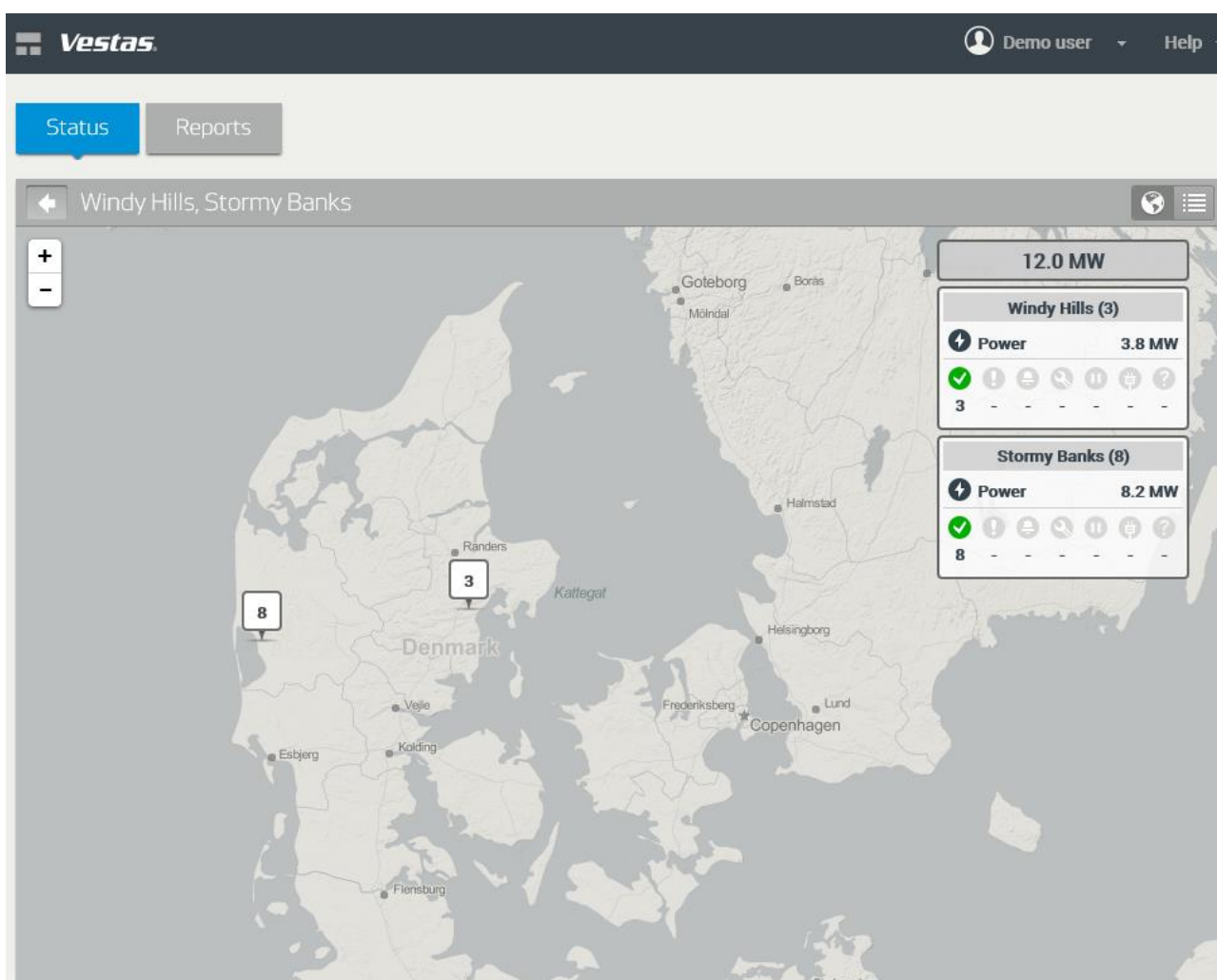


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# VestasOnline<sup>®</sup> Enterprise User Guide



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Type: T09 – User Guide	Table of contents	Page 2 of 55

## History of this document

Version no.	Date	Description of changes
00	2014-06-16	First issue – including minor linguistic corrections
01	2014-10-22	Updated to VOE version 1.0.2.401
02	2015-02-03	New selector for signals and wind turbines in Historical Data and Logs tab
03	2016-02-20	Gamesa and Suzlon wind turbines added; Performance tab for TAC wind turbines added
04	2016-07-12	Calculated production added; matrix of reports/controller types added; Generator Temperature Large/Small added; various editorial changes

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## 1 About this manual

This manual describes the features and functionality of VestasOnline® Enterprise for remote monitoring and control of Vestas wind turbines and wind power plants.

## 2 Introduction to VestasOnline® Enterprise

VestasOnline® Enterprise (VOE) is a web-based tool for monitoring and controlling Vestas as well as 3<sup>rd</sup> party wind turbines. It enables you to see key on-line parameters such as operational status, production, wind speed, various temperatures and to view historical data. In addition, authorized users can acknowledge alarms and warnings as well as stop and start wind turbines.

Access to the wind turbine via VestasOnline® Enterprise is password protected to make sure that unauthorized users cannot control the wind turbine or get access to power production information.

### 2.1 How does VestasOnline® Enterprise work?

By means of an IP connection, data from the wind turbines is streamed to a centralized server system. Using a standard internet browser such as Internet Explorer or Google Chrome, the user opens the VestasOnline® Enterprise application and retrieves the data.

Even though VestasOnline® Enterprise is not directly connected to the wind turbine, the delay of the online data is only around 5 seconds (depending on the quality of the connection to the turbine). This means that an alarm or a warning from a wind turbine will appear in VestasOnline® Enterprise only 5 seconds after it actually occurred on site.

The VestasOnline® Enterprise system requires an IP connection in the wind turbine in order to retrieve wind turbine data - if such a connection does not exist, then Vestas can provide a Turbine Communication Upgrade kit.

## 3 Requirements

### 3.1 Web browser

VestasOnline® Enterprise supports the latest versions of the most popular web browsers on personal computers:

- Internet Explorer
- Google Chrome
- Mozilla Firefox

### 3.2 Wind turbine

VestasOnline® Enterprise supports Vestas wind turbine with these controller types:

- VMP 3500
- VMP 4400
- VMP 5000.01
- VMP 5000.02
- VMP 6000
- VMP Global
- TAC I
- TAC II

In addition, these 3<sup>rd</sup> party wind turbine types are also supported;

- Gamesa G52
- Gamesa G80
- Gamesa G90
- Suzlon S88

## 4 Log in - Log out

### 4.1 How to log in

To log in to VestasOnline® Enterprise, do as follows:

1. Enter this URL in your web browser: <https://voe.vestas.com>

When the connection is established, the VestasOnline® Enterprise Login page appears.

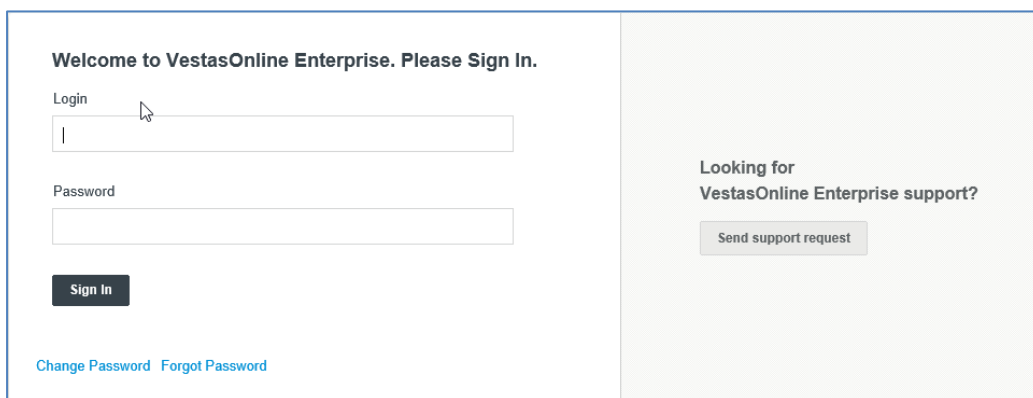


Figure 4-1: Log in page

2. Enter your user name in the Login entry field
3. Enter your password in the Password entry field.
4. Click **Sign In**.

### 4.2 How to log out?

To log off, do as follows:

1. Click the User Name in the upper black row to display the drop-down menu.

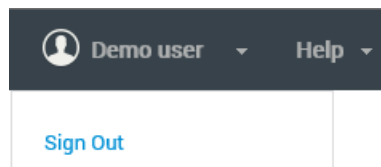


Figure 4-2: Sign out

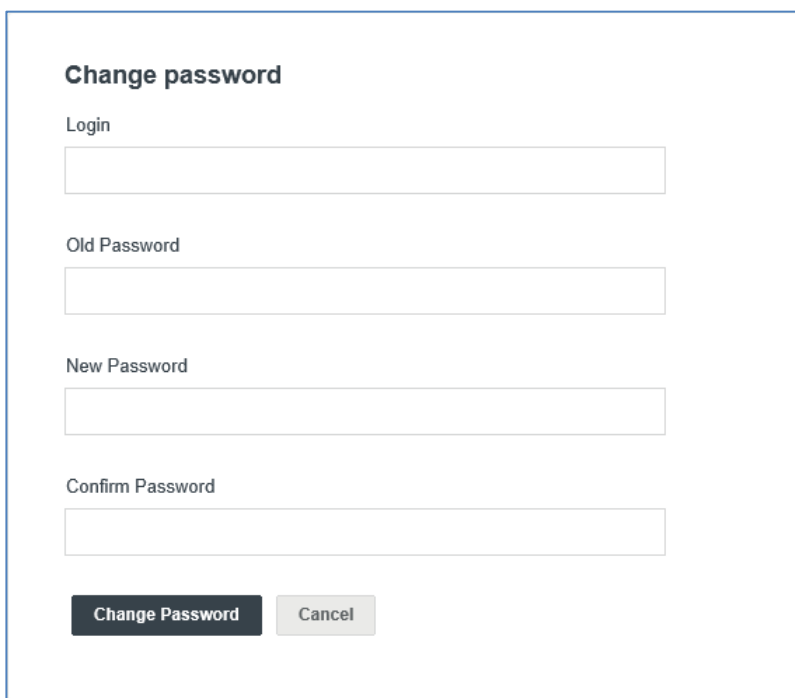
2. Click Sign Out to log off from VestasOnline® Enterprise.

### 4.3 Change password

Vestas recommends that you change the password you received from Vestas to a user-defined password the first time you log in to VestasOnline® Enterprise.

To change the password, do as follows:

1. Click **Change Password**.
2. Enter the new password in the New password field.
3. Confirm the new password in the Confirm password field.
4. Click **Change**.



The screenshot shows a web form titled "Change password". It contains four text input fields labeled "Login", "Old Password", "New Password", and "Confirm Password". Below the fields are two buttons: a dark grey button labeled "Change Password" and a light grey button labeled "Cancel".

Figure 4-3: Change password

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**NOTE** Password requirements: Minimum 8 characters

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**NOTE** Passwords for Vestas users cannot be changed as VestasOnline® Enterprise uses Windows log-in credentials for Vestas users.

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## 4.4 Forgot Password

In case you have forgotten your password, you can request a new password from Vestas. The new password is sent to you by email.

To request a new password, do as follows:

1. Click **Forgot Password**.
2. Enter your email address in the Email address field.
3. Click **Reset Password**.

The screenshot shows a web form titled "Reset password". Below the title is the label "Email" followed by a rectangular text input field. At the bottom of the form are two buttons: a dark grey button labeled "Reset Password" and a light grey button labeled "Cancel". A mouse cursor is visible at the bottom center of the form area.

Figure 4-4: *Forgot password*

## 4.5 Support request

To submit a request for support on VestasOnline® Enterprise, click the Support Request button on the Log in page.

The screenshot shows a light grey rectangular box containing the text "Looking for Vestas Online Enterprise support?" in a bold, dark font. Below this text is a button with the text "Send support request" in a smaller, dark font.

Figure 4-5: *Support request*

This will open a mail message in your default mail application. The mail address of the VestasOnline® Enterprise support is:

WPPO\_SUPPORT@Vestas.com

Please include as much information as you can about your support issue as well as your contact information (contact name, company, mail address, phone number).

## 5 Layout, Levels and Navigation

### 5.1 Layout

VestasOnline® Enterprise automatically adjusts the zoom level of the opening view to include all wind power plants of the customer account in question. For a large account it may display several wind power plants in various continents, while for a smaller account it may only display the wind turbines in a single wind power plant.

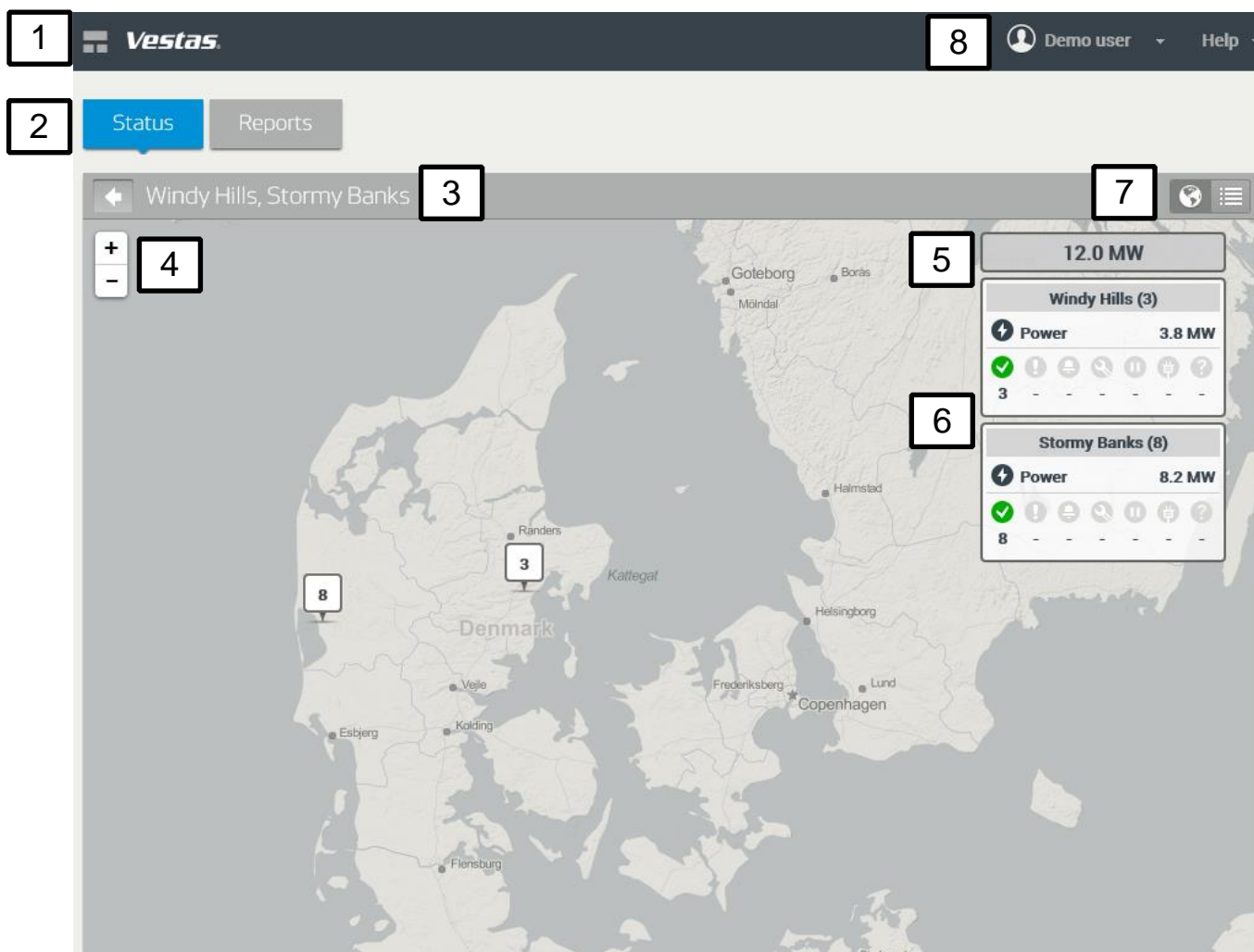


Figure 5-1: Opening view – customer account with two wind power plants

- |   |                    |
|---|--------------------|
| 1 Home icon   | 2 Feature buttons  |
| 3 Wind power plants in current zoom level                     | 4 Zoom tool        |
| 5 Power production of wind power plants in current zoom level | 6 Plant info boxes |
| 7 Table view / Map view icons                                 | 8 Current user     |



## 5.2 Levels

VestasOnline® Enterprise provides information on three levels – ranging from a full overview of all wind turbines in a customer account to focusing on a single wind turbine.

Portfolio level = displays all wind power plants and stand-alone wind turbines in a customer account.

The number in the wind power plant icon shows the number of wind turbines in the plant.

Wind power plant level = displays all wind turbines in a single wind power plant.

Wind turbine level = displays information about production and the main components of the wind turbine

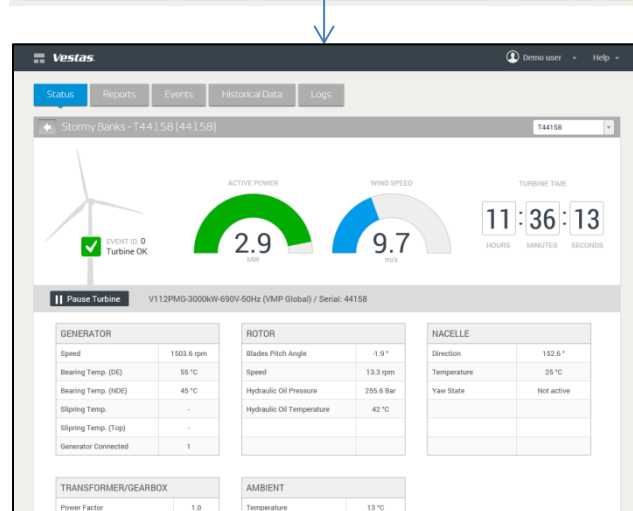
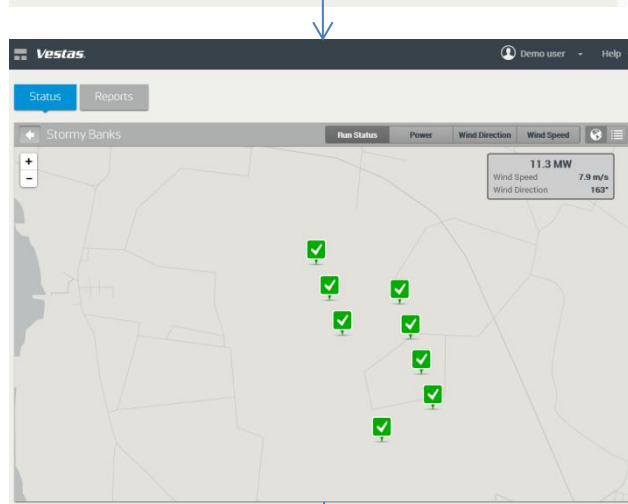
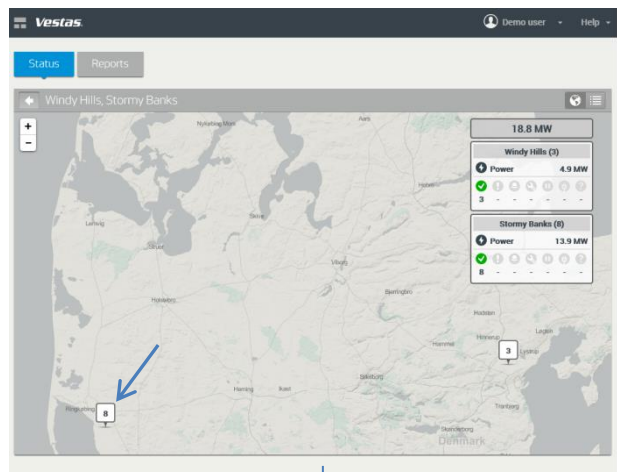


Figure 5-2: Portfolio > Wind power plant > Wind turbine level

On the Portfolio and Wind power plant level the information is available in two separate views:

- Map view – shows location of wind power plants / stand-alone wind turbines on a map; an info box shows current power production and information on operational state of the wind turbines
- Table view – shows current power production and information on operational state of wind turbines in a tabular format

Notice that the information shown in the two views is identical!

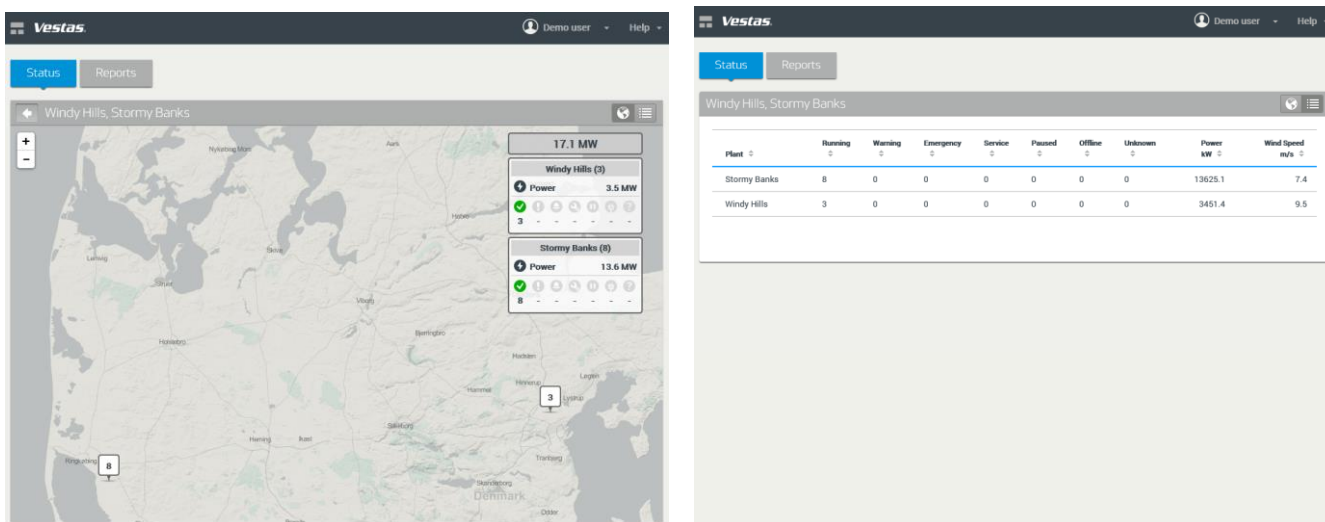


Figure 5-3: Map view – table view

### 5.3 Navigation in the map



#### Zoom tool

Click on the plus sign or minus sign in the Zoom tool to zoom in or out.



#### Back button

The Back button returns you to the previously visited page or to the latest zoom level.



#### Zoom and pan using the mouse

To zoom in or out, use the scroll wheel on the mouse. Place the arrow pointer on top of the Plant icon to keep the wind power plant in focus.

To pan (move the map), simply click and hold your mouse, then drag the map.

## 5.4 Switching between levels

### 5.4.1 Portfolio level to wind power plant level

To go from Portfolio level to Wind power plant level, click the Plant icon or click the Plant info box.

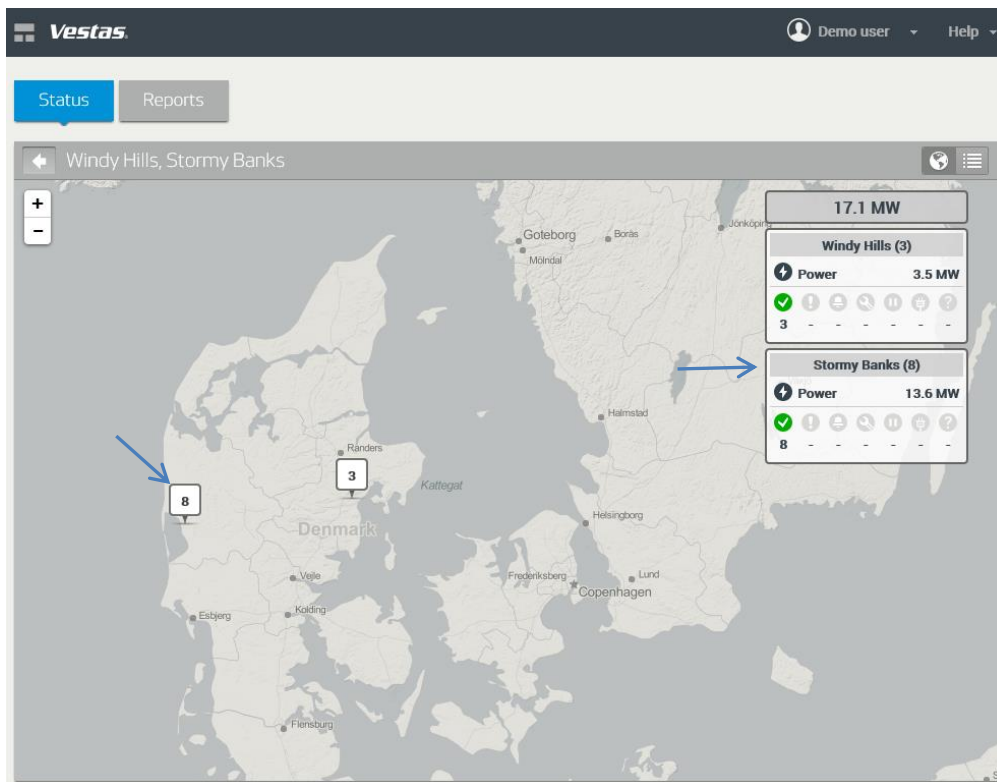


Figure 5-4: Portfolio level

To return to the Portfolio level from any other level, click the Home icon in the upper left corner.



Figure 5-5: Home icon

### 5.4.2 Wind power plant level to Wind turbine level

To go from Wind power plant level to Wind turbine level, click the Wind turbine icon or click the Wind turbine info box.

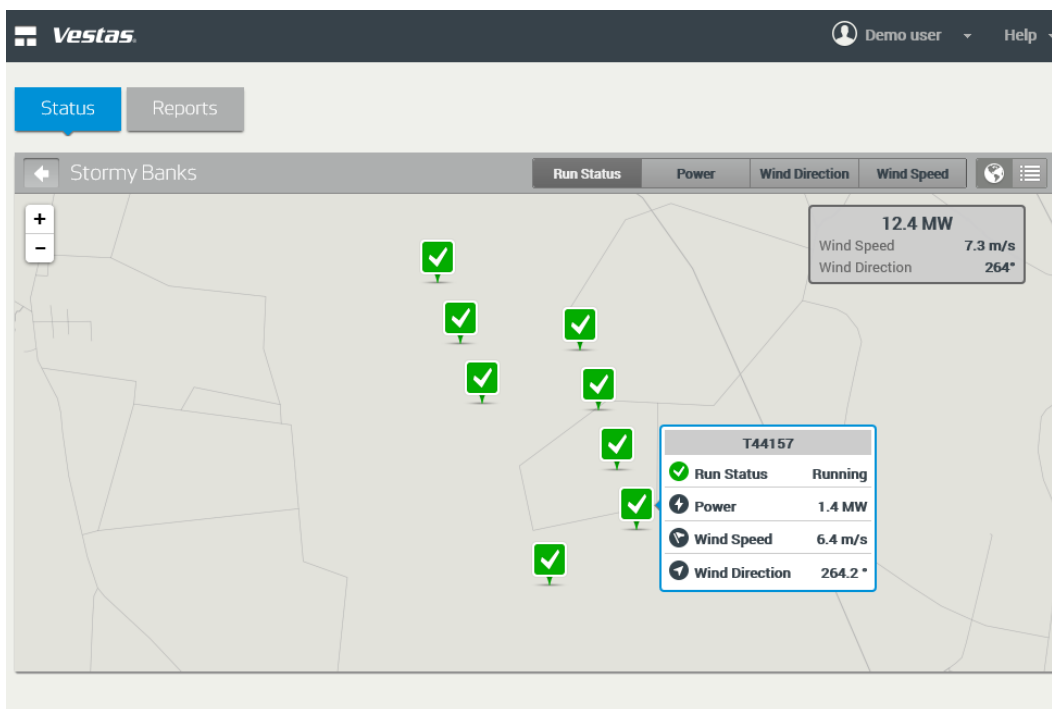


Figure 5-6: Wind power plant level

### 5.4.3 Wind turbine level to Wind power plant level or Portfolio level

To go from Wind turbine level to Wind power plant level, click the Back icon.

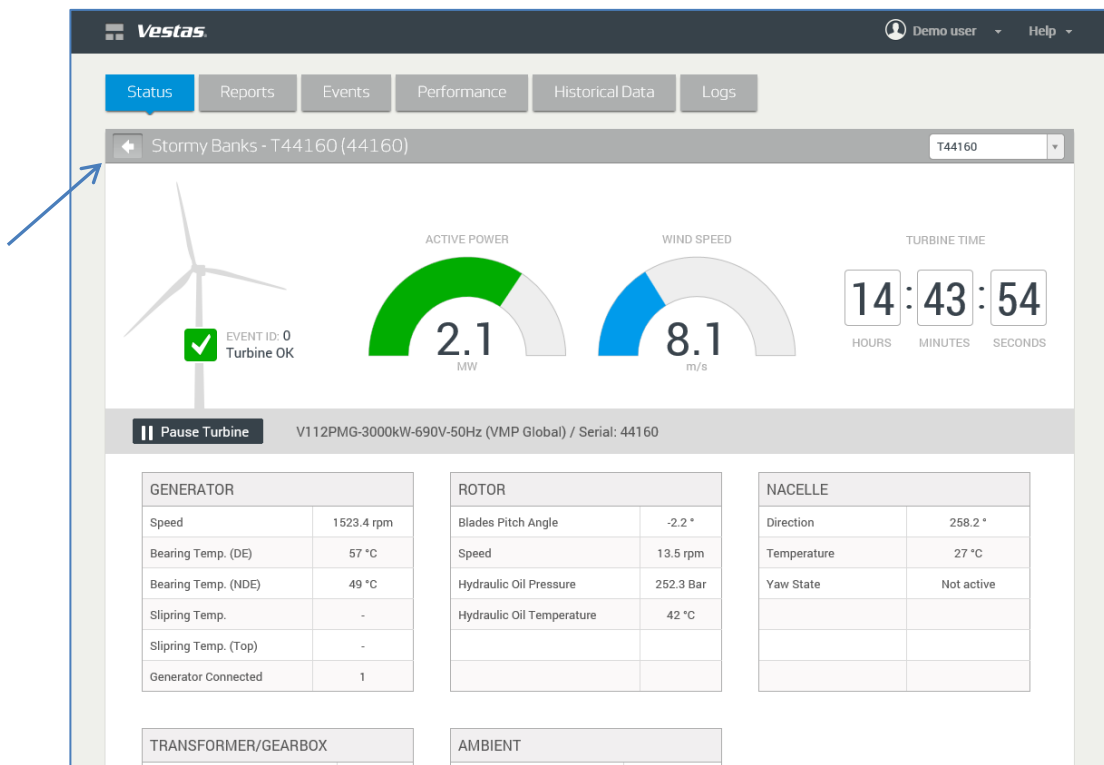


Figure 5-7: Wind turbine level

To go from Wind turbine level to Portfolio level, click the Home icon.



Figure 5-8: Home icon

## 6 Portfolio level

The Portfolio level displays all wind power plants and stand-alone wind turbines in a customer account.

### 6.1 Map view

The Map view shows the geographical location of the wind power plants based on wind turbine GPS data. In addition, a column of info boxes shows basic status information for each wind power plant plus the current power production from all wind turbines.

In the example below the customer account consists of two wind power plants:

- Stormy Banks
- Windy Hills

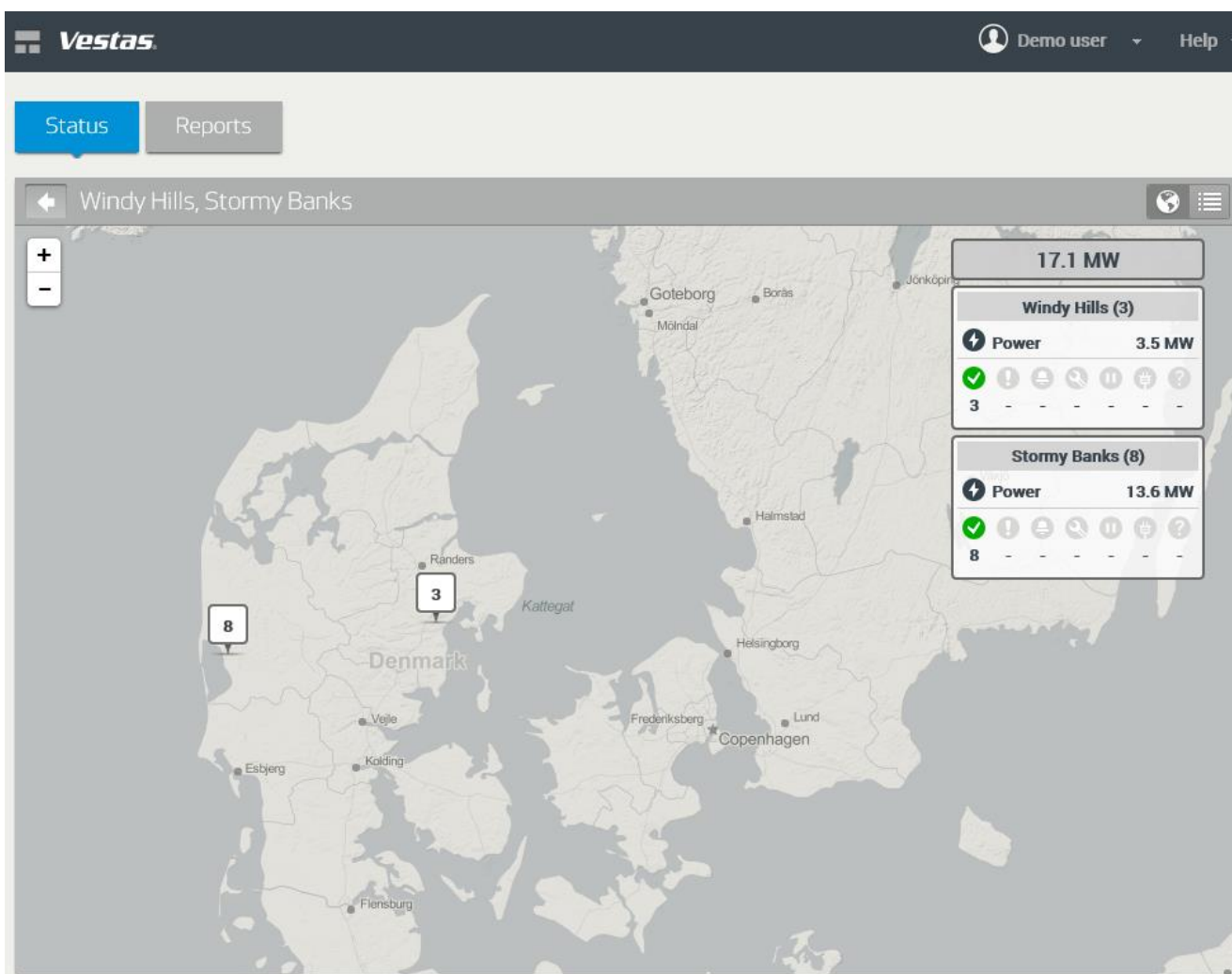


Figure 6-1: Portfolio level – Map view

If you zoom in – using the Zoom tool or the mouse – the list of plant info boxes at the right will only include the wind power plants that are displayed at the current zoom level.

To go to the wind power plant level, click on the plant icon on the map or click on the plant info box at the far right.

The number of wind turbines in the wind power plant is displayed in the wind power plant icon.



Figure 6-2: Wind power plant icon with number of wind turbines

In case one or more wind turbines are not in operation, the colour of the outline of the icon will reflect the state of the wind turbine.

- Emergency – red outline
- Stopped - grey outline
- Warning – orange outline
- Running – grey outline

If you zoom out in the Map view, two or more wind power plants that are located close to one another cannot be shown as separate items. Instead the wind power plant icon changes to the below shape and shows the total number of wind turbines in the wind power plants.



Figure 6-3: Wind power plant icon – several wind power plants with total number of wind turbines



Figure 6-4: Wind power plant icon – several wind power plants. In this example, one or more wind turbines are not in operation. In case of more wind turbines with events, the icon for the most severe state is displayed (for an overview of severity ranking - see Table 7-2: Wind turbine status icons).

At the upper right the production box shows the total current power production of the wind power plants that are displayed at the current zoom level.

The plant info boxes at the right provide a summarized status of each wind power plant in the portfolio. When you place the mouse on top of the wind power plant icon, the same status info box – with additional wind information - appears. The Run Status icons show the operational state of the wind turbines.



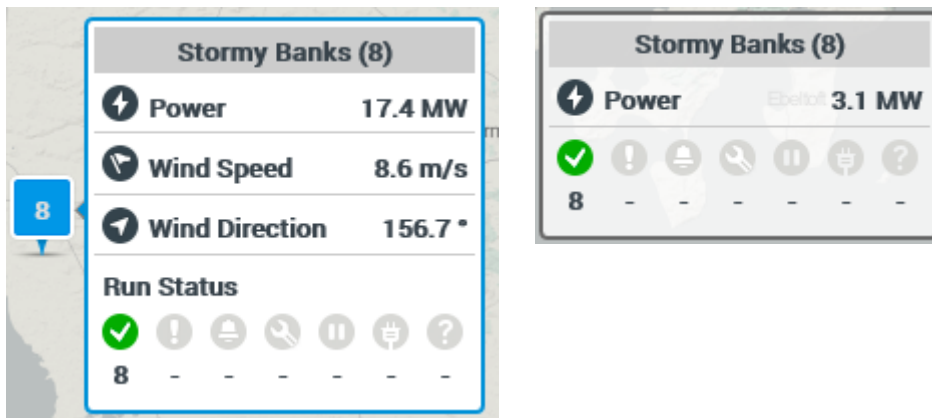


Figure 6-5: Status info box in Map view (mouse-over) and Plant info box

Explanation of information

Row name / icon	Displays
Wind power plant name	The name of the wind power plant – the number of wind turbines is shown in the ( ).
Power	The current power production from the wind power plant in MW or kW.
Wind Speed	The current wind speed in meters per second – average of wind speed measurements from wind turbines with communication.
Wind Direction	The current wind direction in degrees - average of wind direction measurements from wind turbines with communication.
Run Status - Colour	The number below the icon shows the number of wind turbines in the corresponding state.
- Green	Normal operation
- Orange	Warning
- Red	Alarm (Emergency / Stopped)
- Blue	Service
- Grey	Pause
- Grey	Offline
- Grey	Unknown

Table 6-1: Information in Info box



## 6.2 Table view

The Table view shows the status information in a table format.

To go the Table view, click the Table view icon at the upper right corner. To return to the Map view, click the Map view icon.



Figure 6-6: Map view / Table view icon

Plant	Running	Warning	Emergency	Service	Paused	Offline	Unknown	Power kW	Wind Speed m/s
Stormy Banks	8	0	0	0	0	0	0	12988.9	8.0
Windy Hills	3	0	0	0	0	0	0	4177.7	10.2

Figure 6-7: Portfolio level – Table view

The information provided in the table view is identical to the information shown in the plant info box (see description in section 6.1).

## 7 Wind power plant level

The Wind power plant level shows information about all wind turbines in a single wind power plant.

### 7.1 Map view

The Map view shows the geographical location of the wind turbines based on the wind turbine's GPS coordinates.

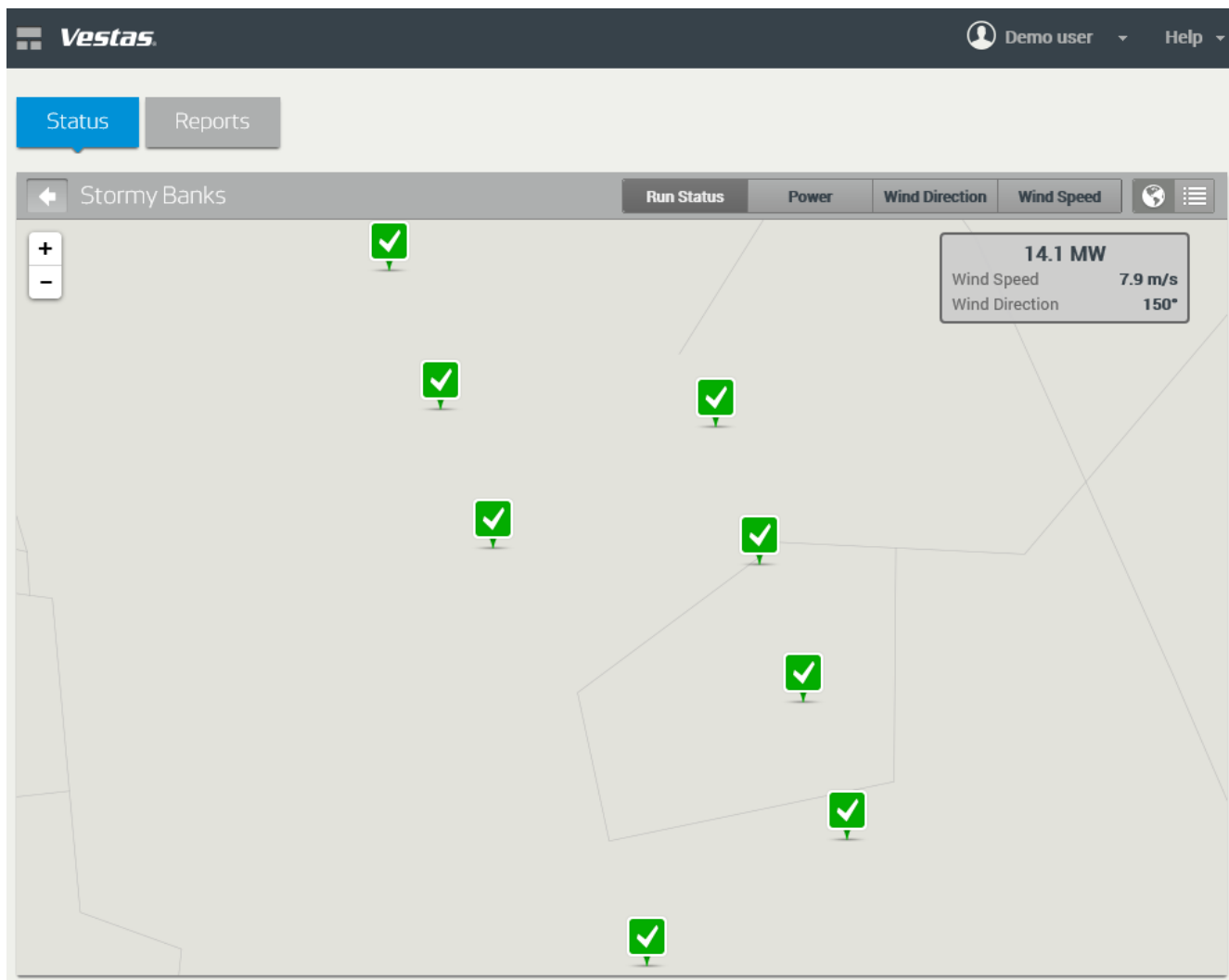


Figure 7-1: Wind power plant level – Map view

Four buttons at the top of the window allow you to select the status information that is shown in the wind turbine icon.



Figure 7-2: Status information buttons

Status information in wind turbine icon





Icon	Description
	Operational status – see overview of status icons in the table below
	Power – shows the current power production in kW or MW
	Wind direction – shows a graphical representation of the wind direction
	Wind speed – shows the wind speed in meters per second

Table 7-1: Wind turbine status information

Overview of wind turbine status icons (shown in order of ranking)







Icon	Colour	Status
	Blue	<b>Service</b> Turbine is in Service mode.
	Grey	<b>Unknown</b> No information about the status of the turbine.
	Grey	<b>Offline</b> Turbine has been taken offline.
	Red	<b>Paused</b> Turbine has been set in Pause mode.
	Grey	<b>Warning</b> A warning has occurred. Turbine is still in operation.
	Orange	<b>Service</b> Turbine is in Service mode.

Table 7-2: Wind turbine status icons

---

**NOTE** The status icons are ranked. This means that if a wind turbine for example has an alarm and later is set in service mode, then the blue Service icon will be displayed.

---

## 7.2 Table view

The Table view option provides the same information as the Map view - in a tabular format.

Turbine	Serial Number	Run Status	Plant	Power kW	Wind Speed m/s
T44152	44152	Running	Stormy Banks	474.0	5.7
T44153	44153	Running	Stormy Banks	348.3	6.3
T44154	44154	Running	Stormy Banks	316.0	5.3
T44155	44155	Running	Stormy Banks	399.8	6.3
T44157	44157	Running	Stormy Banks	440.9	6.1
T44158	44158	Running	Stormy Banks	451.1	6.7
T44159	44159	Running	Stormy Banks	485.6	5.5
T44160	44160	Running	Stormy Banks	515.3	6.5

Figure 7-3: Wind power plant - Table view

Click on a wind turbine in the table to go to the wind turbine Status page.

## 8 Wind turbine level

The wind turbine level shows online power production data and status information from main components in a wind turbine. In addition, it also lists all active events (alarms and warnings), provides an overview of performance and historical data and displays the wind turbine alarm log.

The information is organized into six tabs – each focusing at a specific area.



Figure 8-1: Six tabs at wind turbine level

- Status – provides online information about power production as well as status information of main components. Also, it enables authorized users to pause or start the wind turbine
- Reports – lets the user create contractual availability, performance, events, production, wind and other reports (the Reports tab only appears at wind power plants with AOM 4000 or AOM 5000 service contracts).
- Events – lets the user acknowledge alarms and warnings
- Performance – shows production and availability information for the latest 11 months plus the current month – in a chart or a table
- Historical Data – lets the user select and display 10-Minute data from various wind turbine modules and components
- Logs – lets the user select and display information from wind turbine logs

### Overview of availability of data

	Data Available from	Description
Reports	Start date for generation of Shadow Data	Individual start date for each wind power plant
Performance	12-mothn period (complete information for the latest 11 months plus the available data for the current month)	General time period
Historical Data	Start date of data collection to Vestas Data Centre	Individual start date for each wind power plant
Logs	Start date of data collection to Vestas Data Centre	Individual start date for each wind power plant

Table 8-1: Availability of data

## 8.2 Status

The Status tab shows online information about wind conditions, power production as well as status information about main components in the wind turbine.

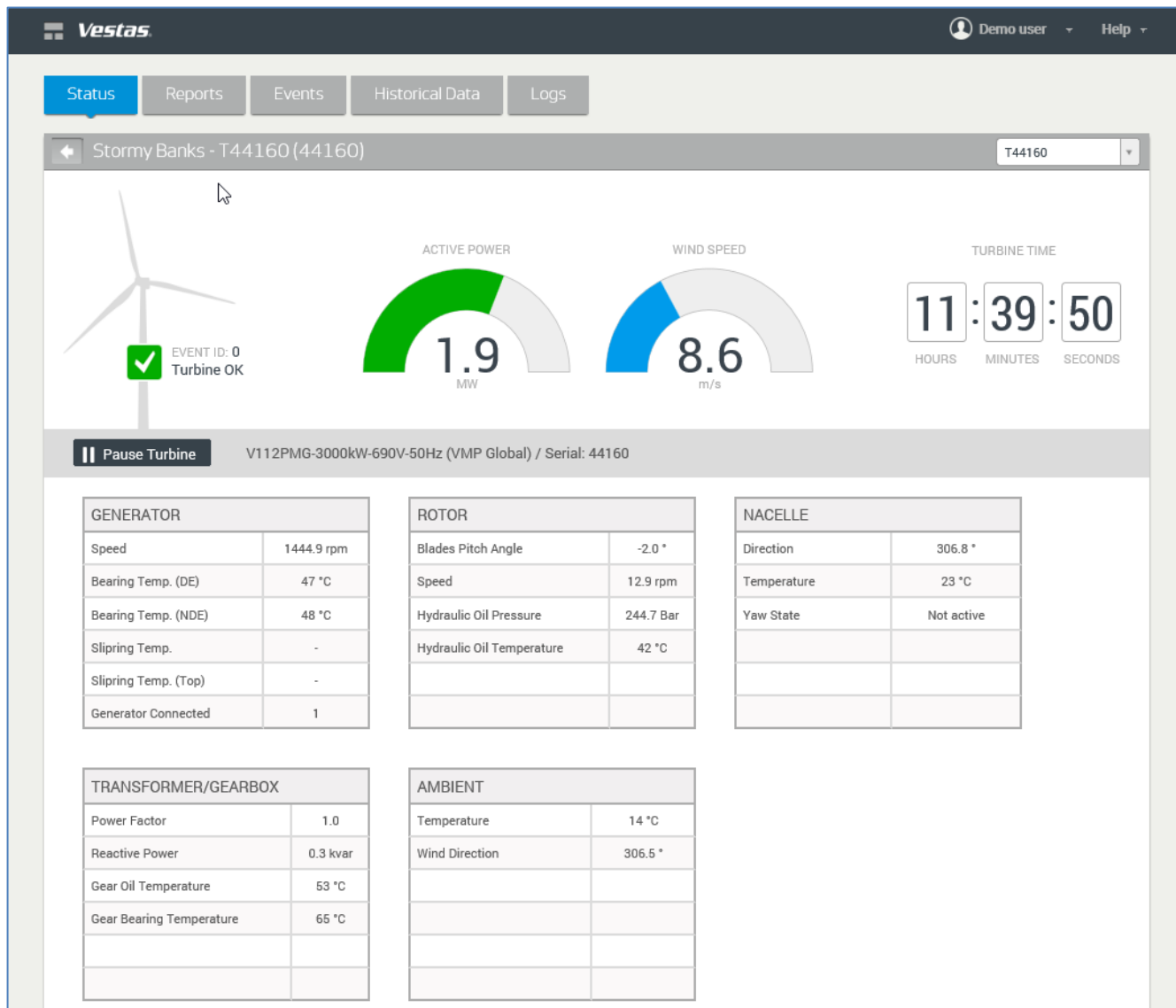


Figure 8-2: Wind turbine level – Status tab

**NOTE** The Status page shows a fixed set of the most significant signals from Vestas wind turbines. However, as the number of online signals varies from one wind turbine type to another, some of the signals may not be supported on a specific wind turbine type. Consequently, an unsupported signal will show a '0' or a '-' such as the Slipring Temperature in the above example.

Explanation of information in Status tab

Name	Description
<b>Status</b>	
Event ID	Shows '0' when the wind turbine is running (Turbine OK) Shows an alarm number and alarm text if the turbine is stopped by an alarm.
Event Text	The textual description of the latest event
Active Power	Active power production (kW or MW)
Wind Speed	Current wind speed ( meters per second)
Turbine Time	The time as set in the wind turbine controller
Turbine type & serial number	Turbine type information and wind turbine serial number
<b>Generator</b>	
Speed	Current generator speed (revolutions per minute)
Bearing Temp. (DE)	Bearing temperature – drive end (° Celsius)
Bearing Temp. (NDE)	Bearing temperature – non-drive end (° Celsius)
Slipring Temp.	Slipring temperature - (° Celsius)
Generator Large Temperature <sup>1</sup>	Temperature for 2-speed generators (Large) - (° Celsius) 1-speed generators will also show this temperature
Generator Small Temperature <sup>2</sup>	Temperature for 2-speed generators (Small) - (° Celsius)
Slipring Temp. (Top)	Slipring temperature top - (° Celsius)
Generator Connected	Shows how the generator is connected: 0 = Generator not connected 1 = Generator 1 configuration (Delta) 2 = Generator 2 configuration (Star)
<b>Rotor</b>	
Blades Pitch Angle	Current pitch angle of the rotor blades (degrees)
Speed	Current rotor speed (revolutions per minute)
Hydraulic Oil Pressure	Current hydraulic oil pressure (bar)
Hydraulic Oil Temperature	Current hydraulic oil temperature (° Celsius)

<sup>1</sup> Only displayed for wind turbines with a TAC controller.

<sup>2</sup> Only displayed for wind turbines with a TAC controller.

<b>Nacelle</b>	
Direction	Current direction of the nacelle (0-359 degrees)
Temperature	Current temperature inside the nacelle (° Celsius)
Yaw State	Current yaw state - possible states are: VMP controller: – Yawing CCW – Yawing CW – Not Yawing – AutoYaw
<b>Transformer / Gearbox</b>	
Power Factor	Power factor is the ratio of the average or real power to the apparent power. The power factor is a dimensionless number between 0 and 1. (Power factor is also known as Cos Phi)
Reactive Power	Current reactive power production (kilovar)
Gear Oil Temperature	Current gear oil temperature (° Celsius)
Gear Bearing Temperature	Current gear bearing temperature (° Celsius)
<b>Ambient</b>	
Temperature	Current ambient temperature (° Celsius)
Wind Direction	Current wind direction (0-359 degrees)

*Table 8-2: Information in Status tab*

### Pause - Start

The Status tab also contains a button for controlling the operation of the wind turbine. The name (Pause/Start) and function of the button reflects the operational state.



*Figure 8-3: Pause Turbine – Start Turbine button*

Turbine state	Name of button	Function
Running	Pause	Sets the wind turbine into 'Pause' state
Not running	Start	Starts the wind turbine = sets it into the 'Run' state if it has been set into the 'Pause', 'Stop' or 'Emergency' state

*Table 8-3: Pause - Start*

### NOTE



---

The Start and Pause buttons are only visible if the user is authorized to start and pause wind turbines. VestasOnline® Enterprise only allows the user to set the wind turbine into the 'Pause' or the 'Run' operational state.

---

When a wind turbine is set into Pause from VestasOnline® Enterprise, this operation is logged as event 309 – Pause over RCS and the responsible part ('Source') is set as 'Remote pause by Owner'.

### 8.3 Reports

The Reports tab lets users generate contractual availability, performance, events, production, wind and other reports for wind power plants with AOM 4000 or AOM 5000 service contracts.

The data foundation for these reports is not the 'raw' 10-minute data but the Shadow Data – an editable copy of the original 10-minute data where incorrect or missing allocation of turbine downtime can be modified or added. Shadow Data is not available for wind turbines with VMP 3500/4400/5000.1 controllers.

---

**NOTE** The Reports tab only appears at wind power plants where the Report functionality is enabled.

---

Using a range of pre-defined templates the Reports option allows the user to generate reports on:

- Performance
- Production
- Environmental conditions (wind and temperature)
- Availability
- Events

The Reports tab is organized in two sections:

- Generate Report – for creating new reports
- Report Archive – lists available reports; download of reports

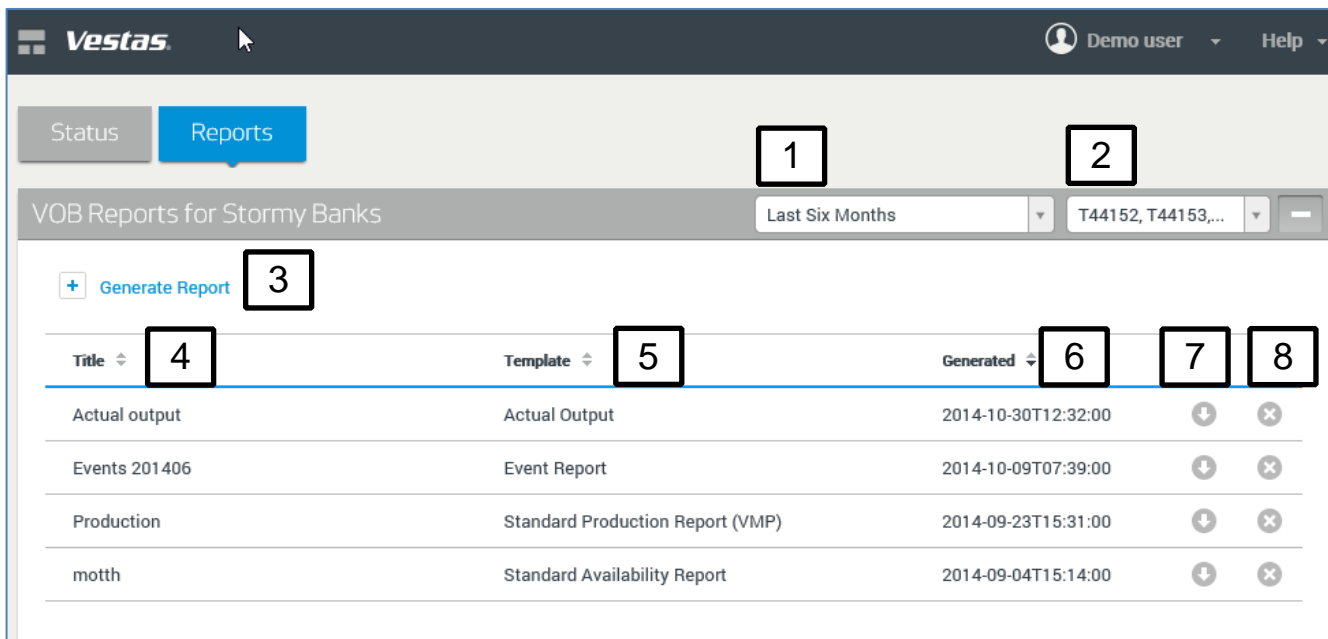


Figure 8-4: Reports tab

- 1 Period selector for Report Archive
- 2 Wind turbine selector for Report Archive
- 3 Hide/Show Generate Report section
- 4 Title of available reports
- 5 Template used for available reports
- 6 Generation time of available reports
- 7 Download Report button
- 8 Delete Report

The Generate Report section is shown or hidden by means of the buttons. This section lets you specify the report parameters (report title, turbines, report template and time period) that are required for creating a report.

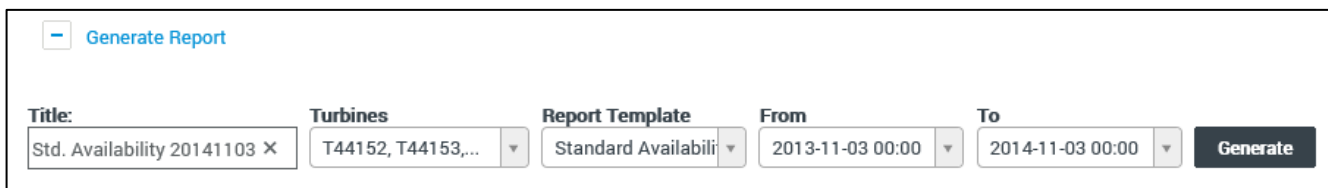


Figure 8-5: Generate Report section - expanded

The lower section holds the Report archive that lists all reports that cover the specified time period for the selected wind turbines. Time period and wind turbines are selected from the drop down boxes in the grey bar. Click on the report title to display the report or click on the Download icon to download the report in PDF format to your PC.



Figure 8-6: Download of report

Reports are kept in the Report archive for a specific period only. The period is site-specific and is configured at the server unit.

**NOTE** The Reports tab is available from the Portfolio level. However, reports cannot include wind turbines across wind power plants – only from a single wind power plant – so you will be prompted to select a wind power plant.



Figure 8-7: Plant selection for Reports

### 8.3.1 Characteristics of report templates

Report type	Focus
Standard report	Signal data; can comprise several signals
Historical report	Time periods; can only comprise a single signal
Event report	Events from wind turbines

Table 8-4: Report types

These report templates are supported for the below controller types:

#### VMP 5000.2 (AP protocol) / VMP 6000 / VMP Global

Report template	Report type	Shadow Data Required
Energy Based Availability	Standard	Required
Energy Based Availability 2	Standard	Required
Energy Based Availability 3	Standard	Required
Standard Availability	Standard	Required
Standard Performance	Standard	Required
Standard Production	Standard	Required
Bat Mitigation Events	Standard	Required
Bat Mitigation Configuration	Standard	Required
Event Report	Event	Required
Wind Speed	Historical	Not required
Wind Gust	Historical	Not required
Average Ambient Temperature	Historical	Not required

**TAC I / TAC II**

Report template	Report type	Shadow Data Required
Energy Based Availability	Standard	Required
Energy Based Availability 2	Standard	Required
Energy Based Availability 3	Standard	Required
Standard Availability	Standard	Required
Performance	Standard	Required
Bat Mitigation Events	Standard	Required
Bat Mitigation Configuration	Standard	Required
Event Report	Event	Required
Maximum Ambient Temperature	Historical	Not required
Wind Availability	Historical	Not required
Wind Speed	Historical	Not required
Wind Gust	Historical	Not required
Average Ambient Temperature	Historical	Not required

**VMP 3500 / VMP 4400 / VMP 5000 / VMP 5000.2 (RCS protocol)**

Report template	Report type	Shadow Data Required
Wind Speed	Historical	Not required
Wind Gust	Historical	Not required
Average Ambient Temperature	Historical	Not required

*Table 8-5: Report templates*

---

**NOTE** Report templates designed for a TAC controller can be selected for VMP controller and vice versa, but will not generate correct results.

---

## 8.4 Events (alarms and warnings)

The Events tab displays all active alarms and warnings from the wind turbine.

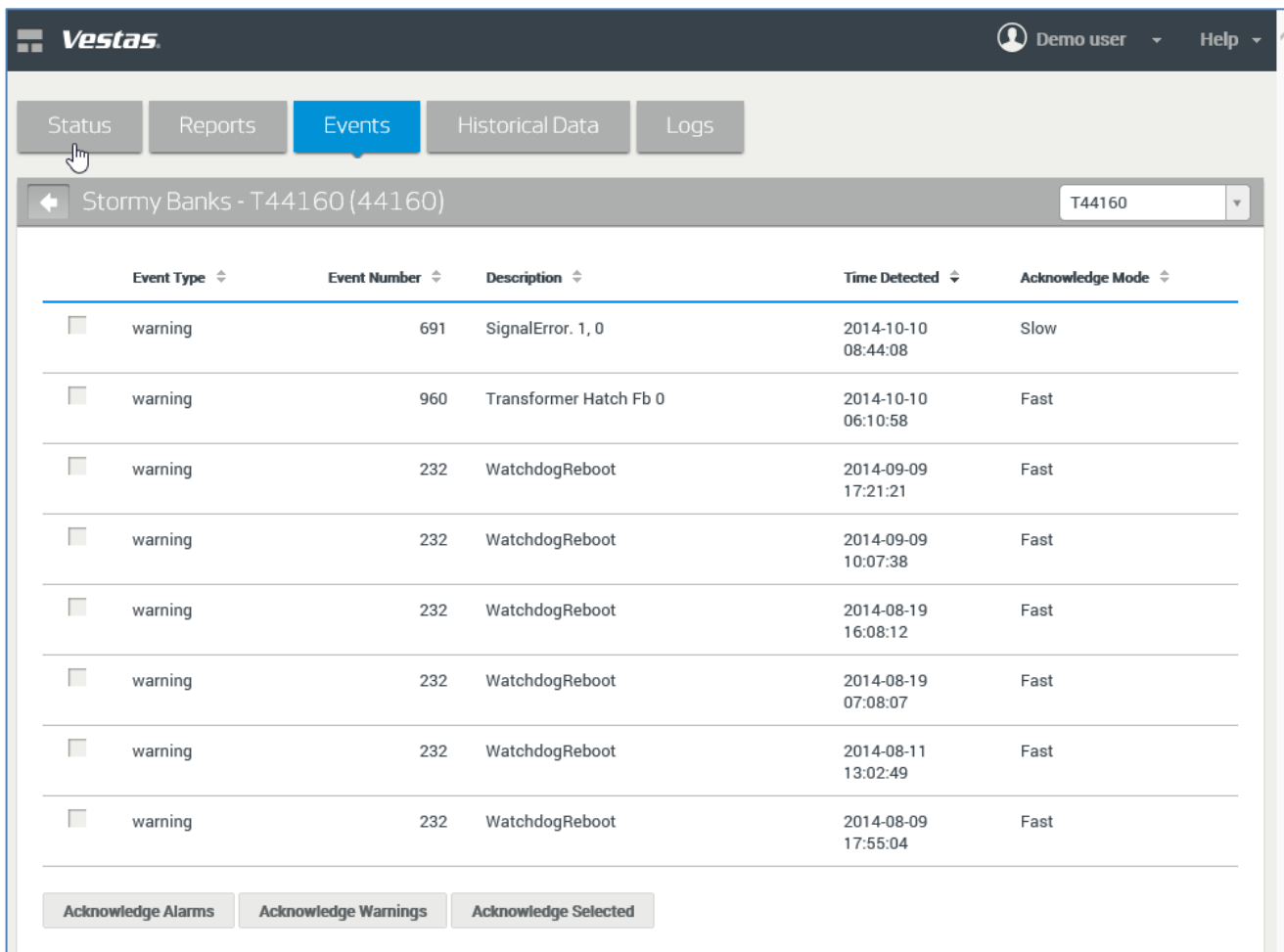


Figure 8-8: Events tab

Column name	Displays
Selection checkbox	Allows the user to select individual warnings for acknowledgement. Note that alarms cannot be selected!
Event Type	Possible event types are: Alarm and Warning
Event Number	The number of the event
Description	Textual description of the event
Time Detected	The date and time the event occurred
Acknowledge Mode	The interval before the effect of the acknowledgement takes place: Fast – 1 minute Slow – 10 minutes

Table 8-6: Explanation of columns in Events tab

## Alarms

Alarms are system messages that signal an error situation that has caused a unit in the wind farm to stop normal operation and go from Run state to the Pause, Stop or Emergency operational state.

To resume operation, one of three types of acknowledgement is required:

- Local acknowledgement from the turbine's controller unit
- Remote acknowledgement from VestasOnline® Enterprise
- Automatic acknowledgement - takes place automatically after a pause of 1 minute (auto short) /fast or 10 minutes (auto long) /slow depending on the nature of the alarm

## Warnings

Warnings are system messages that signal an irregularity that requires attention but does not cause the turbine to stop normal operation immediately and leave Run state.

## Acknowledging alarms and warnings

All messages are labelled with a date and time stamp, an ID and an informative text. If the alarm is acknowledged automatically, no further action is required from the user.

All warnings can be acknowledged from VestasOnline® Enterprise.

When you click the Acknowledge Alarms button, ALL alarms that can be acknowledged from VestasOnline® Enterprise are automatically acknowledged. All alarms in the list are removed but alarms that cannot be remotely acknowledged from VestasOnline® Enterprise will re-appear in the list after an interval of one minute.

To acknowledge and remove ALL warnings from the list, click the Acknowledge Warnings button.

If you do not want to acknowledge and remove all warnings in the list, first click the checkboxes for the warnings that you want to acknowledge; then click the Acknowledge Selected button.

---

**NOTE** The three Acknowledge buttons are only visible if the user is authorized to acknowledge events.

---

## 8.5 Performance

The Performance tab displays information about:

- Power production
- Availability
- States
- Hour counters

for a 12-month period: complete information for the latest 11 months plus the available data for the current month.

**NOTE** The States and Hour Counter information appears on wind turbines with a VMP controller – not on wind turbines with a TAC controller.



Figure 8-9: Performance tab - Production

- |                         |  |
|-------------------------|--|
| 1 Chart or Table view   | 2 Data selector: Production/States/Counters (only available for VMP controllers) |
| 3 Wind turbine selector | 4 Show/Hide data in chart  |

The information can be displayed in a table or in a chart. Use the Table-Chart icons to switch between the views.



Figure 8-10: Chart view



Figure 8-11: Table view

### Zoom

To zoom in on an area within a chart, drag the mouse across the wanted area.

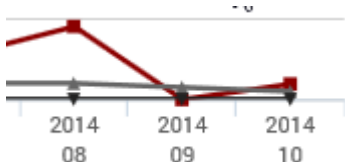


Figure 8-12: Before zooming in



Figure 8-13: After zooming in

### Reset Y Zoom

To return to the original scale on the Y-axis (while maintaining the 'zoom'-scale on the X-axis), click the Reset Y Zoom button that appears when you zoom in.

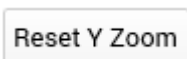


Figure 8-14: Reset zoom button

### Show - Hide

The Show/Hide data feature below the chart allows you to select the data you want to be displayed in the chart.

Click on the wanted data type to show/hide it in the chart.



Figure 8-15: Total Production selected



Figure 8-16: Total Production de-selected



### Production

The Production option displays power production and wind turbine availability on a monthly basis in the same chart or table. The production and availability data are measured by counters in the wind turbine. The Production information is available for a 12-month period (the 11 latest months plus the current month).



Figure 8-17: Performance tab – Production (shown as chart)

Power production is measured as kWh while availability is presented as a percentage. In the default chart production is shown as bars while availability is shown as a curve. The current month is positioned to the far right in the chart.

If you position the arrow pointer on a bar or a section of the curve, a small box displays the actual kWh or the availability percentage as a numerical representation for the month in question.

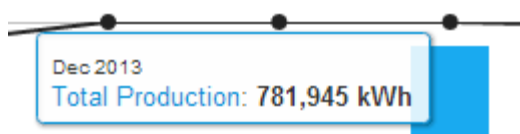


Figure 8-18: Monthly production



Figure 8-19: Monthly availability

### States

The States option provides information about the various operational states of the wind turbine for a 12-month period (the 11 latest months plus the current month).

The information about the operational states is calculated in the wind turbine controller on basis of data from the hour counters.

**NOTE** This information is not available for wind turbines with a TAC controller

Period	Controller Off Hours	Service On Hours	Grid Error Hours	Ambient Error Hours	Turbine Error Hours	Idle Hours	Gen 1 Hours	Gen 2 Hours	User-defined Pause Hours	Availability %
2013 12	2	0	14	12	0	6	709	0	0	100
2014 01	0	0	0	4	2	2	735	0	0	100
2014 02	0	0	0	1	2	17	651	0	0	100
2014 03	2	2	0	5	8	92	633	0	0	98.9
2014 04	0	0	0	4	0	22	693	0	0	100
2014 05	0	1	0	10	1	105	627	0	0	100
2014 06	0	2	1	3	1	58	657	0	0	100
2014 07	0	0	0	1	0	54	688	0	0	100
2014 08	2	16	0	3	0	53	669	0	0	100
2014 09	0	0	0	1	0	55	664	0	0	100
2014 10	0	0	0	1	1	60	682	0	0	99.9
2014 11	0	0	0	1	0	0	58	0	0	100

Figure 8-20: Performance tab – States (shown as table)

#### Explanation of data in States

Column name	Displays
Period	The period in which the data has been recorded. Months are displayed in descending order with the current month at the top of the column.
Controller Off Hours	Number of hours in which the controller unit has been switched off.
Service On Hours	Number of hours the turbine has been in service state for maintenance.
Grid Error Hours	Number of hours in which the wind turbine could not produce power due to errors in the grid.

Ambient Error Hours	Number of hours in which the wind turbine could not produce power due to ambient errors such as high wind etc.
Turbine Error Hours	Number of hours in which the wind turbine could not produce power due to errors within the wind turbine.
Idle Hours	Number of hours in which the wind turbine could not produce power due to low wind conditions and the like.
Gen 1 Hours	Number of hours in which the wind turbine has been producing power in Generator 1 (Delta) connection.
Gen 2 Hours	Number of hours in which the wind turbine has been producing power in Generator 2 (Star) connection.
User Defined Pause Hours	Number of hours in which the turbine has been set in Pause state by the user.
Availability %	Availability of the turbine shown as a percentage.

Table 8-7: Explanation of data in States – Table view

For a detailed explanation of the relationship between States and Hour Counters and how Availability is calculated, please refer to chapter 9 - Hour counters, operational states and availability, page 48.

### Hour Counters

The Hour Counters option provides operating information from the hour counters in the wind turbine for a 12-month period (the 11 latest months plus the current month).

Period	Total Time Hours	Line Hours	Service On Hours	Yaw Hours	Line OK Hours	Ambient OK Hours	Turbine OK Hours	Run Hours	Gen 1 Hours	Gen 2 Hours	Availability %
2013 12	744	742	0	12	728	730	742	715	709	0	100
2014 01	744	744	0	13	744	740	742	737	735	0	100
2014 02	672	672	0	12	672	671	670	668	651	0	100
2014 03	744	742	2	16	740	735	732	725	633	0	98.9
2014 04	720	720	0	16	720	716	720	715	693	0	100
2014 05	744	744	1	25	743	733	742	732	627	0	100
2014 06	720	720	2	25	717	715	717	715	657	0	100
2014 07	744	744	0	24	744	743	744	742	688	0	100
2014 08	744	742	16	22	726	723	726	722	669	0	100
2014 09	720	720	0	15	720	719	720	719	664	0	100
2014 10	744	744	0	14	744	743	743	742	682	0	99.9
2014 11	59	59	0	1	59	58	59	58	58	0	100

Figure 8-21: Performance tab – Hour Counters (shown as table)

**NOTE** This information is not available for wind turbines with a TAC controller

Explanation of data in Hour Counters

Column name	Displays
Period	The period in which the data has been recorded. Months are displayed in descending order with the current month at the top of the column.
Total Time Hours	Number of hours in the month.
Line Hours	Number of hours in which the controller unit is switched on.
Service On Hours	Number of hours the turbine has been in service state for scheduled or unscheduled maintenance.
Yaw Hours	Number of hours the nacelle has been yawing.
Line OK Hours	Number of hours in which the grid was ready to receive power production from the wind turbine.
Ambient OK Hours	Number of hours in which power production was not obstructed by ambient errors - for example due to high wind or high/low temperature.
Turbine OK Hours	Number of hours in which power production was not obstructed by errors in the wind turbine.
Run Hours	Number of hours in which the turbine was in Run state or in Idle state.  Typically, Idle state occurs in low wind conditions.
Gen 1 Hours	Number of hours in which the turbine has been in Generator 1 (Delta) connection.
Gen 2 Hours	Number of hours in which the turbine has been in Generator 2 (Star) connection.
Availability %	Availability of the turbine shown as a percentage.

*Table 8-8: Explanation of data in Hour Counters*

For a detailed explanation of the relationship between States and Hour Counters and how Availability is calculated, please refer to chapter 9 - Hour counters, operational states and availability, page 48.

## 8.6 Historical Data

The Historical Data tab lets the user select and display 10-minute data and 'Calculated Production' from wind turbines. For a complete list of available signals, refer to Appendix A in this document.

## 8.7 10-minute data

You can select 10-minute data from several wind turbines across wind power plants.

**NOTE** You cannot display 10-minute data from wind turbines with different controller types (VMP / TAC).

Also, some signals within a controller type may not be applicable for all of the selected wind turbine models!



Figure 8-22: Example of Historical Data

- |                             |                                |
|-----------------------------|--------------------------------|
| 1 Pre-defined zoom settings | 2 Chart view or Table view     |
| 3 Period selector           | 4 Wind turbine signal selector |
| 5 Wind turbine selector     | 6 Export button                |
| 7 Zoom selector             | 8 Selected signals             |

The time period, 10-minute data signals and wind turbines are selected from three drop-down boxes in the grey bar.

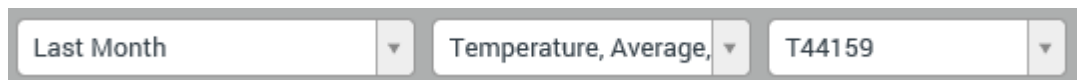


Figure 8-23: Drop-down boxes

### Selection of time period

In addition to a number of pre-set periods, a custom period can be specified by using the Calendar.

The minimum time period is 1 day (= 24 hours).

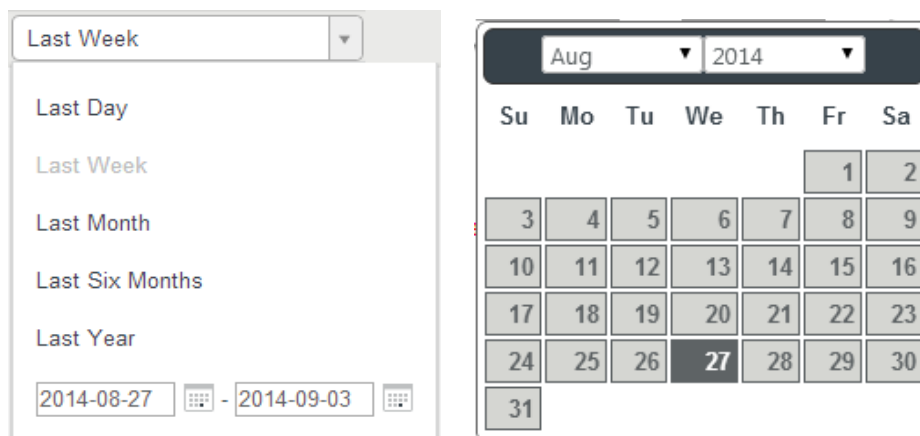


Figure 8-24: Selection of time period

### Selection of 10-minute data signals

In the Signal Selection window, the 10-minute data signals are grouped according to the main components of the wind turbine.

To display a list of all signals within a group, click the signal group button. The number in ( ) indicates the number of signals within the signal group.

To select a signal, click the checkbox and the signal now appears in the list of selected signal at the right. To select all signals within a signal group, click the checkbox to the left of the signal group name.

To remove a signal from the Selected Signals list, use the Remove button.

To get a better overview of the available signals in the selected groups, use the Filter function. The Filter function is not case-sensitive.

Click the Apply button to confirm your selections and display.

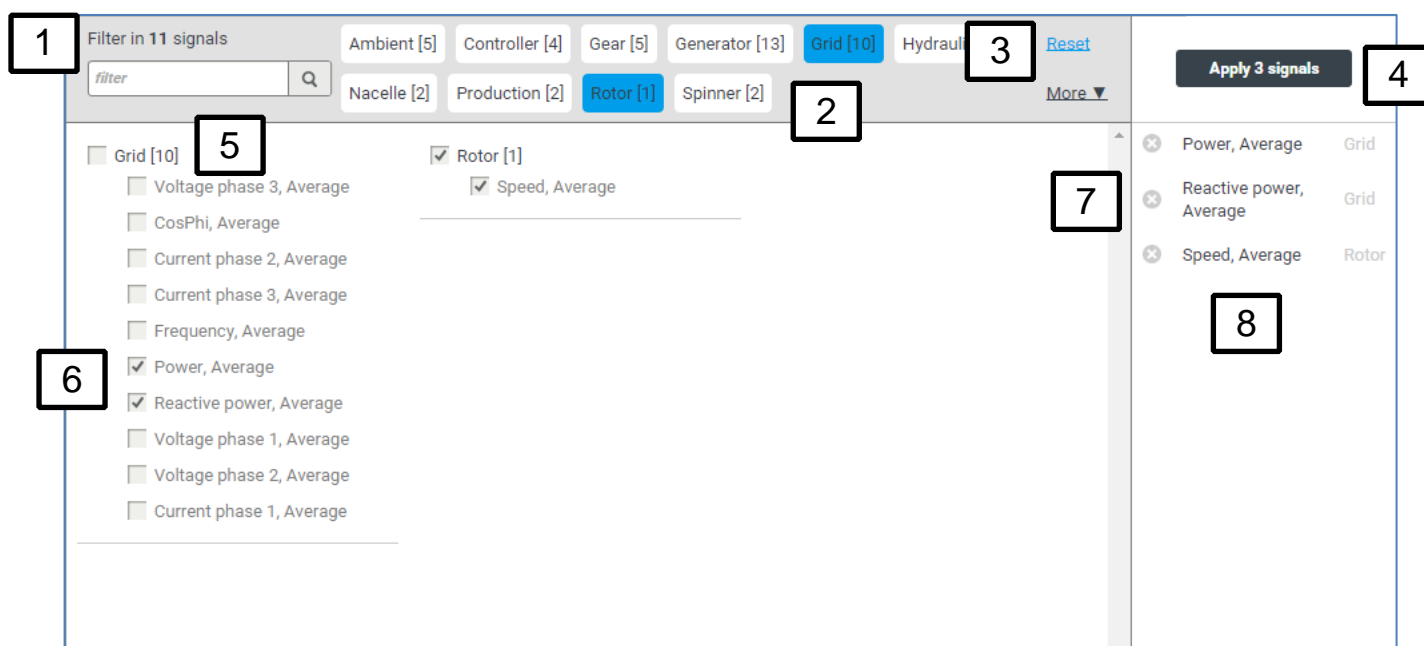


Figure 8-25: Selection of signals

- |   |                                 |   |                                      |
|---|---------------------------------|---|--------------------------------------|
| 1 | Filter                          | 2 | Signal groups                        |
| 3 | Reset button                    | 4 | Apply button                         |
| 5 | Group signal selection checkbox | 6 | Individual signal selection checkbox |
| 7 | Remove button                   | 8 | List of selected signals             |

### Selection of wind turbines

The wind turbine selection window lets you select wind turbines across wind power plants.

To display a list of all wind turbines in a wind power plant, click the wind power plant button. The number in ( ) indicates the number of wind turbines in the wind power plant.

To select an individual wind turbine, click the checkbox and the wind turbine now appears in the list of selected wind turbines at the right. To select all wind turbines in a wind power plant, click the checkbox to the left of the wind power plant name.

To remove a wind turbine from the list of selected wind turbines, use the Remove button.

To get a better overview of the available signals in the selected groups, use the Filter function. The Filter function is not case-sensitive.

Click the Apply button to confirm your selections.

---

**NOTE** You cannot display 10-minute data from wind turbines with different controller types (VMP / TAC).

Also, some signals within a controller type may not be applicable for all of the selected wind turbine models!

---

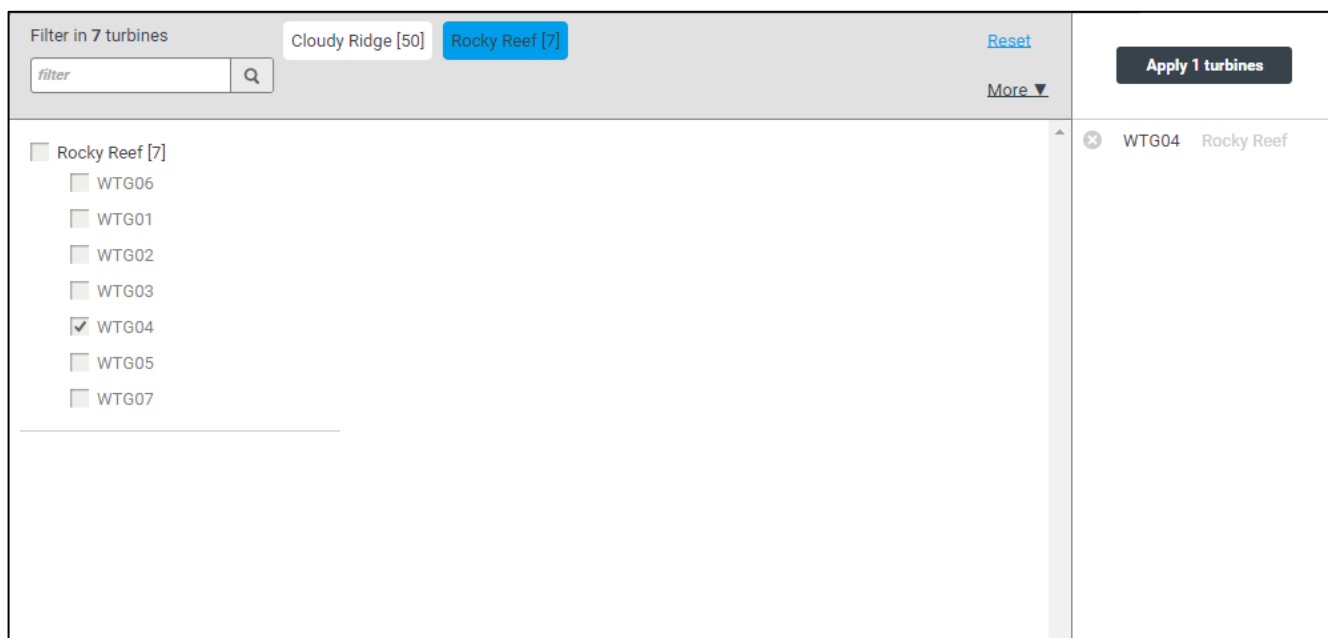


Figure 8-26: Selection of wind turbines



### Display of data

The information can be displayed in table view or in chart view. Use the table-chart icons to switch between the views.



Figure 8-27: Chart view



Figure 8-28: Table view

In the chart a numeric reading of the 10-minute data is displayed when you position the arrow pointer on top of a line.

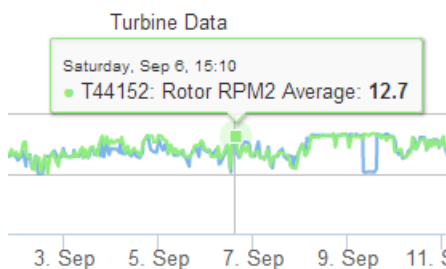


Figure 8-29: Numerical reading of 10-minute data

### Zoom selection

To focus at data for a specific period you can select one of the pre-set zoom levels: last day / last month / last year. The data is now displayed at a higher resolution. To return to the original time period, click All.

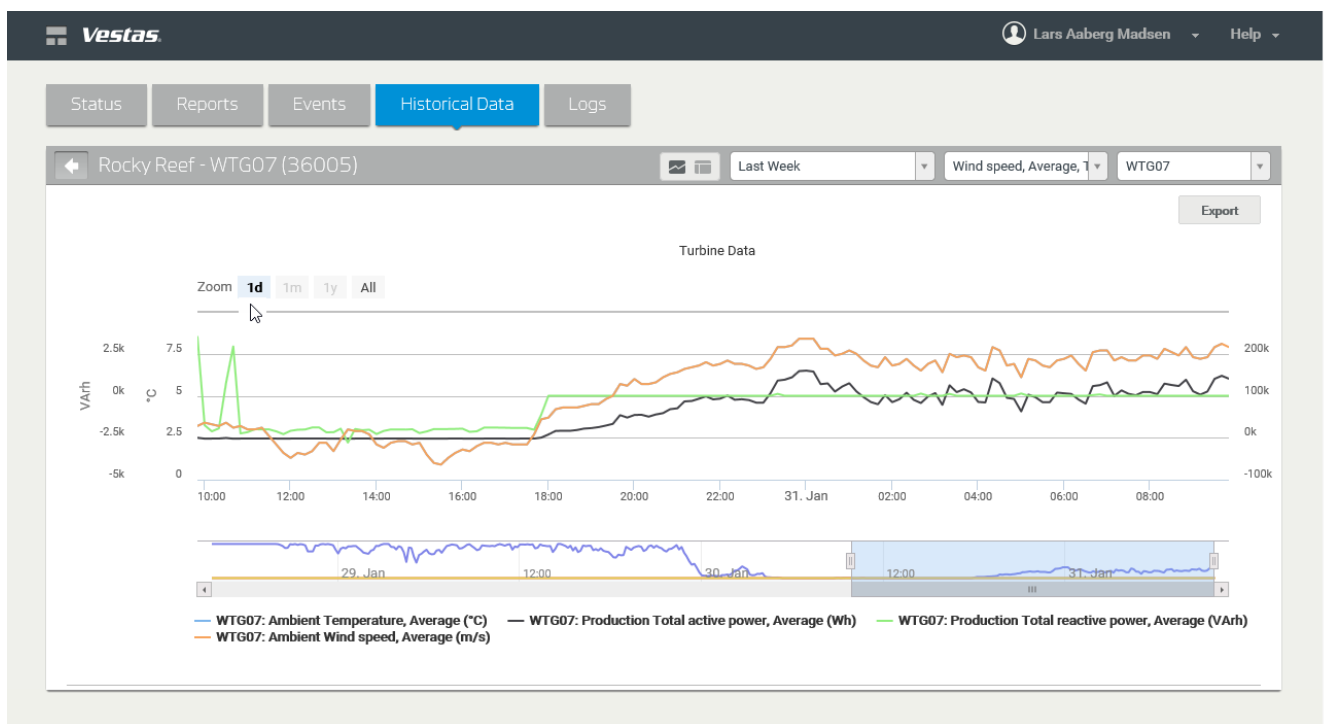


Figure 8-30: Using the pre-set zoom to focusing at the last day within a longer period

Alternatively, you can use the handles on the Zoom selector to focus at a shorter time period.

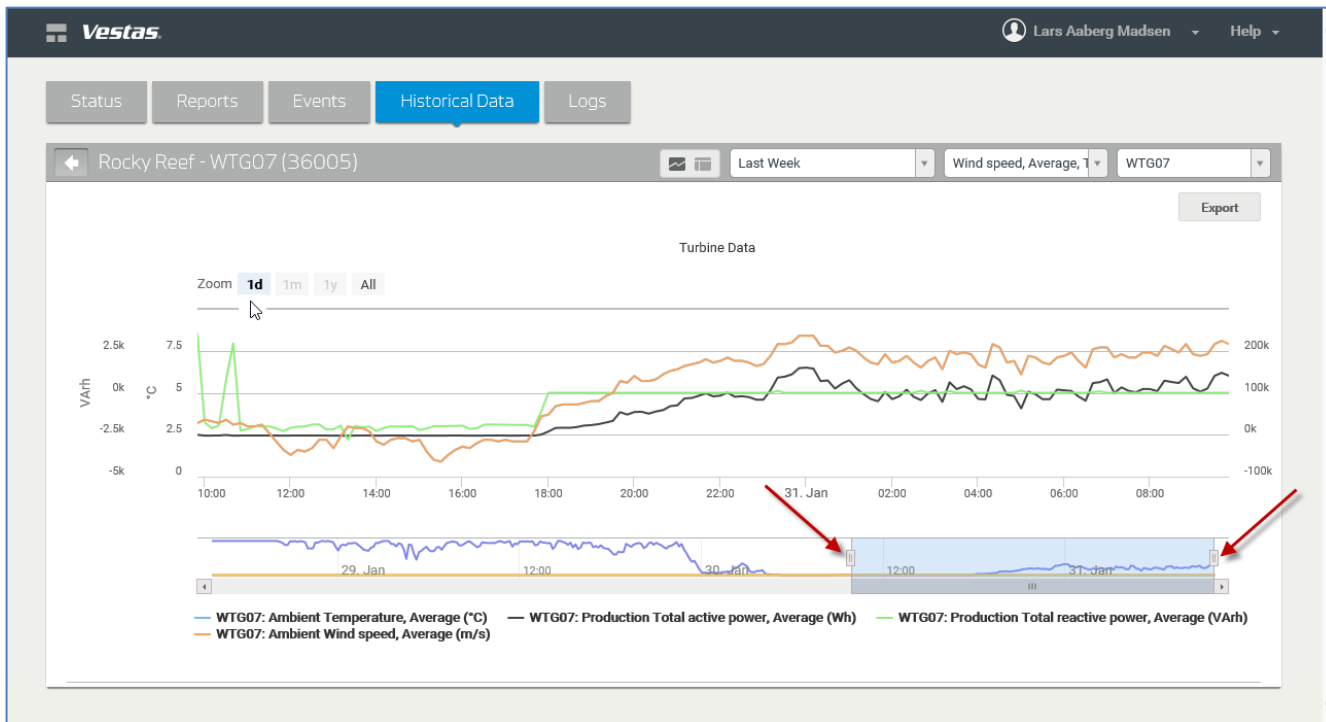


Figure 8-31: Using the Zoom handles to focus on a shorter time period

### Reset Y Zoom

To return to the original scale on the Y-axis (while maintaining the 'zoom'-scale on the X-axis), click the Reset Y Zoom button that appears when you zoom in.

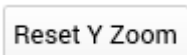


Figure 8-32: Reset zoom button

### Export

The historical data within the selected time period can be exported to a .csv file for further inspection in a spreadsheet.



Click the Export button to open or save the .csv file in Microsoft Excel or the like.

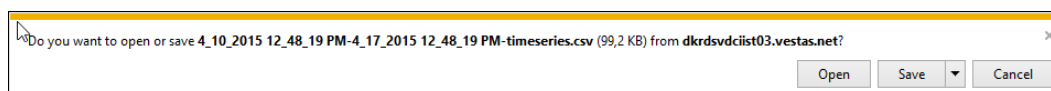


Figure 8-33: Open/Save .csv file

## 8.8 Calculated Production

In addition to the 10-minute data VestasOnline® Enterprise can also display accumulated production data (calculated on an hourly, daily, weekly and monthly basis).

The Calculated Production data from several wind turbines can be displayed in the same chart. In addition, the Calculated Production data can also be exported to a spreadsheet for further calculation or analysis.

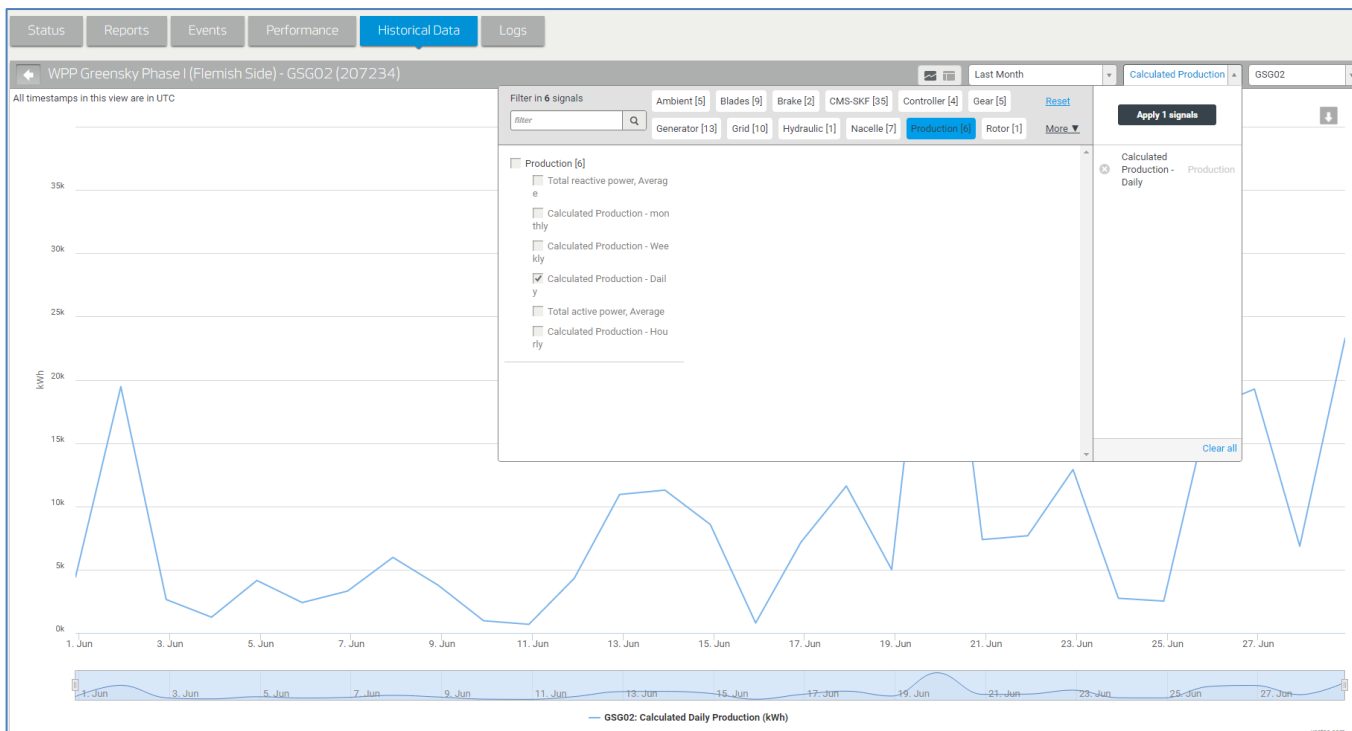


Figure 8-34: Calculated production (hourly, daily, weekly, monthly)

**NOTE** Calculated Production – Weekly only includes data from the time period you have specified in the Date drop-down menu – not for a full week if the week includes a change of month.

The data for Calculated Production – Weekly is always placed on the first day of the week in both the graphical display as well as in the table view. This way the specified reporting may be expanded – for example when a calendar week crosses the start of a month (see Figure 8 35: Week exceeds specified reporting period next page)

All timestamps in this view are in UTC

Timestamp	43429 Tolvmanstegen WTG11 - Calculated Weekly Production[kWh]	43429 Tolvmanstegen WTG11 - Calculated Daily Production[kWh]
2016-04-25 00:00	9539.48	
2016-05-01 00:00		9539.48
2016-05-02 00:00	54492.12	16158.05
2016-05-03 00:00		13434.55
2016-05-04 00:00		4641.17
2016-05-05 00:00		12486.73
2016-05-06 00:00		2152.03
2016-05-07 00:00		3754.70

Figure 8-35: Week exceeds specified reporting period

## 8.9 Logs

The Logs tab lets the user select and display alarm logs from one or more wind turbines in a user-defined time period.

Stormy Banks - T44158 (44158)

Last Month T10821031, T10821032

Export All Export Current

Detected	Acknowledged	Event code	Unit	Description
2014-10-04 19:13:36	2014-10-04 19:24:26	3226	44154	HighTempGridChoke2:Mod8°C
2014-10-04 13:22:45	2014-10-04 13:24:42	444	44153	EMF Acc 1 Press Low, 209.7 bar
2014-10-02 20:38:35	2014-10-02 21:00:55	3273	44158	YawUntwistCCW: Code0°
2014-10-02 10:53:02	2014-10-02 10:54:30	3473	44153	SafetySys Not Ready For Reset
2014-10-02 08:54:47	2014-10-02 10:54:30	3070	44153	EmergStopButtonActivated5
2014-10-02 08:46:21	2014-10-02 10:54:30	900	44153	Pause pressed on keyboard
2014-10-02 06:27:46	2014-10-02 06:29:39	444	44153	EMF Acc 1 Press Low, 200.8 bar
2014-10-02 05:58:26	2014-10-02 06:24:21	444	44153	EMF Acc 1 Press Low, 209.7 bar

Figure 8-36: Alarm logs – Table view

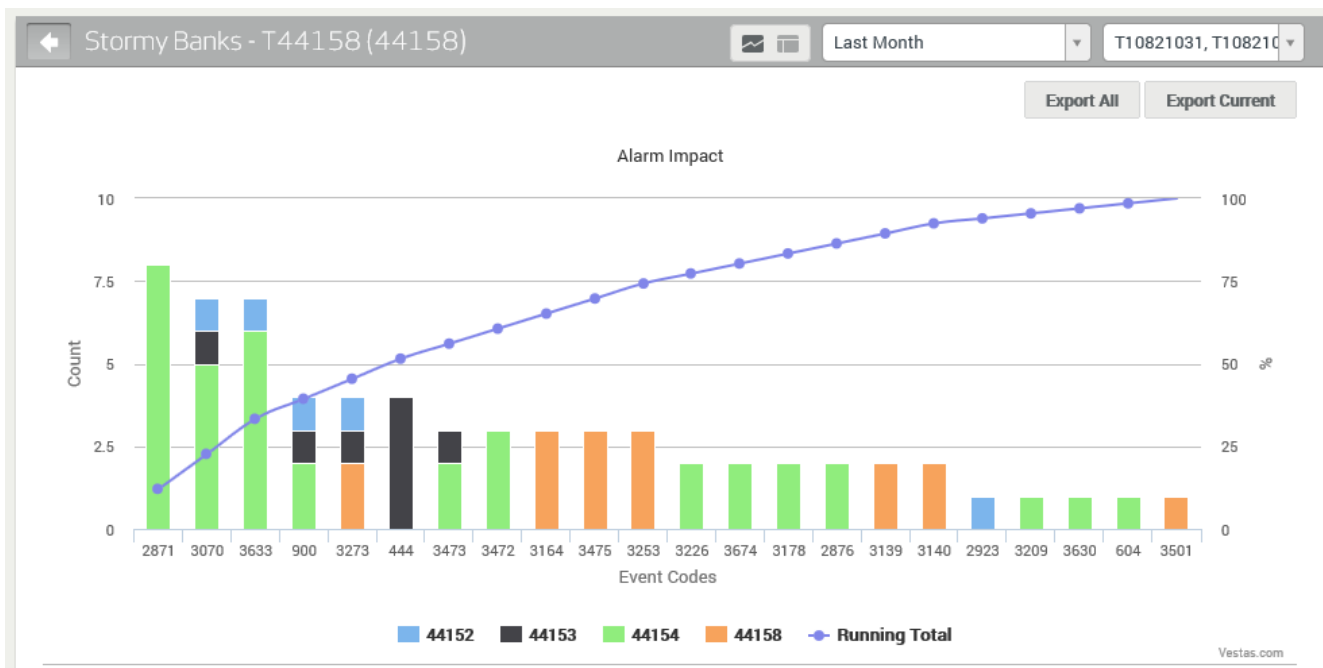


Figure 8-37: Alarm logs – Chart view

The information can be displayed in table view or in chart view. Use the table-chart icons to switch between the views.



Figure 8-38: Chart view



Figure 8-39: Table view

Time period and wind turbine are selected from two drop-down boxes in the upper grey bar.



Figure 8-40: Drop-down boxes

## Selection of time period

In addition to a number of pre-set periods, a custom period can be specified by using the Calendar.

The minimum time period is 1 day (= 24 hours).

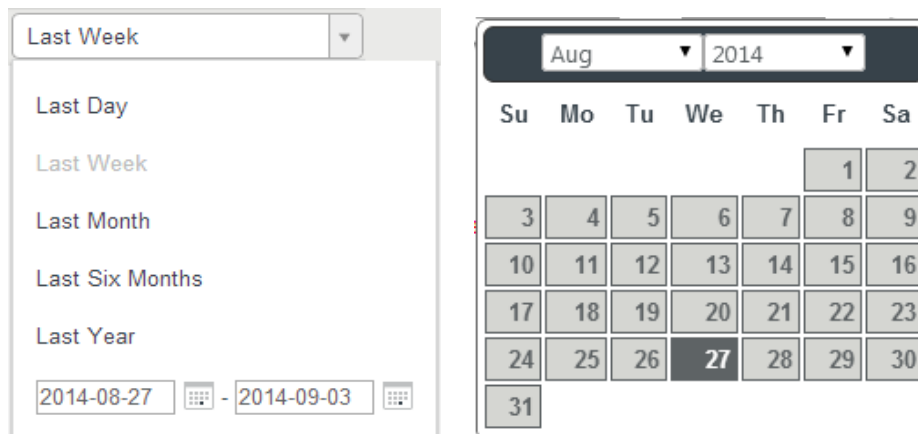


Figure 8-41: Selection of time period

## Selection of wind turbines

The wind turbine selection window lets you select wind turbines across wind power plants.

To display a list of all wind turbines in a wind power plant, click the wind power plant button. The number in ( ) indicates the number of wind turbines in the wind power plant.

To select an individual wind turbine, click the checkbox and the wind turbine now appears in the list of selected wind turbines at the right. To select all wind turbines in a wind power plant, click the checkbox to the left of the wind power plant name. To remove a wind turbine from the list of selected wind turbines, use the Clear All button.

To get a better overview of the available signals in the selected groups, use the Filter function. The Filter function is not case-sensitive.

Click the Apply button to confirm your selections.

See Figure 8-42: Selection of wind turbines on the next page.



Figure 8-42: Selection of wind turbines

### Export

The alarm logs can be exported to a .csv file for further inspection in a spreadsheet.

The Export All button includes all log entries since the commissioning of the wind turbines. The Export Current includes log entries within the selected time period.



Figure 8-43: Drop-down boxes

## 9 Hour counters, operational states and availability

Vestas wind turbines with a VMP 3500/VMP 5000/VMP 6000/VMP Global controller can take nine possible operational states:

- Controller Off
- Service State
- Grid Error
- Ambient Error
- Turbine Error
- Idle
- Generator 1
- Generator 2
- Paused by User

The operational states are not measured by counters but are calculated from the hour counters data.

Figure 9-1 shows the relationship between turbine hour counters and turbine operational states. This figure and the explanation of the counters are valid for VMP 3500/VMP 5000/VMP 6000/VMP Global controllers.

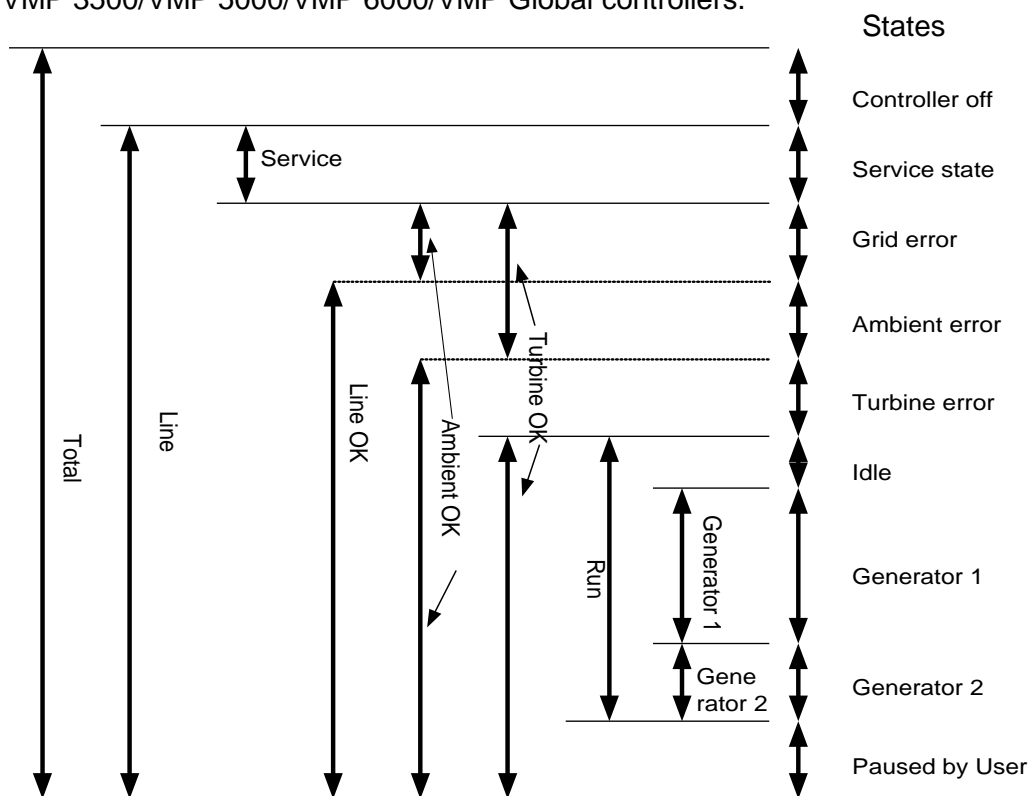


Figure 9-1: Relationship between VMP hour counters and turbine operational states

**NOTE** Counter time information can overlap while states cannot!



The operational states shown at the right side of Figure 9-1 are calculated as follows:

State	Calculation	Description
Controller Off	HourTotal – HourLine	Could be caused by: <ul style="list-style-type: none"> <li>• Waiting for spare parts</li> <li>• Grid maintenance</li> </ul>
Service State	HourServOn	Turbine is in service mode
Grid Error	HourLine – HourServOn – HourLineOk	Grid error as the error with the highest priority.
Ambient Error	HourLine – HourServOn – HourAmbiOk	Ambient error as the error with the highest priority.
Turbine Error	HourLine – HourServOn – HourTurbOk	Turbine error as the error with the highest priority.
Idle	HourRun – HourGen1 – HourGen2	Normally due to low wind speed.
Generator 1 + 2	HourGen1+HourGen2	Turbine is producing energy. Counts when Gen. 1 (Delta) or Gen.2 (Star) is in Run mode and not in Service mode.
Paused by User	HourLineOk – Ambient Error – Turbine Error – HourRun	Could be caused by different reasons: <ul style="list-style-type: none"> <li>• Waiting for spare parts</li> <li>• Emergency stop</li> <li>• Customer visit in turbine</li> <li>• Grid maintenance</li> <li>• Limitations in output (not allowed to output power)</li> </ul>

Table 9-1: Explanation of calculation of states

## Availability

Availability is the ratio of hours in which the wind turbine was available for production against the total number of hours in which the wind turbine was not operational due to maintenance and the like.

Availability is expressed as a percentage and is calculated as follows for VMP 4400 and 3500 controllers (release 1.07 and newer) and for all VMP 5000/6000/Global controllers:

$$\text{Availability \%} = \frac{\text{TurbineOK} * 100}{(\text{Line-Service})}$$

---

**NOTE** The Availability percentage shown in VestasOnline® Enterprise for VMP 5000.02, VMP 6000 and VMP Global is calculated in the turbine controller.

For VMP 4400, VMP 3500 and VMP 5000, the Availability percentage is calculated by VestasOnline® Enterprise – based on Hour Counter data.

---

**10 Appendix A: Signals – Historical Data**

<b>VMP controller</b>
Ambient (5)
Temperature, Average
Wind direction absolute, Average
Wind direction relative, Average
Wind speed estimated, Average
Wind speed, Average
<b>Blades (9)</b>
Blades BladeA BLPitchAngle Average
Blades BladeA BLPitchRef Average
Blades BladeA ControlVoltage Average
Blades BladeB BLPitchAngle Average
Blades BladeB BLPitchRef Average
Blades BladeB ControlVoltage Average
Blades BladeC BLPitchAngle Average
Blades BladeC BLPitchRef Average
Blades BladeC ControlVoltage Average
<b>Brake (2)</b>
Brake AccumulatorPressure Average
Brake Pressure Average
<b>Controller (4)</b>
Ground temperature, Average
Hub temperature, Average
Top temperature, Average
VCP temperature, Average
<b>Gear (5)</b>
Bearing temperature, Average
Oil temperature basis, Average
Oil temperature level 1, Average
Oil temperature level 2-3, Average
Oil temperature, Average
<b>Generator (13)</b>
Slip ring temperature, Average
Active power generator 0, Average
Active power generator 1, Average
Active power generator 2, Average
Bearing temperature, Average

<b>VMP controller</b>
Cooling water temperature, Average
Generator speed, Average
Phase 1 temperature, Average
Phase 2 temperature, Average
Phase 3 temperature, Average
Reactive power generator 0, Average
Reactive power generator 1, Average
Reactive power generator 2, Average
<b>Grid (10)</b>
CosPhi, Average
Current phase 1, Average
Current phase 2, Average
Current phase 3, Average
Frequency, Average
Power, Average
Reactive power, Average
Voltage phase 1, Average
Voltage phase 2, Average
Voltage phase 3, Average
<b>Hydraulic (1)</b>
Oil temperature, Average
<b>Nacelle (6)</b>
Direction, Average
Humidity1, Average
Humidity2, Average
Temp1, Average
Temp2, Average
Temp3, Average
<b>Production (2)</b>
Total active power, Average
Total reactive power, Average
<b>Rotor (1)</b>
Speed, Average
<b>Spinner (2)</b>
Slip ring temperature, Average
Temperature, Average

<b>TAC controller</b>
Ambient (5)
Temperature, Average
Wind direction 1 relative, Average
Wind direction 2 relative, Average
Wind speed 1, Average
Wind speed 2, Average
<b>Current (3)</b>
Pitch motor 1 current, Average
Pitch motor 2 current, Average
Pitch motor 3 current, Average
<b>Grid</b>
Oil temperature, Average
Oil filter temperature, Average
<b>Generator (7)</b>
Change-over from small to large generator, Counter
Change-over from large to small generator, Counter
Hours on grid for large generator, Counter
Hours on grid for small generator, Counter
Power produced by large generator, Counter
Power produced by small generator, Counter
Generator speed, Average
<b>Grid (3)</b>
Active power, Average
Frequency, Average
Reactive power, Average
<b>Nacelle (3)</b>
Direction, Average
Temperature, Average
Humidity, Average
<b>Production (2)</b>
Consumed power, Counter
Consumed reactive power, Counter
<b>Rotor (1)</b>
Speed, Average
<b>Temperature (7)</b>
Control panel temperature, Average
Converter panel temperature, Average

Pitch oil temperature, Average
Thyristor temperature, Average
Topbox temperature, Average
Tower base temperature, Average
Tower temperature, Average
Timer
Brake released, Timer
Event availability counter T1, hours with wind and turbine OK, Timer
Event availability counter T2, hours with wind OK and turbine not OK, Timer
Generator cut-in, Timer
Seconds in 10-min period, Timer
Status not failurefree, Timer

<b>Gamesa wind turbines</b>
Ambient (3)
Temperature, Average
Wind direction absolute, Average
Wind speed, Average
Blades (1)
Pitch angle, Average
Controller (1)
Ground temperature, Average
Cooler (2)
Lower radiator temperature, Average
Upper radiator temperature, Average
Counters (1)
Count Seconds Event Code Not Zero
Gear (2)
Main bearing temperature, Average
Oil temperature, Average
Generator (5)
Bearing temperature, Average
Bearing 2 temperature, Average
Coils temperature, Average
Speed, Average
Slip ring temperature, Average

Grid (9)
CosPhi, Average
Current phase 1, Average
Stator, Current, Average
Frequency, Average
Possible power, Average
Power Average
Reactive power, Average
Voltage phase 1, Average
Current rotor inverter phase 1, Average
Hydraulics (2)
Pressure, Average
Oil temperature, Average
Nacelle (2)
Direction, Average
Temperature, Average
Rotor (1)
Speed, Average
Transformer (1)
Maximum temperature, Average

<b>Suzlon wind turbines</b>
Data now available yet.