| Gamesa | GENERAL CHARACTERISTICS MANUAL | *Code:* **GD245675-en** *Rev:* **2** |
|---|---|---|
| | | *Date:* **14/02/2017** *Pg.* **1** *of* **12** |
| *Documentation Type:* **PDTD - Product** | *Title:* **G114 2.1MW CS1 & CS2 50/60 Hz Power and Noise Curves for Low Noise Operating Mode (NRS)** | *Approval process:* **Electronic: PDM Flow** |
| | | *Prepared:* **SNOVO** |
| *Deliverable*: **S12** | | *Verified:* **JEJGUERRERO** |
| | | *Approved:* **IRS** |



## INDEX



## RECORD OF CHANGES

| Rev. | Date | Author | Description |
|---|---|---|---|
| 00 | 14/04/15 | SNOVO | Initial version |
| 01 | 21/06/16 | SNOVO | Added T139m.<br>Applicability to grid frequency 60Hz included. |
| 02 | 14/02/17 | SNOVO | Added T127m.<br>N6 mode included for 80 meter height tower.<br>N6 mode included for 106 meter height tower.<br>Wind turbine class updated. |

## 1 AIM

This document presents the G114 2.1MW CS1 & CS2 wind turbine power curves and noise emission associated with the low noise modes.

## 2 SCOPE

The values in the present document are applicable to all the existing configurations for the WT G114 2.1MW CS1 & CS2 according to tower height. Tonality is not considered. The noise levels given in the document do not apply to high temperature versions.

## 3 ABBREVIATIONS, DEFINITIONS

- **WT**: Wind turbine.
- **Power (P):** Expressed in kW, this is the electric power obtained at the generator terminals without considering the losses in the transformer or high voltage cables of the wind turbine, or the occasional power consumption which may exist in the same to supply a component. Averaged every 10 minutes.
- **Wind speed ($W_S$.):** Expressed in m/s, it is the horizontal wind component value at the height of the hub averaged every 10 minutes.
- **Power curve (CdP):** Represents the change in the P in accordance with the $W_S$ for the different WT operating modes.
- **Annual Output / Annual Energy Production (AEP)**: Expressed in [MWh], it is the total electrical energy produced in a WT during a one-year period, in accordance with a given CdP and a given wind distribution.
- **Wind distribution:** The Weibull distribution is used for different K-distribution parameters and for annual average wind speed values ($W_{ave}$).
- **Wind speed $W_{10}$ [m/s]:** The wind speed value, measured at 10m above ground level.
- **Tower height (H):** Expressed in meters, is the height of the rotor centre above ground level.
- **Power coefficient:** $C_P$
- **Thrust coefficient:** $C_T$
- **Noise level:** The expected sound power level values, expressed in dB(A), represent the sound power that the WT emits at the height of the hub for a given wind speed. In accordance with the IEC standard, the wind speed value (W10) 10 m from the ground is used.

  The noise levels shown in this document are average expected values, called Lw in IEC-61400-14. To obtain the Lwd value, as defined in IEC-61400-14, an increase of 2 dB(A) shall be considered over said Lw values.
- **dB(A):** An A type frequency filter is applied, in accordance with the IEC standard.

## 4 DESCRIPTION

When not specified otherwise, data in following sections is calculated using the parameters from **Table 1**. All power curve and annual energy production values in this document are subject to the validity ranges presented in **Table 2**.

| | |
|---|---|
| **Rated power** | 2.1 MW |
| **Frequency** | 50Hz/60Hz |
| **Rotor Diameter** | 114m |
| **Angle of blade tip** | Pitch control regulation |
| **Air density reference** | 1.225 kg/m3 |

**Table 1** Calculation parameter values for the G114 2.1MW CS1 & CS2 wind turbine power curve.

| | |
|---|---|
| **Wind Shear (10min average)** | ≤ 0.3 |
| **Turbulence intensity TI [%] for bin i** | $5\%\frac{(0.75v_i+5.6)}{v_i} < TI_i < 12\%\frac{(0.75v_i+5.6)}{v_i}$ |
| **Terrain** | Not complex according to IEC 61400-12-1 |
| **Upflow β [º]** | -2º ≤ β ≤ +2º |
| **Grid frequency [Hz]** | ± 0.5 Hz |

**Table 2** Validity ranges of Power Curves for the G114 2.1MW CS1 & CS2 wind turbine power curve.

**Table 3** presents the ratio of wind speed at hub height $W_S$ [m/s] and wind speed at 10m $W_{10}$ [m/s]:

| **Tower height [m]** | **H = 80m** | **H = 106m** | **H = 127m** | **H = 139m** |
|---|---|---|---|---|
| **$W_S$ / $W_{10}$ [m/s]** | 1.39 | 1.49 | 1.502 | 1.52 |

**Table 3**: Ratio between **$W_S$** and **$W_{10}$**

# 5 LOW NOISE OPERATION MODES

## 5.1 LOW NOISE POWER CURVES

There are 2 different types of noise reduction modes.

- The noise reduction modes that limit the noise at higher wind speed (typical $W_{10}$ ~ 6-10m/s) are indicated as N1, N2 up to N6. The noise reduction levels that correspond to the mode indication in this document are represented in **Table 4** below:

| Mode: | FP | N1 | N2 | N3 | N4 | N5 | N6 |
|---|---|---|---|---|---|---|---|
| Noise Level [dB(A)] | 106.6 | 105 | 104 | 103 | 102 | 101 | 99.4 |

**Table 4:** WT G114 2.1MW CS1 & CS2 noise reduction levels at high wind speed.

- The noise reduction modes that limit the noise at lower velocities (typical $W_{10}$ ~ 3-6m/s) are indicated as NRS A, B and C. It is possible to activate any of the noise reduction modes at high wind speed from table 4 with a noise reduction mode at lower velocity, for example: N2 + NRS B, at the same time.

**Table 5** shows the feasibility for low noise operation modes:

| G114 2.1MW CS1 & CS2 | N1 | N2 | N3 | N4 | N5 | N6 | NRS A | NRS B | NRS C |
|---|---|---|---|---|---|---|---|---|---|
| H = 80m | Yes | Yes | Yes | Yes | esY | Yes | Yes | Yes | Yes |
| H = 106m | No | No | No | No | No | Yes | Yes | Yes | Yes |
| H = 127m | No | No | No | No | No | No | Yes | Yes | Yes |
| H= 139m | Yes | Yes | No | No | No | No | Yes | Yes | Yes |

**Table 5:** WT G114 2.1MW CS1 & CS2 low noise levels

**Table 6** presents the electrical power output [kW] in function of the horizontal wind speed $W_S$ [m/s] at hub height ($W_S$) for different noise reduction mode settings, for tower height H = 80m.

| P [kW] | H = 80m | | | | | |
|---|---|---|---|---|---|---|
| $W_S$ [m/s] | N1 105 [dB(A)] | N2 104 [dB(A)] | N3 103 [dB(A)] | N4 102 [dB(A)] | N5 101 [dB(A)] | N6 99.4 [dB(A)] |
| **3** | 33 | 33 | 33 | 33 | 33 | 33 |
| **4** | 146 | 146 | 146 | 146 | 146 | 146 |
| **5** | 342 | 342 | 342 | 342 | 342 | 342 |
| **6** | 620 | 620 | 620 | 620 | 620 | 613 |
| **7** | 1006 | 1005 | 1003 | 998 | 988 | 855 |
| **8** | 1465 | 1445 | 1418 | 1385 | 1343 | 936 |
| **9** | 1771 | 1712 | 1651 | 1587 | 1521 | 949 |
| **10** | 1872 | 1794 | 1716 | 1641 | 1568 | 950 |
| **11** | 1893 | 1810 | 1728 | 1651 | 1577 | 952 |
| **12** | 1901 | 1818 | 1738 | 1663 | 1589 | 984 |
| **13** | 1924 | 1852 | 1781 | 1714 | 1649 | 1132 |
| **14** | 1973 | 1920 | 1869 | 1821 | 1774 | 1419 |
| **15** | 2027 | 1996 | 1967 | 1939 | 1912 | 1718 |
| **16** | 2065 | 2051 | 2037 | 2024 | 2011 | 1923 |
| **17** | 2086 | 2080 | 2074 | 2068 | 2063 | 2028 |
| **18** | 2095 | 2092 | 2090 | 2088 | 2086 | 2073 |
| **19** | 2098 | 2097 | 2096 | 2095 | 2095 | 2090 |
| **20** | 2099 | 2099 | 2098 | 2098 | 2098 | 2096 |

**Table 6**: Electric power [kW] of the G114 2.1MW CS1 & CS2 wind turbine with a tower height of 80m, calculated according to $W_S$ [m/s] and noise level [dB(A)] (ref: *G114CSAERNRS2100KW_R00_14042015, G114CSAERNRS2100KW_R02_14022017*)

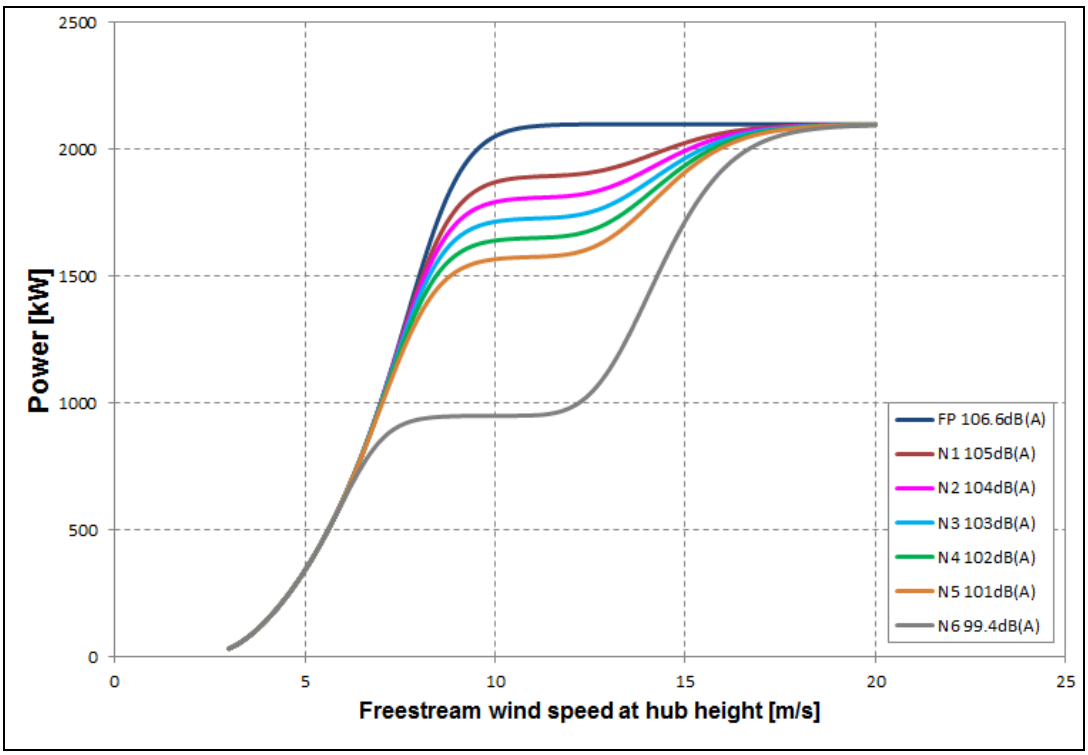


**Figure 1:** Power curve of the G114 2.1MW CS1 & CS2 wind turbine with tower height 80m for different versions of low noise operating mode (ref: *G114CSAERNRS2100KW_R02_14022017*)

**Table 7** presents the electrical power output [kW] in function of the horizontal wind speed $W_S$ [m/s] at hub height ($W_S$) for a noise reduction mode, for tower height H = 106m.

| P [kW] | H = 106m |
|---|---|
| $W_S$ [m/s] | N6 99.4 [dB(A)] |
| **3** | 33 |
| **4** | 146 |
| **5** | 341 |
| **6** | 613 |
| **7** | 855 |
| **8** | 936 |
| **9** | 949 |
| **10** | 950 |
| **11** | 950 |
| **12** | 959 |
| **13** | 1029 |
| **14** | 1234 |
| **15** | 1531 |
| **16** | 1793 |
| **17** | 1955 |
| **18** | 2035 |
| **19** | 2070 |
| **20** | 2085 |

**Table 7**: Electric power [kW] of the G114 2.1MW CS1 & CS2 wind turbine with a tower height of 106m, calculated according to $W_S$ [m/s] and noise level [dB(A)] (ref: *G114CSAERNRS2100KW_R02_14022017*)

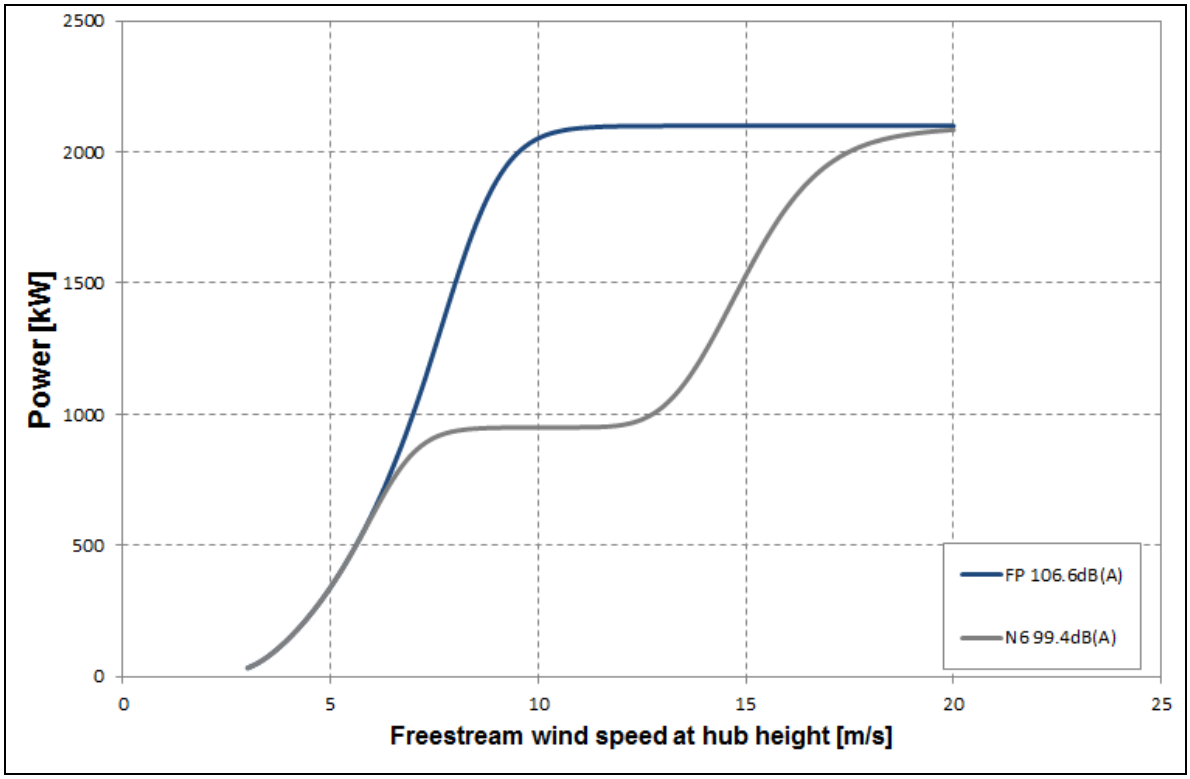


**Figure 2:** Power curve of the G114 2.1MW CS1 & CS2 wind turbine with tower height 106m for a low noise operating mode (ref: *G114CSAERNRS2100KW_R02_14022017*)

**Table 8** presents the electrical power output [kW] in function of the horizontal wind speed $W_S$ [m/s] at hub height ($W_S$) for different noise reduction mode settings, for tower height H = 139m.

| P [kW] | H = 139m | |
|---|---|---|
| $W_S$ [m/s] | N1 105 [dB(A)] | N2 104 [dB(A)] |
| **3** | 33 | 33 |
| **4** | 146 | 146 |
| **5** | 341 | 341 |
| **6** | 620 | 620 |
| **7** | 1006 | 1005 |
| **8** | 1465 | 1445 |
| **9** | 1771 | 1712 |
| **10** | 1872 | 1794 |
| **11** | 1893 | 1809 |
| **12** | 1896 | 1812 |
| **13** | 1900 | 1817 |
| **14** | 1919 | 1841 |
| **15** | 1961 | 1898 |
| **16** | 2011 | 1969 |
| **17** | 2051 | 2027 |
| **18** | 2075 | 2062 |
| **19** | 2087 | 2080 |
| **20** | 2093 | 2089 |

**Table 8**: Electric power [kW] of the G114 2.1MW CS1 & CS2 wind turbine with a tower height of 139m, calculated according to $W_S$ [m/s] and noise level [dB(A)] (ref: *G114CSAERNRS2100KW_R01_21062016*)

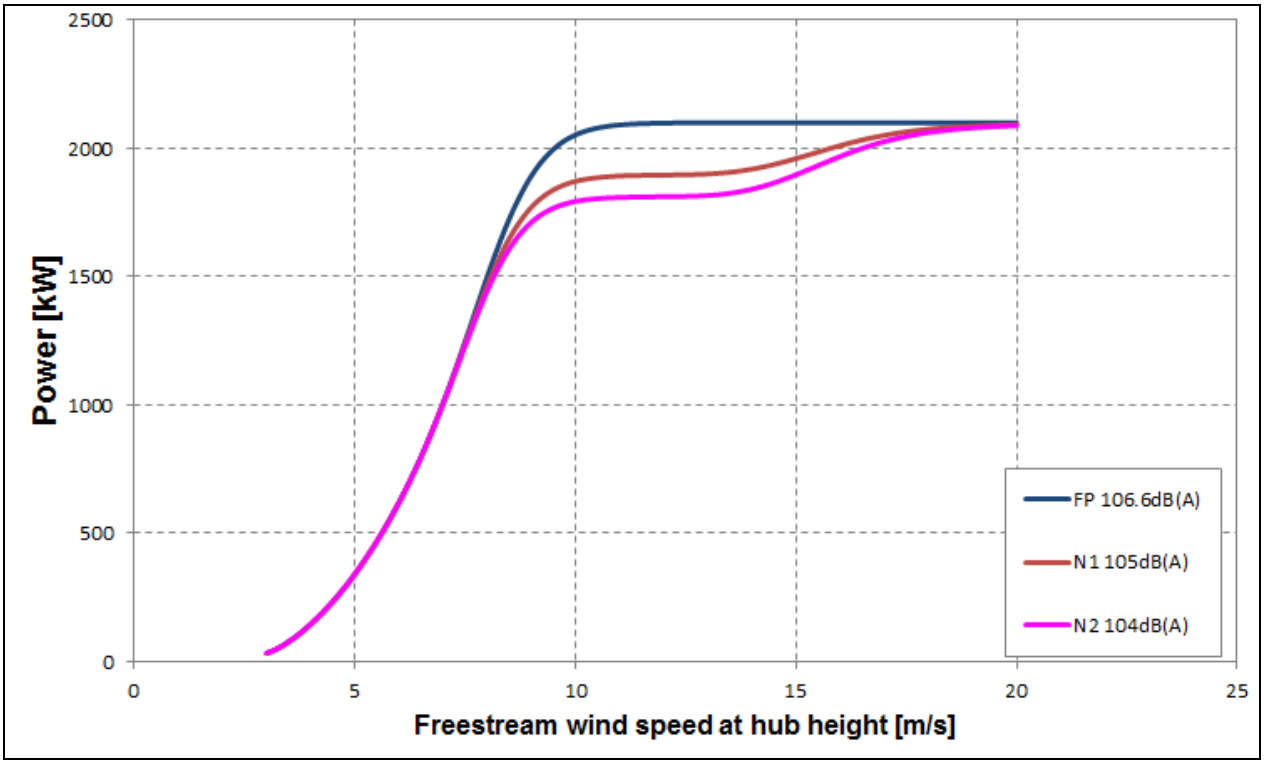


**Figure 3:** Power curve of the G114 2.1MW CS1 & CS2 wind turbine with tower height 139m for different versions of low noise operating mode (ref: *G114CSAERNRS2100KW_R02_14022017*)

**Table 9** presents the power output [kW] of the G114 2.1MW CS1 & CS2 for different noise reduction modes at low wind speed NRS A, B and C. The power output is represented against wind speed at hub height WS [m/s]. For these modes, the power output does not vary with tower height H.

| P [kW] | H = 80m/106m/127m/139m | | |
|---|---|---|---|
| $W_S$ [m/s] | NRS A | NRS B | NRS C |
| **3** | 33 | 33 | 33 |
| **4** | 146 | 146 | 146 |
| **5** | 341 | 341 | 341 |
| **6** | 619 | 602 | 574 |
| **7** | 1006 | 983 | 911 |
| **8** | 1496 | 1471 | 1407 |
| **9** | 1888 | 1861 | 1803 |
| **10** | 2050 | 2037 | 2005 |
| **11** | 2091 | 2087 | 2076 |
| **12** | 2099 | 2098 | 2095 |
| **13** | 2100 | 2100 | 2099 |
| **14** | 2100 | 2100 | 2100 |
| **15** | 2100 | 2100 | 2100 |
| **16** | 2100 | 2100 | 2100 |
| **17** | 2100 | 2100 | 2100 |
| **18** | 2100 | 2100 | 2100 |
| **19** | 2100 | 2100 | 2100 |
| **20** | 2100 | 2100 | 2100 |

**Table 9:** Power output [kW] of the G114 2.1MW CS1 & CS2 wind turbine, calculated according to WS [m/s] for different noise reduction modes at low wind speeds NRS A, B and C.
(ref: *G114CSAERNRS2100KW_R00_14042015*)

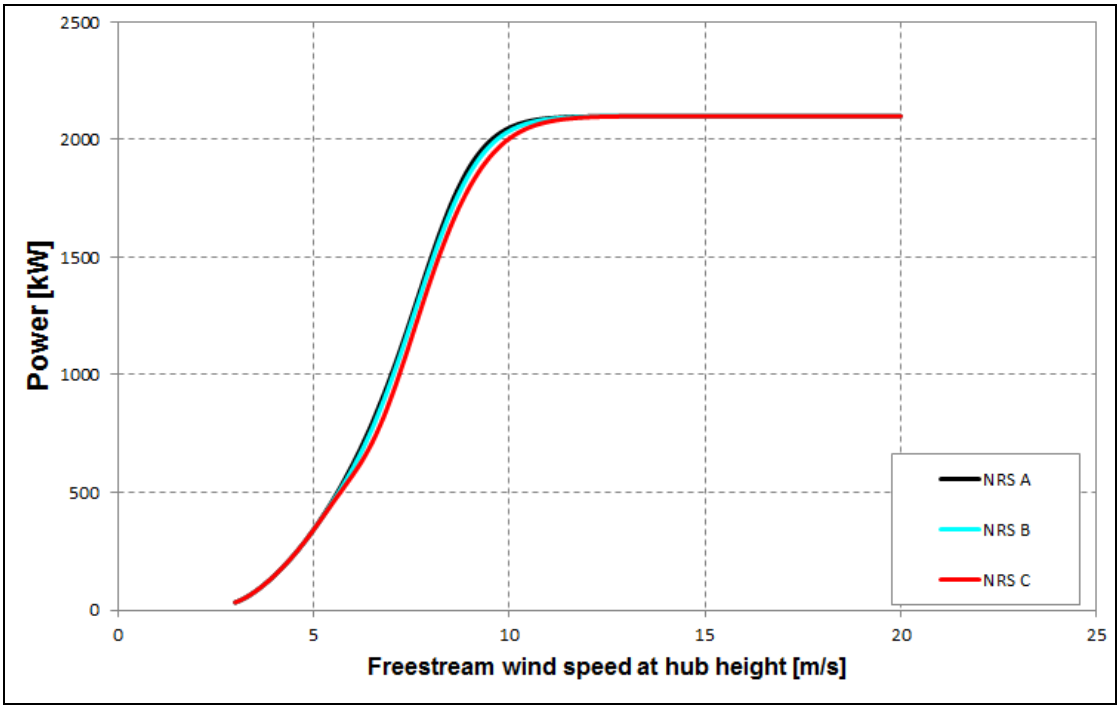


**Figure 4:** Power curve of the G114 2.1MW CS1 & CS2 wind turbine with tower height 80m, 106m, 127m & 139m for different versions of low noise operating modes at low wind speeds NRS A, B and C
(ref: *G114CSAERNRS2100KW_R02_14022017*)

## 5.2 ANNUAL ENERGY PRODUCTION

**Table 10** presents the annual energy output [MWh] for the G114 2.1MW CS1 & CS2 wind turbine calculated with different Weibull distribution parameters Wave [m/s] and K, for a tower height of 80m and different noise reduction modes.

| ***P [MWh]*** | | ***H = 80m*** | | | | |
|---|---|---|---|---|---|---|
| ***$W_{ave}$ [m/s]*** | | ***5.5*** | ***6*** | ***6.5*** | ***7*** | ***7.5*** |
| ***N1 105 [dB(A)]*** | ***K = 1.5*** | 5599 | 6312 | 6945 | 7496 | 7963 |
| | ***K = 2.0*** | 5649 | 6595 | 7476 | 8279 | 8996 |
| | ***K = 2.5*** | 5523 | 6626 | 7667 | 8628 | 9500 |
| ***N2 104 [dB(A)]*** | ***K = 1.5*** | 5480 | 6172 | 6789 | 7325 | 7781 |
| | ***K = 2.0*** | 5541 | 6455 | 7305 | 8081 | 8776 |
| | ***K = 2.5*** | 5441 | 6503 | 7502 | 8423 | 9260 |
| ***N3 103 [dB(A)]*** | ***K = 1.5*** | 5357 | 6029 | 6628 | 7151 | 7595 |
| | ***K = 2.0*** | 5428 | 6308 | 7128 | 7878 | 8551 |
| | ***K = 2.5*** | 5351 | 6373 | 7330 | 8210 | 9013 |
| ***N4 102 [dB(A)]*** | ***K = 1.5*** | 5231 | 5884 | 6467 | 6976 | 7410 |
| | ***K = 2.0*** | 5310 | 6158 | 6948 | 7673 | 8325 |
| | ***K = 2.5*** | 5254 | 6235 | 7151 | 7993 | 8763 |
| ***N5 101 [dB(A)]*** | ***K = 1.5*** | 5098 | 5731 | 6298 | 6793 | 7217 |
| | ***K = 2.0*** | 5181 | 5996 | 6757 | 7457 | 8089 |
| | ***K = 2.5*** | 5144 | 6082 | 6957 | 7762 | 8500 |
| ***N6 99.4 [dB(A)]*** | ***K = 1.5*** | 3918 | 4389 | 4821 | 5210 | 5553 |
| | ***K = 2.0*** | 4007 | 4546 | 5064 | 5561 | 6034 |
| | ***K = 2.5*** | 4106 | 4680 | 5208 | 5705 | 6187 |

**Table 10**: Annual energy production for the G114 2.1MW CS1 & CS2 wind turbine for different Weibull parameters Wave [m/s], Weibull K parameter and different noise reduction modes, for tower height H = 80m (*ref: G114CSAERNRS2100KW_R00_14042015, G114CSAERNRS2100KW_R02_14022017*)

**Table 11** presents the annual energy output [MWh] for the G114 2.1MW CS1 & CS2 wind turbine calculated with different Weibull distribution parameters Wave [m/s] and K, for a tower height of 127m and a noise reduction mode.

| ***P [MWh]*** | | ***H = 106m*** | | | | |
|---|---|---|---|---|---|---|
| ***$W_{ave}$ [m/s]*** | | ***5.5*** | ***6*** | ***6.5*** | ***7*** | ***7.5*** |
| ***N6 99.4 [dB(A)]*** | ***K = 1.5*** | 3857 | 4305 | 4715 | 5082 | 5404 |
| | ***K = 2.0*** | 3983 | 4502 | 4994 | 5460 | 5900 |
| | ***K = 2.5*** | 4101 | 4667 | 5176 | 5646 | 6093 |

**Table 11**: Annual energy production for the G114 2.1MW CS1 & CS2 wind turbine for different Weibull parameters Wave [m/s], Weibull K parameter and a noise reduction mode, for tower height H = 127m (*ref: G114CSAERNRS2100KW_R02_14022017*)

**Table 12** presents the annual energy output [MWh] for the G114 2.1MW CS1 & CS2 wind turbine calculated with different Weibull distribution parameters Wave [m/s] and K, for a tower height of 139m and different noise reduction modes.

| ***P [MWh]*** | | ***H = 139m*** | | | | |
|---|---|---|---|---|---|---|
| ***$W_{ave}$ [m/s]*** | | ***5.5*** | ***6*** | ***6.5*** | ***7*** | ***7.5*** |
| ***N1 105 [dB(A)]*** | ***K = 1.5*** | 5580 | 6285 | 6912 | 7455 | 7915 |
| | ***K = 2.0*** | 5642 | 6582 | 7455 | 8249 | 8955 |
| | ***K = 2.5*** | 5522 | 6623 | 7659 | 8612 | 9473 |
| ***N2 104 [dB(A)]*** | ***K = 1.5*** | 5452 | 6133 | 6739 | 7264 | 7709 |
| | ***K = 2.0*** | 5532 | 6436 | 7274 | 8036 | 8715 |
| | ***K = 2.5*** | 5439 | 6498 | 7490 | 8399 | 9221 |

**Table 12**: Annual energy production for the G114 2.1MW CS1 & CS2 wind turbine for different Weibull parameters Wave [m/s], Weibull K parameter and different noise reduction modes, for tower height H = 139m (*ref: G114CSAERNRS2100KW_R01_21062016*)

**Table 13** presents the annual energy output [MWh] for the G114 2.1MW CS1 & CS2 wind turbine calculated with different Weibull distribution parameters Wave [m/s] and K, for a tower height of 80m, 106m, 127m and 139 m and different noise reduction modes at low wind speeds NRS A, B and C.

| ***P[MWh]*** | | ***H = 80m/106m/127m/139m*** | | | | |
|---|---|---|---|---|---|---|
| ***$W_{ave}$ [m/s]*** | | ***5.5*** | ***6.0*** | ***6.5*** | ***7.0*** | ***7.5*** |
| ***NRS A*** | ***K = 1.5*** | 5860 | 6619 | 7293 | 7877 | 8371 |
| | ***K = 2.0*** | 5877 | 6897 | 7849 | 8716 | 9486 |
| | ***K = 2.5*** | 5690 | 6882 | 8018 | 9072 | 10028 |
| ***NRS B*** | ***K = 1.5*** | 5798 | 6554 | 7227 | 7810 | 8305 |
| | ***K = 2.0*** | 5800 | 6815 | 7764 | 8629 | 9399 |
| | ***K = 2.5*** | 5603 | 6785 | 7916 | 8967 | 9924 |
| ***NRS C*** | ***K = 1.5*** | 5652 | 6401 | 7070 | 7651 | 8146 |
| | ***K = 2.0*** | 5618 | 6619 | 7559 | 8422 | 9193 |
| | ***K = 2.5*** | 5398 | 6554 | 7670 | 8716 | 9674 |

**Table 13**: Annual energy production for the G114 2.1MW CS1 & CS2 wind turbine for different Weibull parameters Wave [m/s], Weibull K parameter and different noise reduction modes at low wind speeds NRS A, B and C (*ref: G114CSAERNRS2100KW_R00_14042015*)

## 5.3 NOISE CURVES

**Table 14** represents the noise curves of the G114 2.1MW CS1 & CS2 wind turbine for different noise reduction modes in function of $W_{10}$ [m/s] and $W_S$ [m/s] for the 80m tower.

| H = 80m | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **$W_{10}$ [m/s]** | **$W_S$ [m/s]** | **N1 [dB(A)]** | **N2 [dB(A)]** | **N3 [dB(A)]** | **N4 [dB(A)]** | **N5 [dB(A)]** | **N6 [dB(A)]** | **NRS A [dB(A)]** | **NRS B [dB(A)]** | **NRS C [dB(A)]** |
| **3.0** | 4.2 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 |
| **3.5** | 4.9 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 |
| **4.0** | 5.6 | 96.4 | 96.4 | 96.4 | 96.4 | 96.4 | 96.3 | 95.8 | 95.8 | 95.8 |
| **4.5** | 6.3 | 99.1 | 99.1 | 99.1 | 99.1 | 99.1 | 99.0 | 97.6 | 96.7 | 95.8 |
| **5.0** | 7.0 | 101.4 | 101.4 | 101.4 | 101.4 | 101.0 | 99.4 | 99.9 | 99.1 | 98.0 |
| **5.5** | 7.7 | 103.6 | 103.6 | 103.0 | 102.0 | 101.0 | 99.4 | 102.1 | 101.3 | 100.2 |
| **6.0** | 8.4 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 104.2 | 103.3 | 102.3 |
| **6.5** | 9.1 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 105.9 | 105.1 | 104.1 |
| **7.0** | 9.8 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 105.7 |
| **7.5** | 10.5 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |
| **8.0** | 11.2 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |
| **8.5** | 11.9 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |
| **9.0** | 12.6 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |
| **9.5** | 13.3 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |
| **10.0** | 13.9 | 105.0 | 104.0 | 103.0 | 102.0 | 101.0 | 99.4 | 106.6 | 106.6 | 106.6 |

**Table 14**: Noise curves of the G114 2.1MW CS1 & CS2 wind turbine for a tower height of 80m.
(*ref: G114CSAERNRS2100KW_R00_14042015, G114CSAERNRS2100KW_R02_14022017*)

**Table 15** represents the noise curves of the G114 2.1MW CS1 & CS2 wind turbine for different noise reduction modes in function of $W_{10}$ [m/s] and $W_S$ [m/s] for the 106m tower.

| H = 106m | | | | | |
|---|---|---|---|---|---|
| **$W_{10}$ [m/s]** | **$W_S$ [m/s]** | **N6 [dB(A)]** | **NRS A [dB(A)]** | **NRS B [dB(A)]** | **NRS C [dB(A)]** |
| **3.0** | 4.4 | 95.8 | 95.8 | 95.8 | 95.8 |
| **3.5** | 5.1 | 95.8 | 95.8 | 95.8 | 95.8 |
| **4.0** | 5.8 | 97.4 | 95.9 | 95.8 | 95.8 |
| **4.5** | 6.6 | 99.4 | 98.5 | 97.6 | 96.6 |
| **5.0** | 7.3 | 99.4 | 100.9 | 100.0 | 98.9 |
| **5.5** | 8.0 | 99.4 | 103.1 | 102.2 | 101.2 |
| **6.0** | 8.8 | 99.4 | 105.1 | 104.3 | 103.3 |
| **6.5** | 9.5 | 99.4 | 106.6 | 106.6 | 105.0 |
| **7.0** | 10.2 | 99.4 | 106.6 | 106.6 | 106.6 |
| **7.5** | 10.9 | 99.4 | 106.6 | 106.6 | 106.6 |
| **8.0** | 11.7 | 99.4 | 106.6 | 106.6 | 106.6 |
| **8.5** | 12.4 | 99.4 | 106.6 | 106.6 | 106.6 |
| **9.0** | 13.1 | 99.4 | 106.6 | 106.6 | 106.6 |
| **9.5** | 13.9 | 99.4 | 106.6 | 106.6 | 106.6 |
| **10.0** | 14.6 | 99.4 | 106.6 | 106.6 | 106.6 |

**Table 15:** Noise curves of the G114 2.1MW CS1 & CS2 wind turbine for a tower height of 106m.
(ref: *G114CSAERNRS2100KW_R00_14042015, G114CSAERNRS2100KW_R02_14022017*)

**Table 16** represents the noise curves of the G114 2.1MW CS1 & CS2 wind turbine for for different noise reduction modes in function of $W_{10}$ [m/s] and $W_S$ [m/s] for the 127m tower.

| H = 127m | | | | |
|---|---|---|---|---|
| **$W_{10}$ [m/s]** | **$W_S$ [m/s]** | **NRS A [dB(A)]** | **NRS B [dB(A)]** | **NRS C [dB(A)]** |
| **3.0** | 4.5 | 95.8 | 95.8 | 95.8 |
| **3.5** | 5.3 | 95.8 | 95.8 | 95.8 |
| **4.0** | 6.0 | 96.5 | 95.8 | 95.8 |
| **4.5** | 6.8 | 99.2 | 98.3 | 97.2 |
| **5.0** | 7.5 | 101.6 | 100.7 | 99.6 |
| **5.5** | 8.3 | 103.8 | 102.9 | 101.9 |
| **6.0** | 9.0 | 105.7 | 104.9 | 103.9 |
| **6.5** | 9.8 | 106.6 | 106.6 | 105.6 |
| **7.0** | 10.5 | 106.6 | 106.6 | 106.6 |
| **7.5** | 11.3 | 106.6 | 106.6 | 106.6 |
| **8.0** | 12.0 | 106.6 | 106.6 | 106.6 |
| **8.5** | 12.8 | 106.6 | 106.6 | 106.6 |
| **9.0** | 13.5 | 106.6 | 106.6 | 106.6 |
| **9.5** | 14.3 | 106.6 | 106.6 | 106.6 |
| **10.0** | 15.0 | 106.6 | 106.6 | 106.6 |

**Table 16:** Noise curves of the G114 2.1MW CS1 & CS2 wind turbine for a tower height of 127m.
(ref: *G114CSAERNRS2100KW_R02_14022017*)

**Table 17** represents the noise curves of the G114 2.1MW CS1 & CS2 wind turbine for different noise reduction modes in function of $W_{10}$ [m/s] and $W_S$ [m/s] for the 139m tower.

| H = 139 m | | | | | | |
|---|---|---|---|---|---|---|
| **$W_{10}$ [m/s]** | **$W_S$ [m/s]** | **N1 [dB(A)]** | **N2 [dB(A)]** | **NRS A [dB(A)]** | **NRS B [dB(A)]** | **NRS C [dB(A)]** |
| **3.0** | 4.6 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 |
| **3.5** | 5.3 | 95.8 | 95.8 | 95.8 | 95.8 | 95.8 |
| **4.0** | 6.1 | 98.3 | 98.3 | 96.8 | 95.9 | 95.8 |
| **4.5** | 6.9 | 101.0 | 101.0 | 99.5 | 98.6 | 97.5 |
| **5.0** | 7.6 | 103.4 | 103.4 | 101.9 | 101.0 | 100.0 |
| **5.5** | 8.4 | 105.0 | 104.0 | 104.1 | 103.3 | 102.3 |
| **6.0** | 9.1 | 105.0 | 104.0 | 106.0 | 105.2 | 104.2 |
| **6.5** | 9.9 | 105.0 | 104.0 | 106.6 | 106.6 | 105.9 |
| **7.0** | 10.7 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **7.5** | 11.4 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **8.0** | 12.2 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **8.5** | 13.0 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **9.0** | 13.7 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **9.5** | 14.5 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |
| **10.0** | 15.2 | 105.0 | 104.0 | 106.6 | 106.6 | 106.6 |

**Table 17**: Noise curves of the G114 2.1MW CS1 & CS2 wind turbine for a tower height of 139m.
(*ref: G114CSAERNRS2100KW_R01_21062016*)