05:28	05:39	06:19	07:05	18:58-19:16/18	07:50		07:41	08:23
	16:57	17:47	18:34		20:22		21:09	21:44	21:44	21:03	20:01		18:56		16:59	16:35
12	08:31	07:54	06:59	07:28-07:51/23	06:52		05:57	05:28	05:40	06:21	07:06	18:57-19:16/19	07:52		07:43	08:24
	16:58	17:49	18:35		20:24		21:10	21:45	21:43	21:02	19:59		18:54		16:58	16:35
13	08:31	07:52	06:56	07:26-07:50/24	06:50		05:55	05:28	05:41	06:22	07:08	18:56-19:16/20	07:54		07:44	08:25
	17:00	17:50	18:37		20:26		21:11	21:45	21:42	21:00	19:56		18:51		16:57	16:35
14	08:30	07:50	06:54	07:26-07:51/25	06:48		05:54	05:27	05:42	06:23	07:09	18:55-19:15/20	07:55		07:46	08:26
	17:01	17:52	18:38		20:27		21:13	21:46	21:41	20:58	19:54		18:49		16:55	16:35
15	08:29	07:48	06:52	07:25-07:51/26	06:46		05:52	05:27	05:43	06:25	07:11	18:56-19:15/19	07:57		07:47	08:27
	17:02	17:54	18:40		20:29		21:14	21:46	21:41	20:56	19:52		18:47		16:54	16:35
16	08:29	07:47	06:50	07:25-07:50/25	06:44		05:51	05:27	05:44	06:26	07:12	18:56-19:13/17	07:58		07:49	08:28
	17:04	17:55	18:42		20:30		21:16	21:47	21:40	20:54	19:50		18:45		16:53	16:35
17	08:28	07:45	06:48	07:25-07:50/25	06:42		05:49	05:27	05:46	06:28	07:14	18:57-19:12/15	08:00		07:51	08:29
	17:05	17:57	18:43		20:32		21:17	21:47	21:39	20:52	19:48		18:43		16:51	16:36
18	08:27	07:43	06:46	07:26-07:49/23	06:40		05:48	05:27	05:47	06:29	07:15	18:58-19:10/12	08:01		07:52	08:30
	17:07	17:59	18:45		20:33		21:18	21:48	21:38	20:51	19:45		18:41		16:50	16:36
19	08:26	07:41	06:44	07:26-07:47/21	06:38		05:47	05:27	05:48	06:31	07:17	19:00-19:08/8	08:03		07:54	08:30
	17:08	18:00	18:46		20:35		21:20	21:48	21:37	20:49	19:43		18:39		16:49	16:36
20	08:25	07:39	06:41	07:26-07:46/20	06:36		05:46	05:27	05:49	06:32	07:18		08:05		07:55	08:31
	17:10	18:02	18:48		20:37		21:21	21:48	21:36	20:47	19:41		18:37		16:48	16:36
21	08:24	07:37	06:39	07:28-07:45/17	06:34		05:44	05:27	05:50	06:34	07:20	08:16-08:27/11	08:06		07:57	08:31
	17:11	18:04	18:50		20:38		21:22	21:49	21:35	20:45	19:39		18:35		16:47	16:37
22	08:23	07:35	06:37	07:30-07:42/12	06:32		05:43	05:28	05:52	06:35	07:21	08:13-08:29/16	08:08		07:59	08:32
	17:13	18:06	18:51		20:40		21:24	21:49	21:33	20:43	19:37		18:33		16:46	16:37
23	08:22	07:34	06:35	07:35-07:37/2	06:30		05:42	05:28	05:53	06:37	07:23	08:11-08:30/19	08:10		08:00	08:32
	17:15	18:07	18:53		20:41		21:25	21:49	21:32	20:41	19:34		18:32		16:45	16:38
24	08:21	07:32	06:33	18:14-18:19/5	06:28		05:41	05:28	05:54	06:38	07:24	08:09-08:31/22	08:11		08:02	08:33
	17:16	18:09	18:54		20:43		21:26	21:49	21:31	20:39	19:32		18:30		16:44	16:38
25	08:20	07:30	06:31	18:11-18:22/11	06:26		05:40	05:28	05:55	06:40	07:26	08:09-08:32/23	07:13		08:03	08:33
	17:18	18:11	18:56		20:44		21:27	21:49	21:30	20:37	19:30		17:28		16:43	16:39
26	08:19	07:28	06:28	18:09-18:24/15	06:24		05:39	05:29	05:57	06:41	07:27	08:07-08:31/24	07:14		08:05	08:34
	17:20	18:12	18:57		20:46		21:29	21:49	21:28	20:35	19:28		17:26		16:42	16:40
27	08:18	07:26	06:26	18:08-18:25/17	06:22		05:38	05:29	05:58	06:43	07:29	08:07-08:32/25	07:16		08:06	08:34
	17:21	18:14	18:59		20:47		21:30	21:49	21:27	20:33	19:26		17:24		16:41	16:40
28	08:16	07:24	06:24	18:07-18:25/18	06:20		05:37	05:30	05:59	06:44	07:30	08:06-08:31/25	07:18		08:07	08:34
	17:23	18:16	19:01		20:49		21:31	21:49	21:26	20:31	19:23		17:22		16:41	16:41
29	08:15		07:22	19:05-19:24/19	06:18		05:36	05:30	06:01	06:46	07:32	08:06-08:31/25	07:19		08:09	08:34
	17:25		20:02		20:50		21:32	21:49	21:24	20:29	19:21		17:20		16:40	16:42
30	08:14		07:20	19:05-19:24/19	06:17		05:35	05:31	06:02	06:47	07:33	08:06-08:30/24	07:21		08:10	08:35
	17:26		20:04		20:52		21:33	21:49	21:23	20:26	19:19		17:19		16:39	16:43
31	08:12		07:17	19:05-19:24/19			05:34		06:03	06:49			07:23			08:35
	17:28		20:05				21:34		21:21	20:24			17:17			16:44
Sonnenscheinstunden	268	282	368		412		477	488	492	448	380		334		273	254
Anzahl Minuten mit Schatten	0	0	436		67		0	0	0	0	410		108		0	0

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserWEA: 3 - ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (101)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar		März	April	Mai	Juni	Juli	August	September	Oktober		November		Dezember
1	08:35	08:11		07:22	07:15	06:15	05:33	05:31	06:05	06:50	07:35		07:24	16:13-16:33/20	08:12
	16:45	17:30		18:17	20:07	20:53	21:35	21:49	21:20	20:22	19:17		17:15		16:39
2	08:35	08:10	16:50-16:54/4	07:20	07:13	06:13	05:33	05:32	06:06	06:52	07:36		07:26	16:12-16:32/20	08:13
	16:46	17:31		18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15		17:13		16:38
3	08:34	08:08	16:47-16:57/10	07:17	07:11	06:11	05:32	05:33	06:08	06:53	07:38		07:28	16:13-16:32/19	08:14
	16:47	17:33		18:21	20:10	20:57	21:37	21:48	21:17	20:18	19:13		17:12		16:37
4	08:34	08:07	16:46-16:59/13	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:40		07:29	16:13-16:32/19	08:15
	16:48	17:35		18:22	20:12	20:58	21:38	21:48	21:15	20:16	19:10		17:10		16:37
5	08:34	08:05	16:44-17:00/16	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41		07:31	16:14-16:32/18	08:17
	16:49	17:36		18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08		17:08		16:37
6	08:34	08:04	16:44-17:02/18	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43		07:33	16:14-16:30/16	08:18
	16:50	17:38		18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06		17:07		16:36
7	08:34	08:02	16:43-17:02/19	07:09	07:02	06:05	05:30	05:36	06:13	06:59	07:44		07:34	16:16-16:29/13	08:19
	16:52	17:40		18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04		17:05		16:36
8	08:33	08:00	16:43-17:03/20	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46		07:36	16:18-16:28/10	08:20
	16:53	17:42		18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02		17:04		16:36
9	08:33	07:59	16:43-17:04/21	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47		07:38	16:21-16:24/3	08:21
	16:54	17:43		18:30	20:19	21:06	21:43	21:45	21:07	20:05	19:00		17:02		16:35
10	08:32	07:57	17:04-17:07/3	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49		07:39		08:22
	16:55	17:45	16:43-17:03/20	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58		17:01		16:35
11	08:32	07:55	16:43-17:11/28	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50		07:41		08:23
	16:57	17:47		18:34	20:22	21:08	21:44	21:44	21:03	20:01	18:56		16:59		16:35
12	08:31	07:54	16:43-17:12/29	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52		07:43		08:24
	16:58	17:49		18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54		16:58		16:35
13	08:31	07:52	16:44-17:13/29	06:56	06:50	05:55	05:28	05:41	06:22	07:08	07:54		07:44		08:25
	17:00	17:50		18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51		16:57		16:35
14	08:30	07:50	16:45-17:15/30	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55		07:46		08:26
	17:01	17:52		18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49		16:55		16:35
15	08:29	07:48	16:46-17:15/29	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57		07:47		08:27
	17:02	17:54		18:40	20:29	21:14	21:46	21:41	20:56	19:52	18:47		16:54		16:35
16	08:29	07:47	16:48-17:15/27	06:50	06:44	05:51	05:27	05:44	06:26	07:12	07:58		07:49		08:28
	17:04	17:55		18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45		16:53		16:35
17	08:28	07:45	16:56-17:15/19	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00		07:51		08:29
	17:05	17:57	16:52-16:55/3	18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43		16:51		16:36
18	08:27	07:43	16:56-17:15/19	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01		07:52		08:29
	17:07	17:59		18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41		16:50		16:36
19	08:26	07:41	16:56-17:15/19	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	17:32-17:41/9	07:54		08:30
	17:08	18:00		18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39		16:49		16:36
20	08:25	07:39	16:57-17:14/17	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	17:30-17:43/13	07:55		08:31
	17:10	18:02		18:48	20:36	21:21	21:48	21:36	20:47	19:41	18:37		16:48		16:36
21	08:24	07:37	16:58-17:13/15	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	17:28-17:44/16	07:57		08:31
	17:11	18:04		18:50	20:38	21:22	21:49	21:34	20:45	19:39	18:35		16:47		16:37
22	08:23	07:35	16:59-17:11/12	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	17:27-17:44/17	07:58		08:32
	17:13	18:06		18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33		16:46		16:37
23	08:22	07:33	17:02-17:09/7	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:10	17:27-17:45/18	08:00		08:32
	17:15	18:07		18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32		16:45		16:38
24	08:21	07:32		06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	17:25-17:45/20	08:02		08:33
	17:16	18:09		18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30		16:44		16:38
25	08:20	07:30		06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	16:20-16:45/25	08:03		08:33
	17:18	18:11		18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28		16:43		16:39
26	08:19	07:28		06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	16:17-16:45/28	08:04		08:34
	17:20	18:12		18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26		16:42		16:40
27	08:18	07:26		06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	16:16-16:45/29	08:06		08:34
	17:21	18:14		18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24		16:41		16:40
28	08:16	07:24		06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	16:14-16:43/29	08:07		08:34
	17:23	18:16		19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22		16:41		16:41
29	08:15			07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	16:13-16:43/30	08:09		08:34
	17:25			20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20		16:40		16:42
30	08:14			07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	16:13-16:42/29	08:10		08:34
	17:26			20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19		16:39		16:43
31	08:12			07:17		05:34		06:03	06:49		07:23	16:13-16:40/27			08:35
	17:28			20:05		21:34		21:21	20:24		17:17				16:44
Sonnenscheinstunden	268	282		368	412	477	488	492	448	380	334		273		254
Anzahl Minuten mit Schatten	0	427		0	0	0	0	0	0	0	290		138		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

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserWEA: 4 - ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (11)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März		April	Mai	Juni	Juli	August	September		Oktober		November	Dezember
1	08:35	08:11	07:22		07:15	06:15	05:34	05:31	06:05	06:50		07:35	17:58-18:20/22	07:24	08:12
	16:45	17:30	18:17		20:07	20:54	21:36	21:49	21:20	20:22		19:17		17:15	16:39
2	08:35	08:10	07:20		07:13	06:13	05:33	05:32	06:06	06:52		07:37	18:00-18:17/17	07:26	08:13
	16:46	17:31	18:19		20:09	20:55	21:37	21:48	21:18	20:20		19:15		17:14	16:38
3	08:35	08:08	07:18		07:11	06:11	05:32	05:33	06:08	06:53		07:38	18:03-18:13/10	07:28	08:14
	16:47	17:33	18:21		20:10	20:57	21:38	21:48	21:17	20:18		19:13		17:12	16:38
4	08:34	08:07	07:16		07:09	06:10	05:31	05:33	06:09	06:55		07:40		07:29	08:16
	16:48	17:35	18:22		20:12	20:58	21:38	21:48	21:15	20:16		19:11		17:10	16:37
5	08:34	08:05	07:13		07:07	06:08	05:31	05:34	06:10	06:56		07:41		07:31	08:17
	16:49	17:37	18:24		20:13	21:00	21:39	21:47	21:14	20:14		19:08		17:09	16:37
6	08:34	08:04	07:11		07:05	06:06	05:30	05:35	06:12	06:58		07:43		07:33	08:18
	16:51	17:38	18:26		20:15	21:01	21:40	21:47	21:12	20:12		19:06		17:07	16:36
7	08:34	08:02	07:09		07:03	06:05	05:30	05:36	06:13	06:59		07:44		07:34	08:19
	16:52	17:40	18:27		20:16	21:03	21:41	21:46	21:10	20:10		19:04		17:05	16:36
8	08:33	08:01	07:07		07:00	06:03	05:29	05:37	06:15	07:01		07:46		07:36	08:20
	16:53	17:42	18:29		20:18	21:04	21:42	21:46	21:09	20:07		19:02		17:04	16:36
9	08:33	07:59	07:05		06:58	06:01	05:29	05:37	06:16	07:02		07:47		07:38	08:21
	16:54	17:43	18:30		20:19	21:06	21:43	21:45	21:07	20:05		19:00		17:02	16:35
10	08:33	07:57	07:03	17:29-17:32/3	06:56	06:00	05:29	05:38	06:18	07:04		07:49		07:39	08:23
	16:56	17:45	18:32		20:21	21:07	21:43	21:45	21:05	20:03		18:58		17:01	16:35
11	08:32	07:56	07:01	17:23-17:37/14	06:54	05:58	05:28	05:39	06:19	07:05		07:50		07:41	08:24
	16:57	17:47	18:34		20:23	21:09	21:44	21:44	21:04	20:01		18:56		16:59	16:35
12	08:31	07:54	06:59	17:20-17:40/20	06:52	05:57	05:28	05:40	06:21	07:07		07:52		07:43	08:25
	16:58	17:49	18:35		20:24	21:10	21:45	21:43	21:02	19:59		18:54		16:58	16:35
13	08:31	07:52	06:57	17:17-17:41/24	06:50	05:55	05:28	05:41	06:22	07:08	18:11-18:21/10	07:54		07:44	08:26
	17:00	17:50	18:37		20:26	21:11	21:45	21:42	21:00	19:56		18:52		16:57	16:35
14	08:30	07:50	06:54	17:16-17:42/26	06:48	05:54	05:27	05:42	06:24	07:10	18:08-18:25/17	07:55		07:46	08:26
	17:01	17:52	18:39		20:27	21:13	21:46	21:42	20:58	19:54		18:49		16:55	16:35
15	08:30	07:49	06:52	17:15-17:43/28	06:46	05:52	05:27	05:43	06:25	07:11	18:05-18:26/21	07:57		07:48	08:27
	17:02	17:54	18:40		20:29	21:14	21:47	21:41	20:56	19:52		18:47		16:54	16:35
16	08:29	07:47	06:50	17:14-17:44/30	06:44	05:51	05:27	05:45	06:26	07:12	18:03-18:28/25	07:58		07:49	08:28
	17:04	17:55	18:42		20:30	21:16	21:47	21:40	20:54	19:50		18:45		16:53	16:35
17	08:28	07:45	06:48	17:13-17:44/31	06:42	05:50	05:27	05:46	06:28	07:14	18:01-18:28/27	08:00		07:51	08:29
	17:05	17:57	18:43		20:32	21:17	21:47	21:39	20:53	19:48		18:43		16:51	16:36
18	08:27	07:43	06:46	17:13-17:45/32	06:40	05:48	05:27	05:47	06:29	07:15	17:59-18:28/29	08:02		07:52	08:30
	17:07	17:59	18:45		20:33	21:18	21:48	21:38	20:51	19:45		18:41		16:50	16:36
19	08:26	07:41	06:44	17:11-17:44/33	06:38	05:47	05:27	05:48	06:31	07:17	17:58-18:29/31	08:03		07:54	08:30
	17:08	18:01	18:47		20:35	21:20	21:48	21:37	20:49	19:43		18:39		16:49	16:36
20	08:25	07:39	06:41	17:11-17:44/33	06:36	05:46	05:27	05:49	06:32	07:18	17:57-18:28/31	08:05		07:55	08:31
	17:10	18:02	18:48		20:37	21:21	21:49	21:36	20:47	19:41		18:37		16:48	16:37
21	08:24	07:37	06:39	17:11-17:44/33	06:34	05:44	05:27	05:50	06:34	07:20	17:57-18:29/32	08:06		07:57	08:32
	17:12	18:04	18:50		20:38	21:22	21:49	21:35	20:45	19:39		18:35		16:47	16:37
22	08:23	07:36	06:37	17:11-17:43/32	06:32	05:43	05:28	05:52	06:35	07:21	17:56-18:28/32	08:08		07:59	08:32
	17:13	18:06	18:51		20:40	21:24	21:49	21:33	20:43	19:37		18:34		16:46	16:37
23	08:22	07:34	06:35	17:11-17:43/32	06:30	05:42	05:28	05:53	06:37	07:23	17:56-18:28/32	08:10		08:00	08:33
	17:15	18:07	18:53		20:41	21:25	21:49	21:32	20:41	19:34		18:32		16:45	16:38
24	08:21	07:32	06:33	17:11-17:41/30	06:28	05:41	05:28	05:54	06:38	07:24	17:55-18:28/33	08:11		08:02	08:33
	17:16	18:09	18:54		20:43	21:26	21:49	21:31	20:39	19:32		18:30		16:44	16:39
25	08:20	07:30	06:31	17:11-17:41/30	06:26	05:40	05:29	05:55	06:40	07:26	17:55-18:27/32	07:13		08:03	08:33
	17:18	18:11	18:56		20:44	21:28	21:49	21:30	20:37	19:30		17:28		16:43	16:39
26	08:19	07:28	06:28	17:12-17:40/28	06:24	05:39	05:29	05:57	06:41	07:27	17:55-18:26/31	07:15		08:05	08:34
	17:20	18:12	18:58		20:46	21:29	21:49	21:28	20:35	19:28		17:26		16:42	16:40
27	08:18	07:26	06:26	17:13-17:38/25	06:22	05:38	05:29	05:58	06:43	07:29	17:55-18:26/31	07:16		08:06	08:34
	17:21	18:14	18:59		20:47	21:30	21:49	21:27	20:33	19:26		17:24		16:41	16:41
28	08:16	07:24	06:24	17:15-17:37/22	06:20	05:37	05:30	05:59	06:44	07:30	17:55-18:24/29	07:18		08:08	08:34
	17:23	18:16	19:01		20:49	21:31	21:49	21:26	20:31	19:24		17:22		16:41	16:41
29	08:15		07:22	18:17-18:35/18	06:19	05:36	05:30	06:01	06:46	07:32	17:56-18:23/27	07:19		08:09	08:34
	17:25		20:02		20:51	21:32	21:49	21:24	20:29	19:21		17:20		16:40	16:42
30	08:14		07:20	18:19-18:31/12	06:17	05:35	05:31	06:02	06:47	07:33	17:57-18:21/24	07:21		08:10	08:35
	17:26		20:04		20:52	21:33	21:49	21:23	20:27	19:19		17:19		16:39	16:43
31	08:12		07:18			05:34		06:03	06:49			07:23			08:35
	17:28		20:05			21:34		21:22	20:24			17:17			16:44
Sonnenscheinstunden	268	282	368		412	477	488	492	448	380		334		273	254
Anzahl Minuten mit Schatten	0	0	536		0	0	0	0	0	494		49		0	0

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & WaasserWEA: 5 - ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (12)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai		Juni		Juli		August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15		05:34	07:11-07:45/34	05:31	07:12-07:56/44	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54		21:35		21:49		21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:20	07:13	06:13		05:33	07:11-07:46/35	05:32	07:13-07:56/43	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:08	20:55		21:37		21:48		21:18	20:20	19:15	17:13	16:38
3	08:35	08:08	07:18	07:11	06:11		05:32	07:10-07:46/36	05:33	07:13-07:55/42	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57		21:38		21:48		21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:10		05:31	07:10-07:48/38	05:33	07:14-07:55/41	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58		21:38		21:48		21:15	20:16	19:11	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08		05:31	07:09-07:48/39	05:34	07:15-07:56/41	06:10	06:56	07:41	07:31	08:17
	16:49	17:37	18:24	20:13	21:00		21:39		21:47		21:14	20:14	19:08	17:09	16:37
6	08:34	08:04	07:11	07:05	06:06		05:30	07:10-07:49/39	05:35	07:15-07:55/40	06:12	06:58	07:43	07:33	08:18
	16:51	17:38	18:26	20:15	21:01		21:40		21:47		21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:05		05:30	07:09-07:49/40	05:36	07:16-07:54/38	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03		21:41		21:46		21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03		05:29	07:09-07:50/41	05:37	07:16-07:54/38	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04		21:42		21:46		21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01		05:29	07:08-07:50/42	05:37	07:17-07:54/37	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:30	20:19	21:06		21:43		21:45		21:07	20:05	19:00	17:02	16:35
10	08:33	07:57	07:03	06:56	06:00		05:28	07:08-07:51/43	05:38	07:18-07:54/36	06:18	07:04	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07		21:43		21:45		21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58		05:28	07:08-07:51/43	05:39	07:19-07:53/34	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09		21:44		21:44		21:04	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57		05:28	07:08-07:52/44	05:40	07:20-07:53/33	06:21	07:07	07:52	07:43	08:25
	16:58	17:49	18:35	20:24	21:10		21:45		21:43		21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55		05:28	07:09-07:53/44	05:41	07:21-07:52/31	06:22	07:08	07:54	07:44	08:25
	17:00	17:50	18:37	20:26	21:11		21:45		21:42		21:00	19:56	18:52	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54		05:27	07:08-07:52/44	05:42	07:23-07:51/28	06:24	07:09	07:55	07:46	08:26
	17:01	17:52	18:39	20:27	21:13		21:46		21:42		20:58	19:54	18:49	16:55	16:35
15	08:30	07:49	06:52	06:46	05:52		05:27	07:08-07:53/45	05:43	07:24-07:50/26	06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14		21:47		21:41		20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51		05:27	07:08-07:53/45	05:45	07:25-07:48/23	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16		21:47		21:40		20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50		05:27	07:08-07:53/45	05:46	07:27-07:47/20	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17		21:47		21:39		20:52	19:48	18:43	16:51	16:36
18	08:27	07:43	06:46	06:40	05:48		05:27	07:08-07:53/45	05:47	07:30-07:44/14	06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:33	21:18		21:48		21:38		20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47		05:27	07:09-07:55/46	05:48	07:34-07:40/6	06:31	07:17	08:03	07:54	08:30
	17:08	18:01	18:46	20:35	21:20		21:48		21:37		20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46		05:27	07:09-07:55/46	05:49		06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:37	21:21		21:48		21:36		20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44		05:27	07:09-07:55/46	05:50		06:34	07:20	08:06	07:57	08:32
	17:12	18:04	18:50	20:38	21:22		21:49		21:35		20:45	19:39	18:35	16:47	16:37
22	08:23	07:36	06:37	06:32	05:43		05:28	07:09-07:55/46	05:52		06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24		21:49		21:33		20:43	19:37	18:33	16:46	16:37
23	08:22	07:34	06:35	06:30	05:42		05:28	07:09-07:55/46	05:53		06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25		21:49		21:32		20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41		05:28	07:10-07:56/46	05:54		06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26		21:49		21:31		20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	07:22-07:33/11	05:28	07:10-07:55/45	05:55		06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:28		21:49		21:30		20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	07:19-07:36/17	05:29	07:10-07:55/45	05:57		06:41	07:27	07:15	08:05	08:34
	17:20	18:12	18:58	20:46	21:29		21:49		21:28		20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	07:17-07:38/21	05:29	07:11-07:56/45	05:58		06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30		21:49		21:27		20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	07:15-07:40/25	05:30	07:11-07:55/44	05:59		06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31		21:49		21:26		20:31	19:24	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	07:14-07:41/27	05:30	07:12-07:56/44	06:01		06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:51	21:32		21:49		21:24		20:29	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	07:13-07:43/30	05:31	07:12-07:55/43	06:02		06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33		21:49		21:23		20:26	19:19	17:19	16:39	16:43
31	08:12		07:18		05:34	07:12-07:44/32			06:03		06:49		07:23		08:35
	17:28		20:05		21:34				21:21		20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477		488		492		448	380	334	273	254
Anzahl Minuten mit Schatten	0	0	0	0	163		1284		615		0	0	0	0	0

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1	08:35	08:11	07:22	07:15	06:15	05:33	06:12-06:17/5	05:31	06:13-06:29/16	06:05	06:50	07:35	07:24	08:12
	16:45	17:30	18:17	20:07	20:54	21:35		21:49		21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:20	07:13	06:13	05:33	06:12-06:20/8	05:32	06:14-06:30/16	06:06	06:52	07:37	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:37		21:48		21:18	20:20	19:15	17:13	16:38
3	08:35	08:08	07:18	07:11	06:11	05:32	06:10-06:20/10	05:33	06:13-06:29/16	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:57	21:37		21:48		21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:10	05:31	06:10-06:22/12	05:33	06:14-06:29/15	06:09	06:55	07:40	07:29	08:16
	16:48	17:35	18:22	20:12	20:58	21:38		21:48		21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	06:09-06:22/13	05:34	06:15-06:30/15	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39		21:47		21:14	20:14	19:08	17:09	16:37
6	08:34	08:04	07:11	07:05	06:06	05:30	06:10-06:23/13	05:35	06:15-06:29/14	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40		21:47		21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:03	06:05	05:30	06:09-06:23/14	05:36	06:15-06:29/14	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41		21:46		21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	06:09-06:24/15	05:37	06:16-06:28/12	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42		21:46		21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	06:08-06:24/16	05:37	06:17-06:28/11	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:30	20:19	21:06	21:43		21:45		21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	06:08-06:25/17	05:38	06:18-06:27/9	06:18	07:04	07:49	07:39	08:23
	16:55	17:45	18:32	20:21	21:07	21:43		21:45		21:05	20:03	18:58	17:01	16:35
11	08:32	07:56	07:01	06:54	05:58	05:28	06:09-06:25/16	05:39	06:20-06:27/7	06:19	07:05	07:50	07:41	08:24
	16:57	17:47	18:34	20:23	21:09	21:44		21:44		21:04	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57	05:28	06:09-06:26/17	05:40	06:23-06:24/1	06:21	07:07	07:52	07:43	08:25
	16:58	17:49	18:35	20:24	21:10	21:45		21:43		21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:57	06:50	05:55	05:28	06:09-06:26/17	05:41		06:22	07:08	07:54	07:44	08:25
	17:00	17:50	18:37	20:26	21:11	21:45		21:42		21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	06:08-06:26/18	05:42		06:24	07:09	07:55	07:46	08:26
	17:01	17:52	18:39	20:27	21:13	21:46		21:42		20:58	19:54	18:49	16:55	16:35
15	08:29	07:49	06:52	06:46	05:52	05:27	06:09-06:26/17	05:43		06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:47		21:41		20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	06:09-06:26/17	05:44		06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47		21:40		20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50	05:27	06:09-06:27/18	05:46		06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:47		21:39		20:52	19:48	18:43	16:51	16:36
18	08:27	07:43	06:46	06:40	05:48	05:27	06:09-06:27/18	05:47		06:29	07:15	08:02	07:52	08:30
	17:07	17:59	18:45	20:33	21:18	21:48		21:38		20:51	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	06:10-06:28/18	05:48		06:31	07:17	08:03	07:54	08:30
	17:08	18:01	18:46	20:35	21:20	21:48		21:37		20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	06:10-06:28/18	05:49		06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:37	21:21	21:48		21:36		20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	06:10-06:28/18	05:50		06:34	07:20	08:06	07:57	08:32
	17:12	18:04	18:50	20:38	21:22	21:49		21:35		20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	06:10-06:28/18	05:52		06:35	07:21	08:08	07:59	08:32
	17:13	18:06	18:51	20:40	21:24	21:49		21:33		20:43	19:37	18:33	16:46	16:37
23	08:22	07:34	06:35	06:30	05:42	05:28	06:10-06:28/18	05:53		06:37	07:23	08:10	08:00	08:33
	17:15	18:07	18:53	20:41	21:25	21:49		21:32		20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	06:11-06:29/18	05:54		06:38	07:24	08:11	08:02	08:33
	17:16	18:09	18:54	20:43	21:26	21:49		21:31		20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:31	06:26	05:40	05:28	06:11-06:29/18	05:55		06:40	07:26	07:13	08:03	08:33
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	17:21	18:14	18:59	20:47	21:30	21:49		21:27		20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	06:11-06:29/18	05:59		06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31	21:49		21:26		20:31	19:24	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	05:30	06:12-06:29/17	06:01		06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:50	21:32	21:49		21:24		20:29	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:12-06:29/17	06:02		06:47	07:33	07:21	08:10	08:35
	17:26		20:04	20:52	21:33	21:49		21:23		20:26	19:19	17:19	16:39	16:43
31	08:12		07:18		05:34			06:03		06:49		07:23		08:35
	17:28		20:05		21:34			21:21		20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488		492		448	380	334	273	254
Anzahl Minuten mit Schatten	0	0	0	0	0	473		146		0	0	0	0	0

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

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

Projekt:

Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu

Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser WEA: 7 - Siemens SWT-3.0-113 -LJ 3000 113.0 !O! NH: 127,5 m (Ges:184,0 m) (14)

Voraussetzungen für Berechnung des Schattenwurfs

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

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

	Januar	Februar	März	April	Mai	Juni	Juli	August	September	Oktober	November	Dezember
1	08:35	08:11	07:22	07:15	06:15	05:34	05:31	06:05	06:50	07:35	07:24	08:11
	16:45	17:30	18:17	20:07	20:53	21:35	21:49	21:20	20:22	19:17	17:15	16:39
2	08:35	08:10	07:19	07:13	06:13	05:33	05:32	06:06	06:52	07:36	07:26	08:13
	16:46	17:31	18:19	20:08	20:55	21:36	21:48	21:18	20:20	19:15	17:13	16:38
3	08:34	08:08	07:17	07:11	06:11	05:32	05:33	06:08	06:53	07:38	07:28	08:14
	16:47	17:33	18:21	20:10	20:56	21:37	21:48	21:17	20:18	19:13	17:12	16:37
4	08:34	08:07	07:15	07:09	06:10	05:31	05:33	06:09	06:55	07:39	07:29	08:15
	16:48	17:35	18:22	20:12	20:58	21:38	21:48	21:15	20:16	19:10	17:10	16:37
5	08:34	08:05	07:13	07:07	06:08	05:31	05:34	06:10	06:56	07:41	07:31	08:17
	16:49	17:36	18:24	20:13	21:00	21:39	21:47	21:14	20:14	19:08	17:08	16:37
6	08:34	08:04	07:11	07:05	06:06	05:30	05:35	06:12	06:58	07:43	07:33	08:18
	16:50	17:38	18:26	20:15	21:01	21:40	21:47	21:12	20:12	19:06	17:07	16:36
7	08:34	08:02	07:09	07:02	06:05	05:30	05:36	06:13	06:59	07:44	07:34	08:19
	16:52	17:40	18:27	20:16	21:03	21:41	21:46	21:10	20:09	19:04	17:05	16:36
8	08:33	08:00	07:07	07:00	06:03	05:29	05:37	06:15	07:01	07:46	07:36	08:20
	16:53	17:42	18:29	20:18	21:04	21:42	21:46	21:09	20:07	19:02	17:04	16:36
9	08:33	07:59	07:05	06:58	06:01	05:29	05:37	06:16	07:02	07:47	07:38	08:21
	16:54	17:43	18:30	20:19	21:05	21:43	21:45	21:07	20:05	19:00	17:02	16:35
10	08:32	07:57	07:03	06:56	06:00	05:28	05:38	06:18	07:03	07:49	07:39	08:22
	16:55	17:45	18:32	20:21	21:07	21:43	21:44	21:05	20:03	18:58	17:01	16:35
11	08:32	07:55	07:01	06:54	05:58	05:28	05:39	06:19	07:05	07:50	07:41	08:23
	16:57	17:47	18:34	20:22	21:08	21:44	21:44	21:03	20:01	18:56	16:59	16:35
12	08:31	07:54	06:59	06:52	05:57	05:28	05:40	06:21	07:06	07:52	07:42	08:24
	16:58	17:49	18:35	20:24	21:10	21:45	21:43	21:02	19:59	18:54	16:58	16:35
13	08:31	07:52	06:56	06:50	05:55	05:28	05:41	06:22	07:08	07:53	07:44	08:25
	17:00	17:50	18:37	20:26	21:11	21:45	21:42	21:00	19:56	18:51	16:57	16:35
14	08:30	07:50	06:54	06:48	05:54	05:27	05:42	06:23	07:09	07:55	07:46	08:26
	17:01	17:52	18:38	20:27	21:13	21:46	21:41	20:58	19:54	18:49	16:55	16:35
15	08:29	07:48	06:52	06:46	05:52	05:27	05:43	06:25	07:11	07:57	07:47	08:27
	17:02	17:54	18:40	20:29	21:14	21:46	21:41	20:56	19:52	18:47	16:54	16:35
16	08:29	07:47	06:50	06:44	05:51	05:27	05:45	06:26	07:12	07:58	07:49	08:28
	17:04	17:55	18:42	20:30	21:16	21:47	21:40	20:54	19:50	18:45	16:53	16:35
17	08:28	07:45	06:48	06:42	05:50	05:27	05:46	06:28	07:14	08:00	07:51	08:29
	17:05	17:57	18:43	20:32	21:17	21:47	21:39	20:52	19:48	18:43	16:51	16:36
18	08:27	07:43	06:46	06:40	05:48	05:27	05:47	06:29	07:15	08:01	07:52	08:29
	17:07	17:59	18:45	20:33	21:18	21:48	21:38	20:50	19:45	18:41	16:50	16:36
19	08:26	07:41	06:44	06:38	05:47	05:27	05:48	06:31	07:17	08:03	07:54	08:30
	17:08	18:00	18:46	20:35	21:20	21:48	21:37	20:49	19:43	18:39	16:49	16:36
20	08:25	07:39	06:41	06:36	05:46	05:27	05:49	06:32	07:18	08:05	07:55	08:31
	17:10	18:02	18:48	20:36	21:21	21:48	21:36	20:47	19:41	18:37	16:48	16:36
21	08:24	07:37	06:39	06:34	05:44	05:27	05:50	06:34	07:20	08:06	07:57	08:31
	17:12	18:04	18:50	20:38	21:22	21:49	21:34	20:45	19:39	18:35	16:47	16:37
22	08:23	07:35	06:37	06:32	05:43	05:28	05:52	06:35	07:21	08:08	07:58	08:32
	17:13	18:06	18:51	20:40	21:24	21:49	21:33	20:43	19:37	18:33	16:46	16:37
23	08:22	07:33	06:35	06:30	05:42	05:28	05:53	06:37	07:23	08:09	08:00	08:32
	17:15	18:07	18:53	20:41	21:25	21:49	21:32	20:41	19:34	18:32	16:45	16:38
24	08:21	07:32	06:33	06:28	05:41	05:28	05:54	06:38	07:24	08:11	08:01	08:33
	17:16	18:09	18:54	20:43	21:26	21:49	21:31	20:39	19:32	18:30	16:44	16:38
25	08:20	07:30	06:30	06:26	05:40	05:28	05:55	06:40	07:26	07:13	08:03	08:33
	17:18	18:11	18:56	20:44	21:27	21:49	21:30	20:37	19:30	17:28	16:43	16:39
26	08:19	07:28	06:28	06:24	05:39	05:29	05:57	06:41	07:27	07:14	08:04	08:34
	17:20	18:12	18:57	20:46	21:29	21:49	21:28	20:35	19:28	17:26	16:42	16:40
27	08:18	07:26	06:26	06:22	05:38	05:29	05:58	06:43	07:29	07:16	08:06	08:34
	17:21	18:14	18:59	20:47	21:30	21:49	21:27	20:33	19:26	17:24	16:41	16:40
28	08:16	07:24	06:24	06:20	05:37	05:30	05:59	06:44	07:30	07:18	08:07	08:34
	17:23	18:16	19:01	20:49	21:31	21:49	21:26	20:31	19:23	17:22	16:41	16:41
29	08:15		07:22	06:18	05:36	05:30	06:01	06:46	07:32	07:19	08:09	08:34
	17:25		20:02	20:50	21:32	21:49	21:24	20:28	19:21	17:20	16:40	16:42
30	08:14		07:20	06:17	05:35	05:31	06:02	06:47	07:33	07:21	08:10	08:34
	17:26		20:04	20:52	21:33	21:49	21:23	20:26	19:19	17:19	16:39	16:43
31	08:12		07:17		05:34		06:03	06:49		07:23		08:34
	17:28		20:05		21:34		21:21	20:24		17:17		16:44
Sonnenscheinstunden	268	282	368	412	477	488	492	448	380	335	273	254
Anzahl Minuten mit Schatten	0	0	0	0	0	0	0	0	0	0	0	0

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

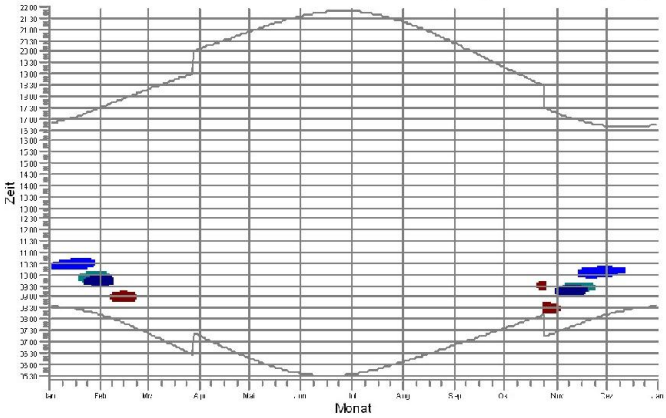
Tag im Monat	Sonnenaufgang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten
	Sonnenuntergang (SS:MM)	Zeitpunkt (SS:MM)	Schattenanfang-Zeitpunkt (SS:MM)	Schattenende/Minuten mit Schatten

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
+352 449 021
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

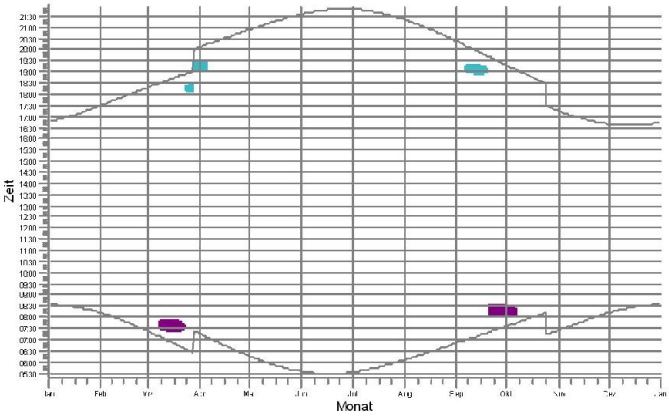
SHADOW - Grafischer Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

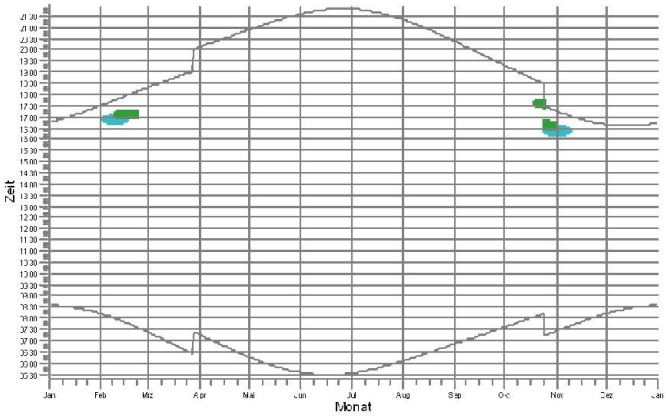
1: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (99)



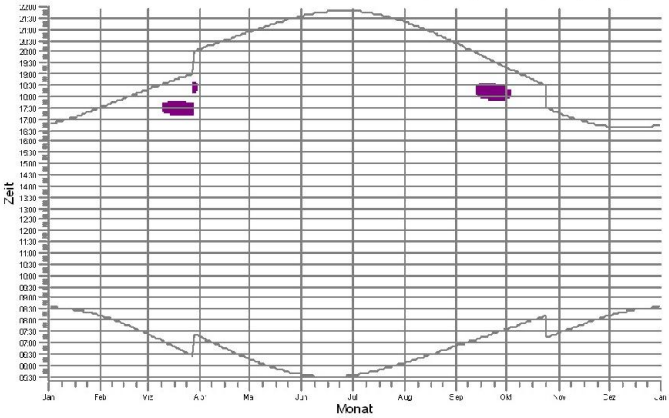
2: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (100)



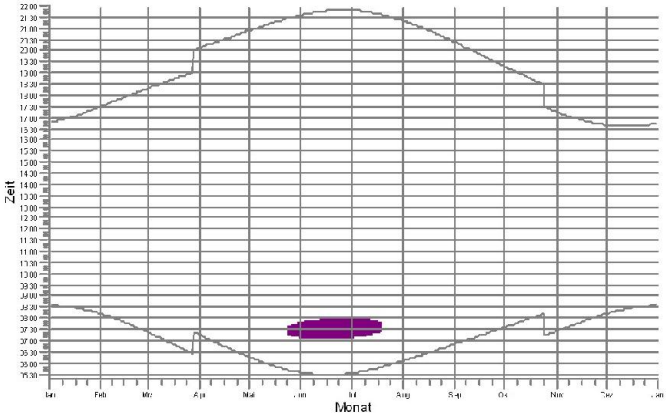
3: ENERCON E-138 EP3 3500 138.6 !O! NH: 160,0 m (Ges:229,3 m) (101)



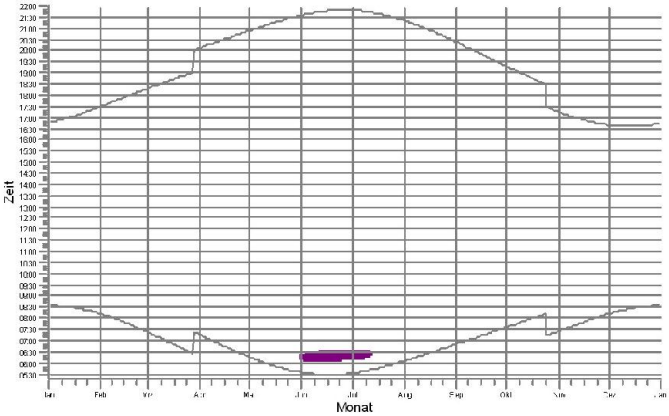
4: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (11)



5: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (12)



6: ENERCON E-40/5.40 500 40.3 !O! NH: 65,0 m (Ges:85,2 m) (13)



Schattenrezeptoren

- C: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (21)
- F: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (24)
- G: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (25)
- H: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (26)
- K: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (29)
- S: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (37)
- T: Schattenrezeptor: 0,1 × 0,1 Azimut: 0,0° Ausrichtung: 90,0° (38)

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
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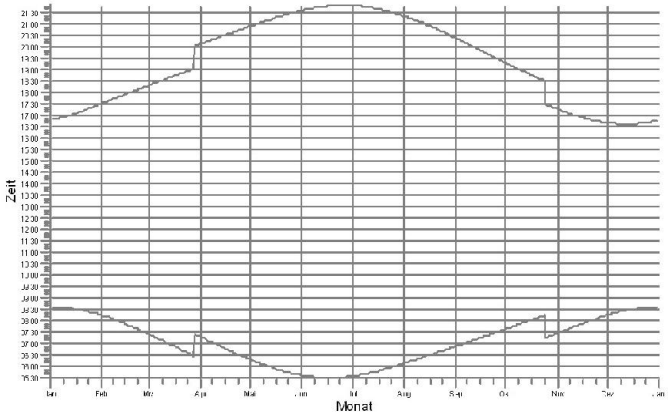
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Grafischer Kalender pro WEA

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser

7: Siemens SWT-3.0-113 -LJ 3000 113.0 !O! NH: 127,5 m (Ges:184,0 m) (



Schattenrezeptoren

Projekt:
Repowering WP Kehmen-Heischent Phase 1

Lizenzierter Anwender:
Societe Electrique de l'Our S.A.
2, rue Pierre d'Aspelt, P.B. 37
LU-2010 Luxembourg
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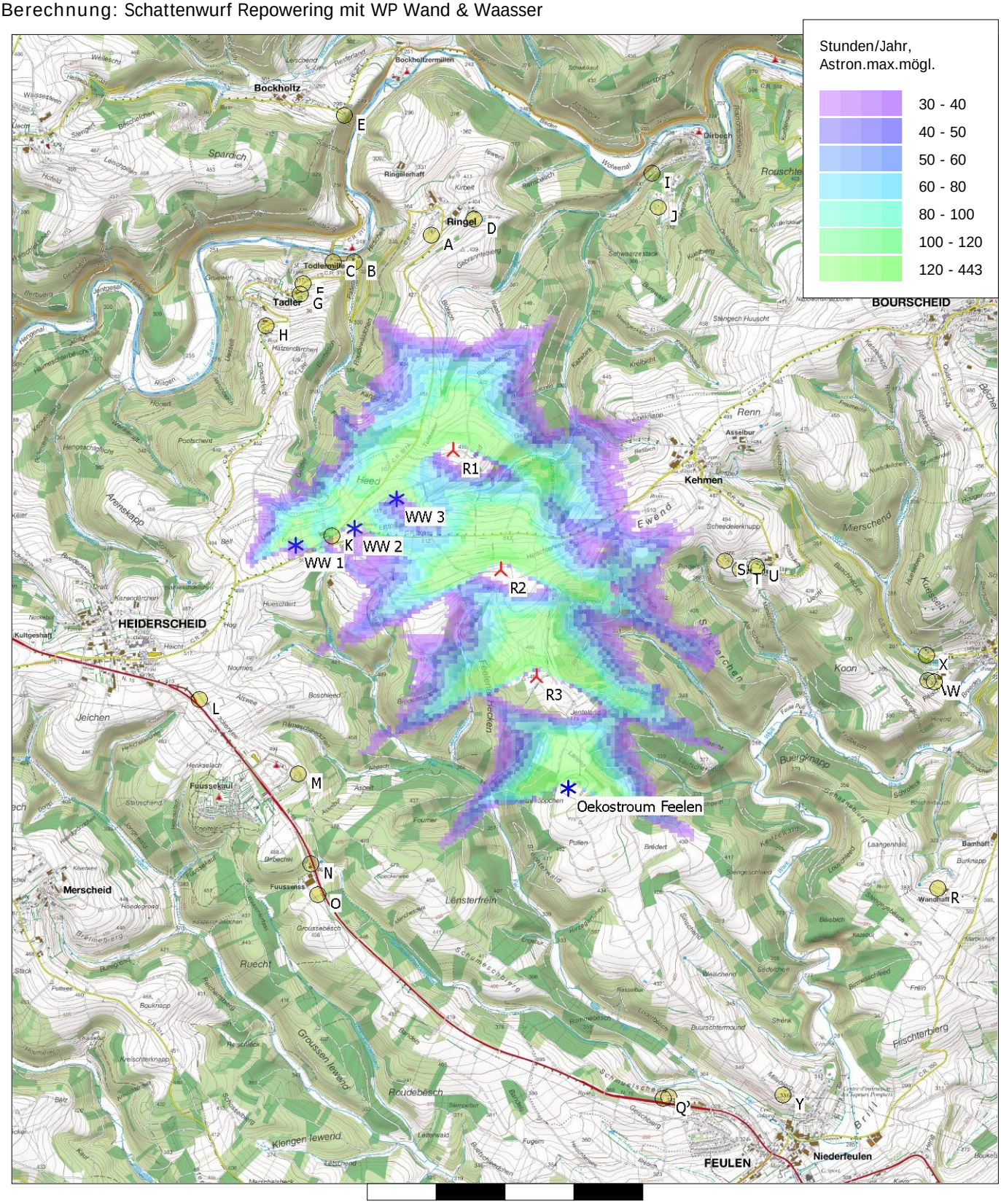
Lynn Jacobs / lynn.jacobs@seo.lu
Berechnet:
20.07.2018 11:14/3.1.633

SHADOW - Karte

Berechnung: Schattenwurf Repowering mit WP Wand & Waasser



Karte: Bitmap-Karte: SERIE_R_TOPO_TC06.tif , Maßstab 1:40.000, Mitte: LUREF Ost: 69.309 Nord: 106.323

Neue WEA Existierende WEA Schattenrezeptor

Höhe der Schattenkarte: Höhenlinien: CONTOURLINE_ONLINEDATA_0.wpo (4)