

SIEMENS

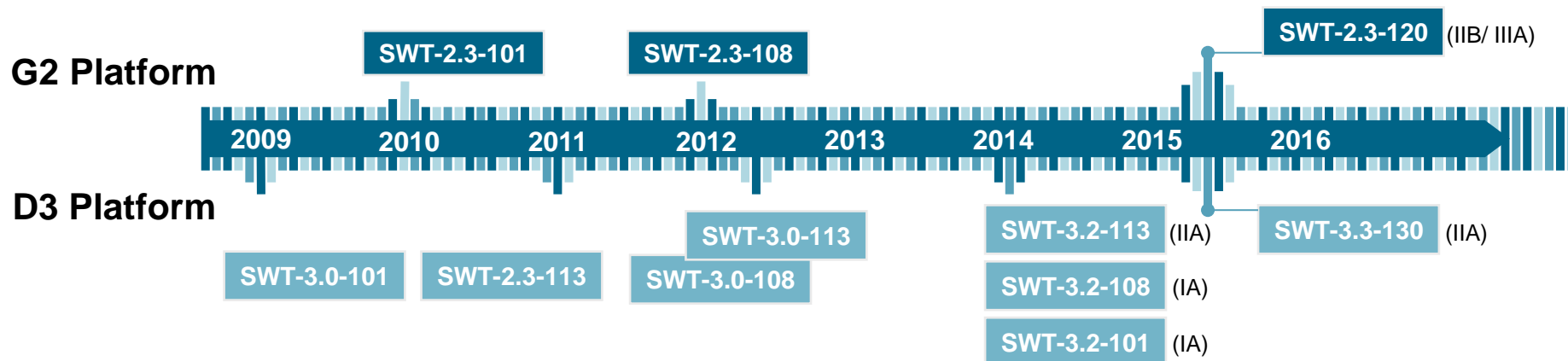
Siemens Wind Power

SWT 2.3-120

Extending the reach of the G2 Product Platform



Two product platforms Maximizing project financials



G2 SWT-2.3-120

- ~10% AEP increase (per park)
- Hub Height: 80m/92.4m
- Serial Production 2017







D3 SWT-3.3-130

- ~12% AEP increase (per turbine)
- Hub Height: 85m/ 115m/135m
- Serial Production 2017



Flexibility to match project criteria

Development Constraints		SWT Turbine	Gross AEP	Selection
MW	Positions			
100		2.3-120	44  * 10.4k MWh/yr = 46k MWh/yr	✓
		3.3-130	30  * 13.7k MWh/yr = 41k MWh/yr	
	20	2.3-120	20  * 10.4k MWh/yr = 21k MWh/yr	
		3.3-130	20  * 13.7k MWh/yr = 27k MWh/yr	✓

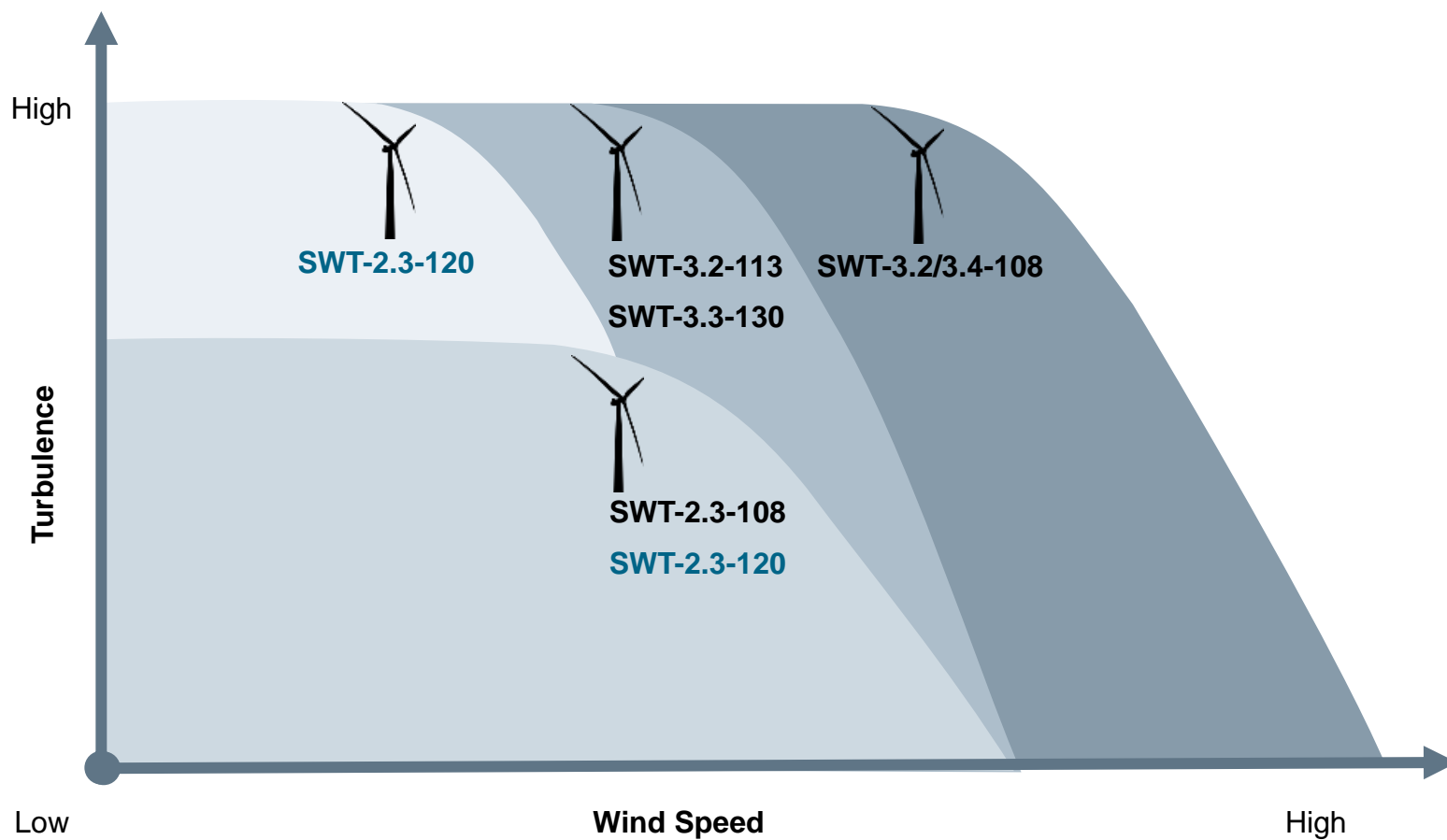


Other drivers:

- BoP cost
- Location / Infrastructure



The right turbines for all wind conditions



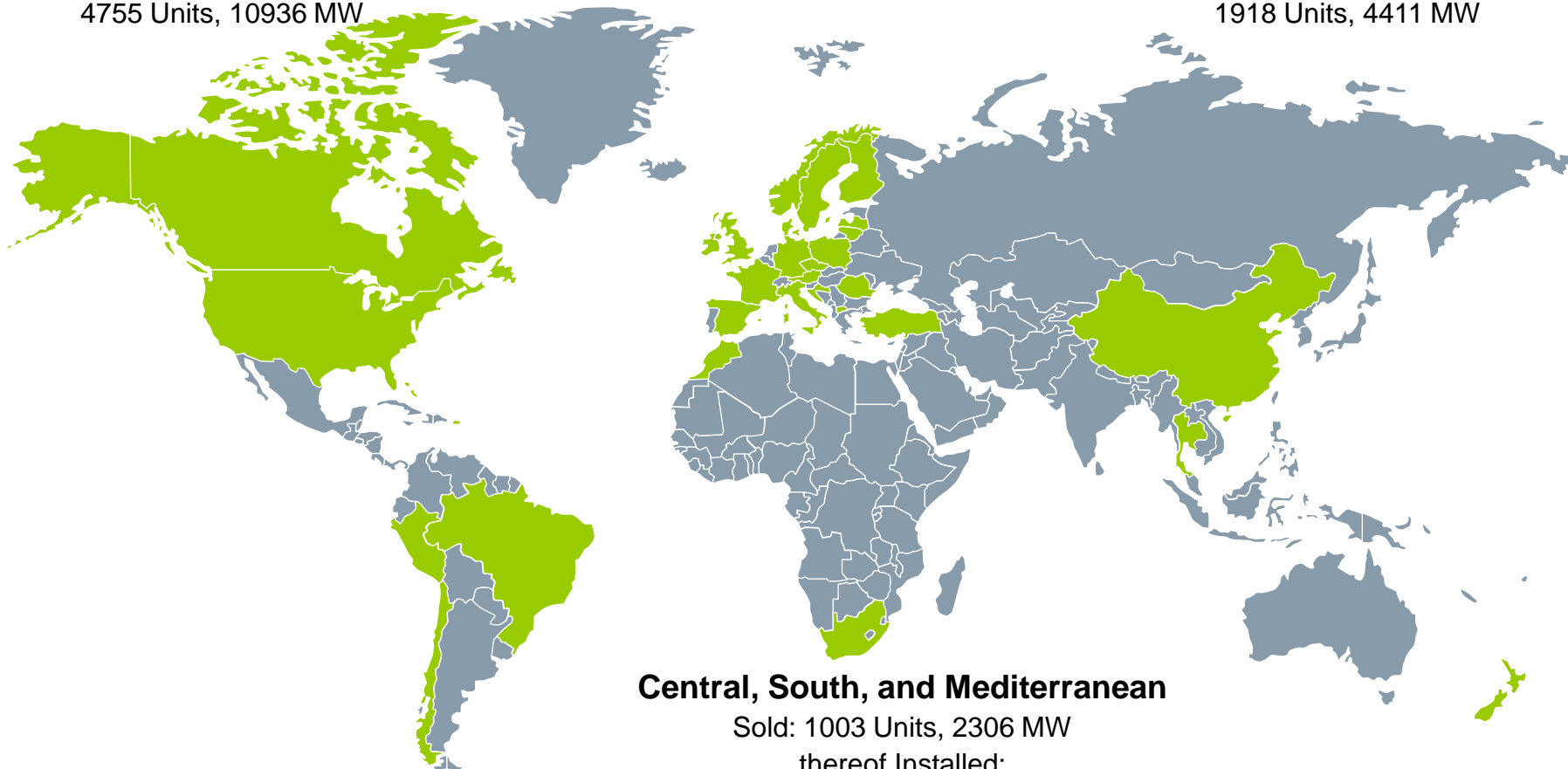
Siemens G2 track record: 20 years of experience and 19 GW sold worldwide

Americas

Sold: 5360 Units, 12328 MW
 thereof Installed:
 4755 Units, 10936 MW

UK, North, and Asia Pacific

Sold: 1939 Units, 4459 MW
 thereof Installed:
 1918 Units, 4411 MW



 Countries where Siemens G2 turbines are installed

Central, South, and Mediterranean

Sold: 1003 Units, 2306 MW
 thereof Installed:
 949 Units, 2183 MW

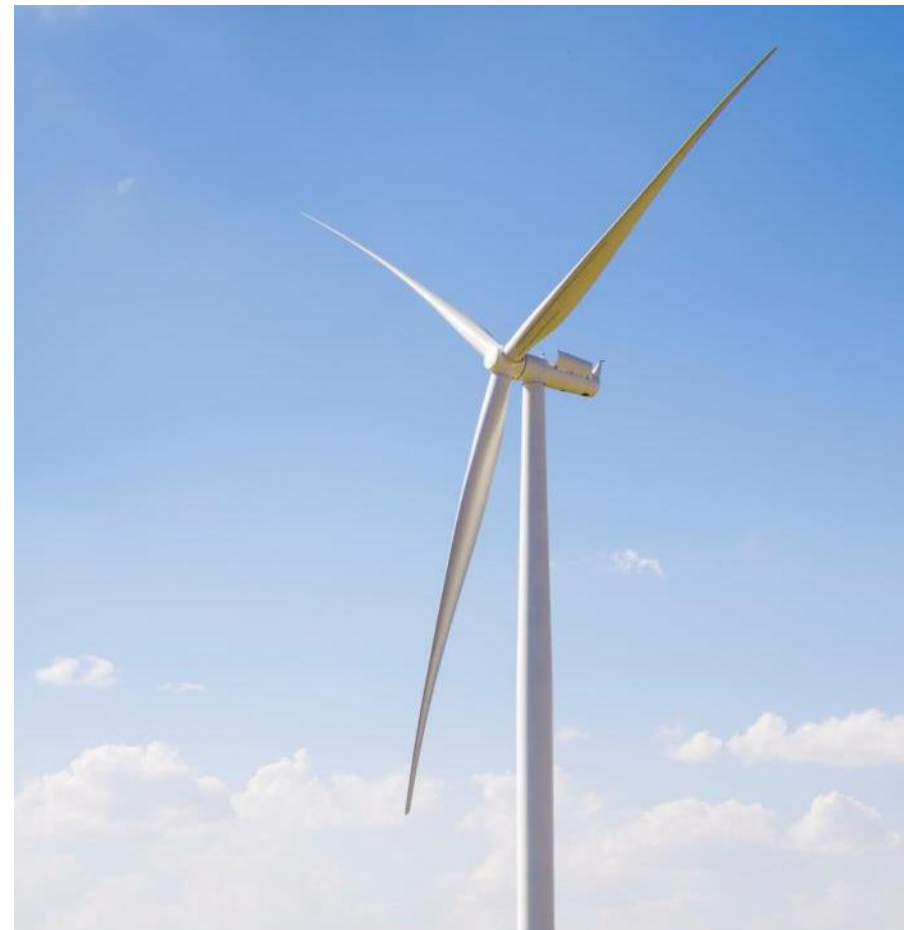
As of December 2014

SWT 2.3-108 : Enhanced Efficiency

SWT-2.3-108 Wind Turbine

Technical Data

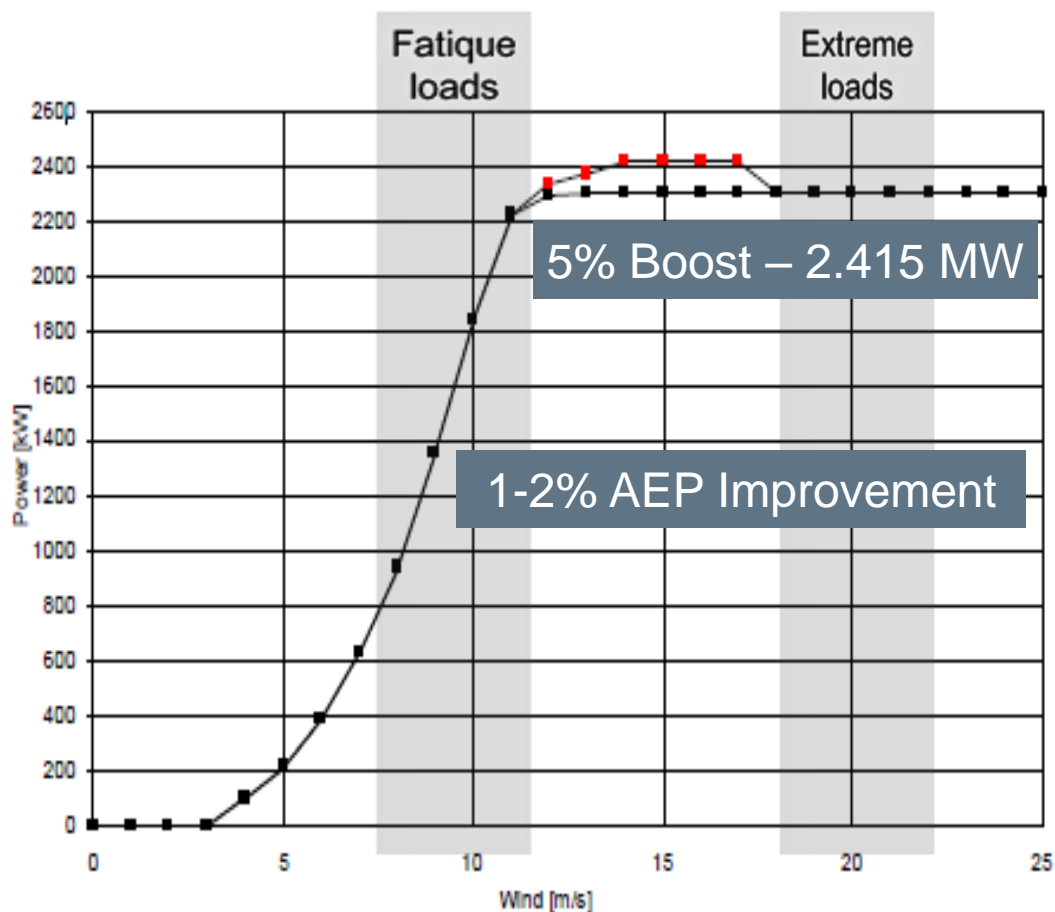
IEC Class:	<i>II B</i>
Nominal Power:	<i>2,300 kW</i>
Rotor diameter:	<i>108 m</i>
Blade length:	<i>53 m</i>
Swept area:	<i>9160 m²</i>
Hub height:	<i>79.5 m and 99.5 m</i>
Power regulation:	<i>pitch regulation, variable speed</i>
Rotor weight:	<i>62 t</i>
Nacelle weight:	<i>83 t</i>



G2 evolution

Power Boost

2.3-108 Power Boost



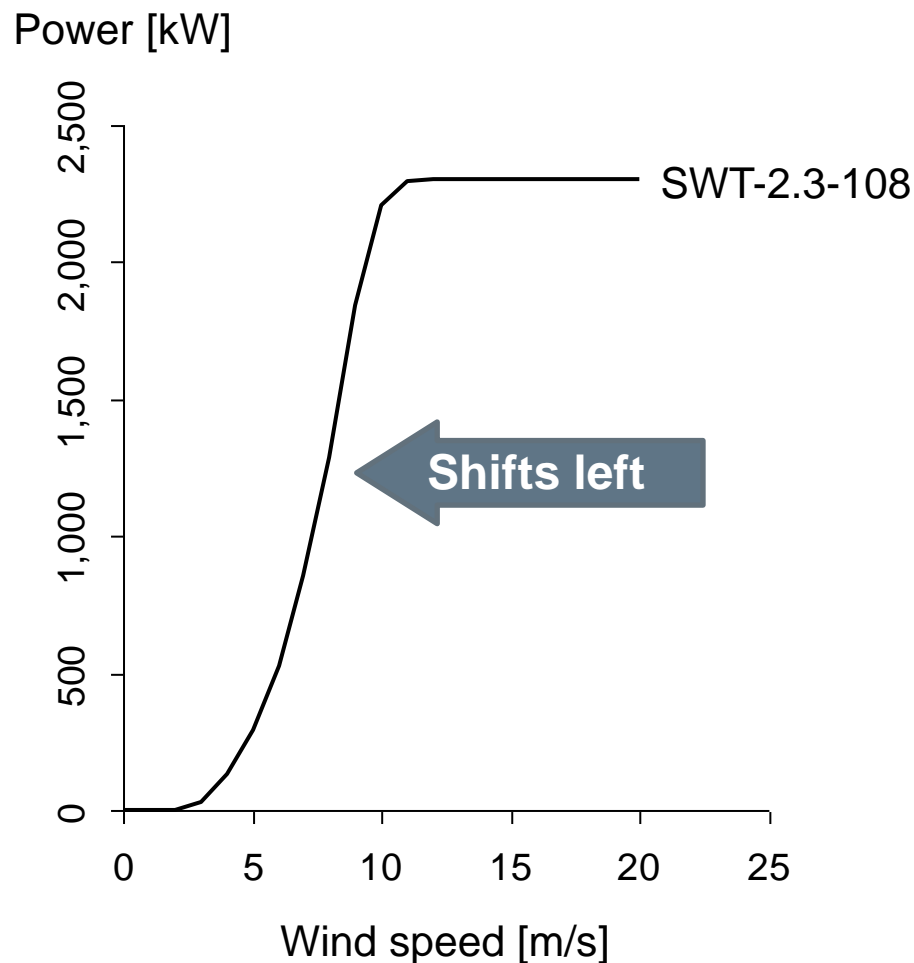
Overview

- DNV Certification
- On-board controls – park set-point as required (i.e 100 MW max.)
- Operates within electrical / mechanical design window based on on-board instrumentation
 - Electrical: Ambient temperature limit with sub-component safeguards
 - Mechanical: Increased RPM maintains torque, turbulence estimation for extreme events
- Applicable to G2 platform (93/101/108)

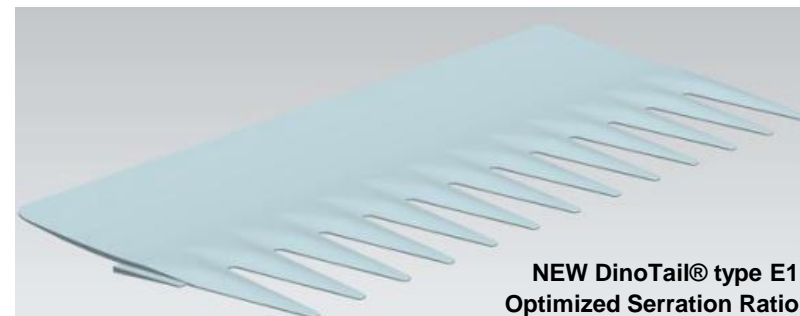
G2 evolution

Power curve enhancement – R2

Power Curve Update



Enhanced Dino Tail design



- Improved lift
- Improved noise characteristics

Yaw control improvements

- Improved algorithms based on testing and operational experience – improves production in the 4-10m/s range

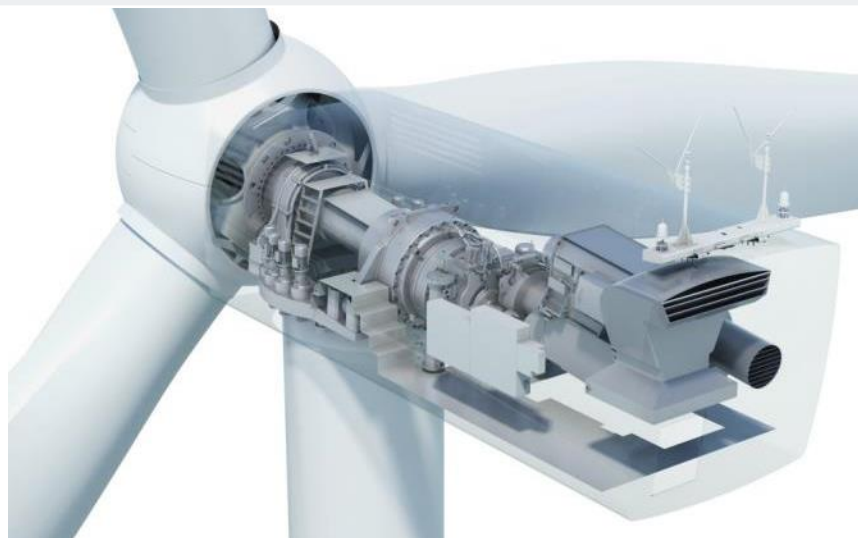
- Upgrade applicable to 108 rotor (D3)

Extending the reach of the G2 product platform

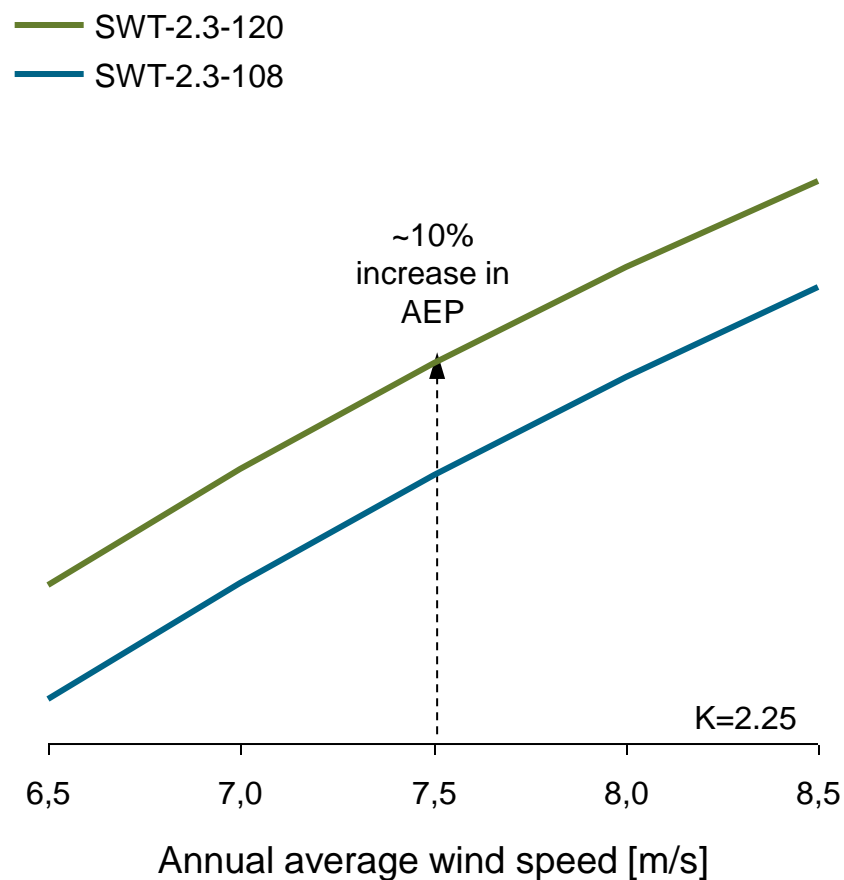
SWT-2.3-120 Wind Turbine

Technical Data

IEC Class:	<i>IIB / IIIA</i>
Nominal Power:	<i>2,300 kW</i>
Rotor diameter:	<i>120 m</i>
Blade length:	<i>59 m</i>
Swept area:	<i>11,310 m²</i>
Hub height:	<i>80 m or 92.4 m</i>

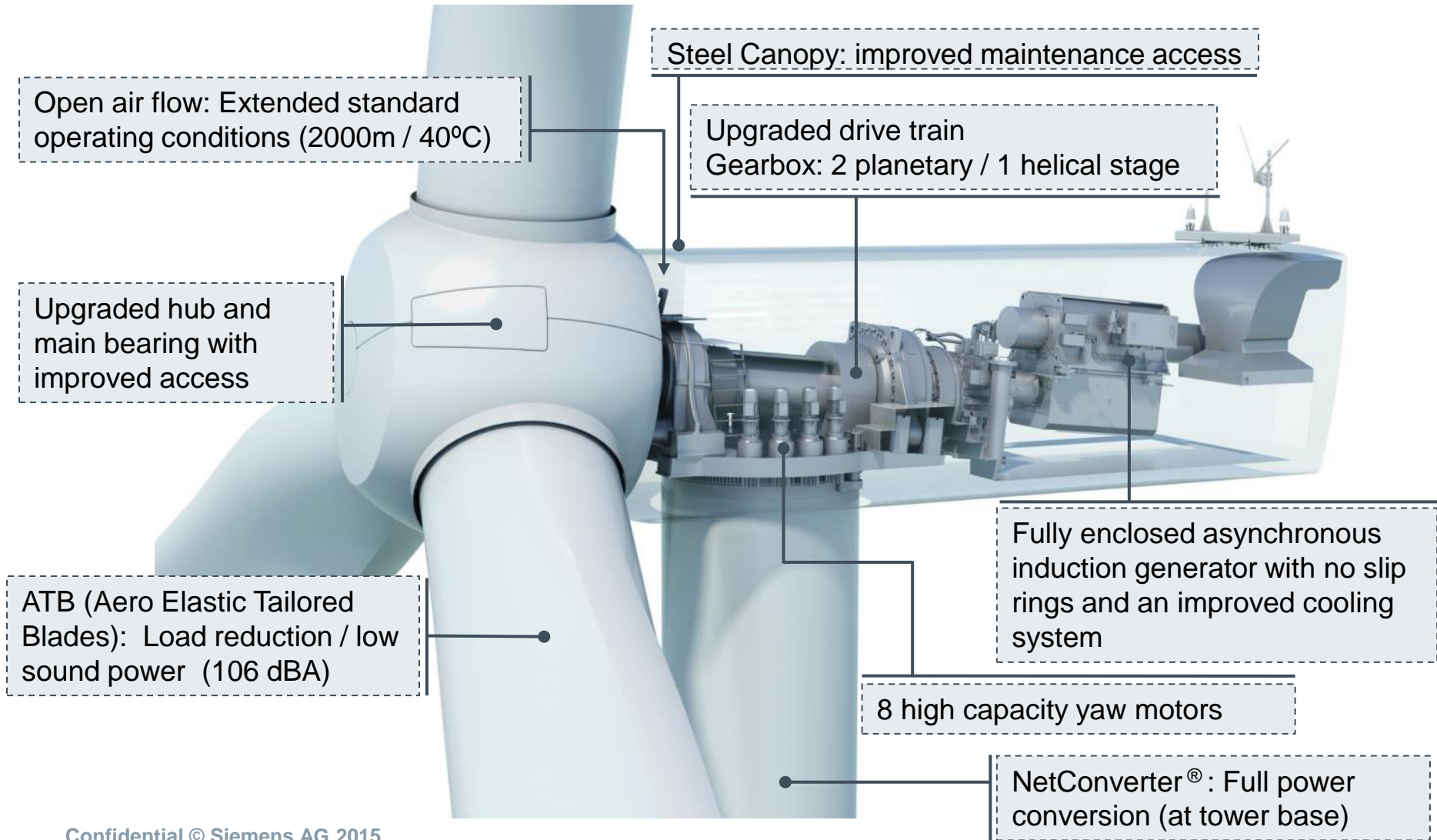


AEP increase per Wind Park



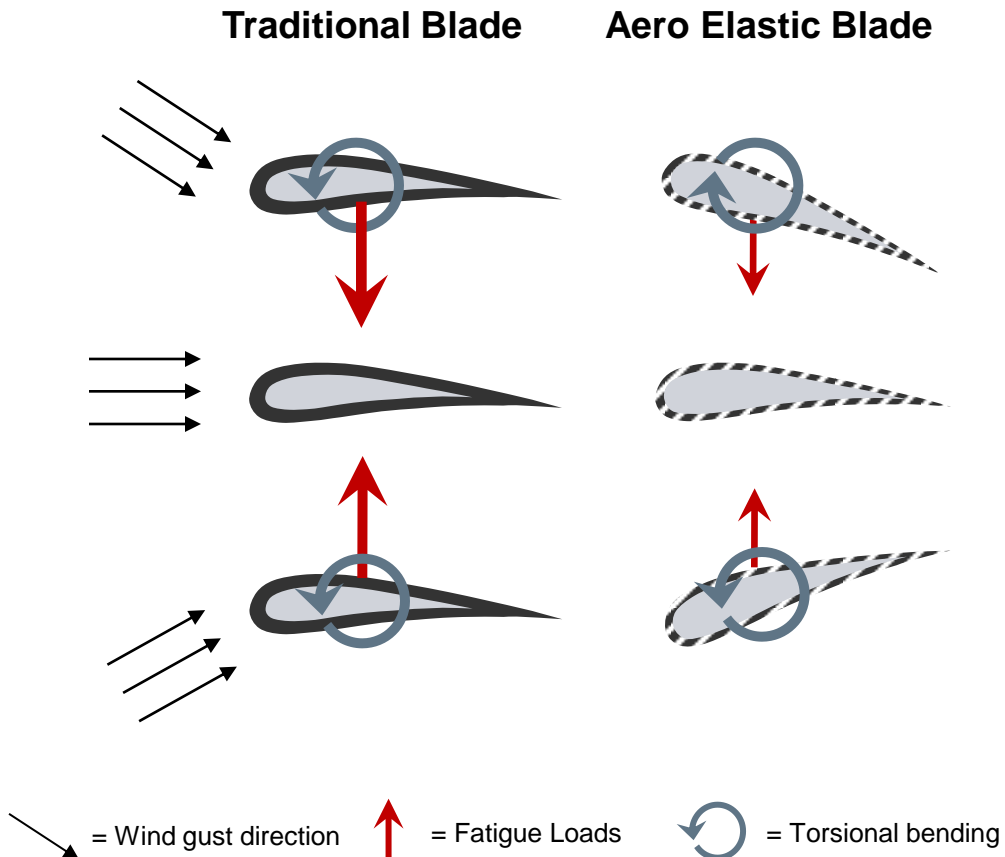
SWT-2.3-120

Extending the reach of the G2 product platform



Aero Elastic Tailored Blades

Reduced loads and increased AEP

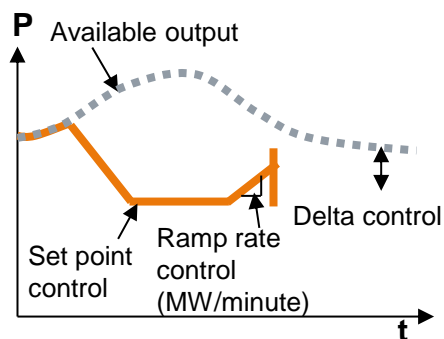


- Couples blade bending and blade twisting to absorb peak loads and reduce cumulative fatigue loading
- Enables instant adjustment in angle of attack without using pitch system
- Reduction of loads on the nacelle, tower and foundation.

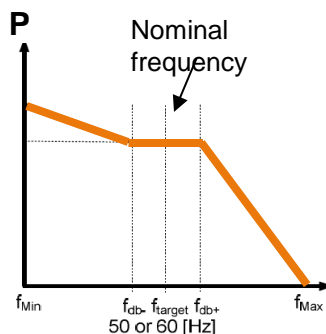
NetConverter®

Superior electrical capabilities

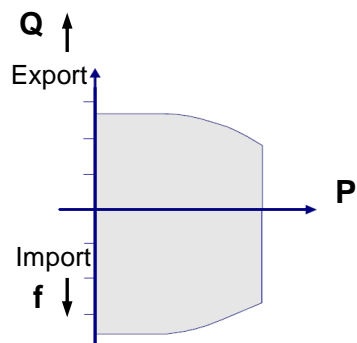
Active power control



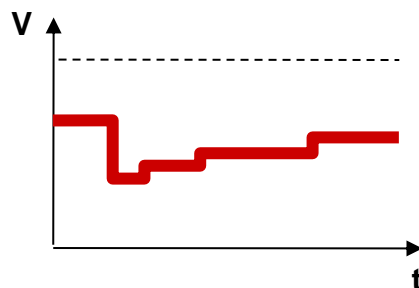
Frequency regulation



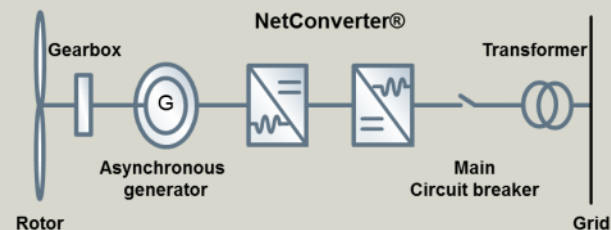
Reactive power capability



Low voltage ride through

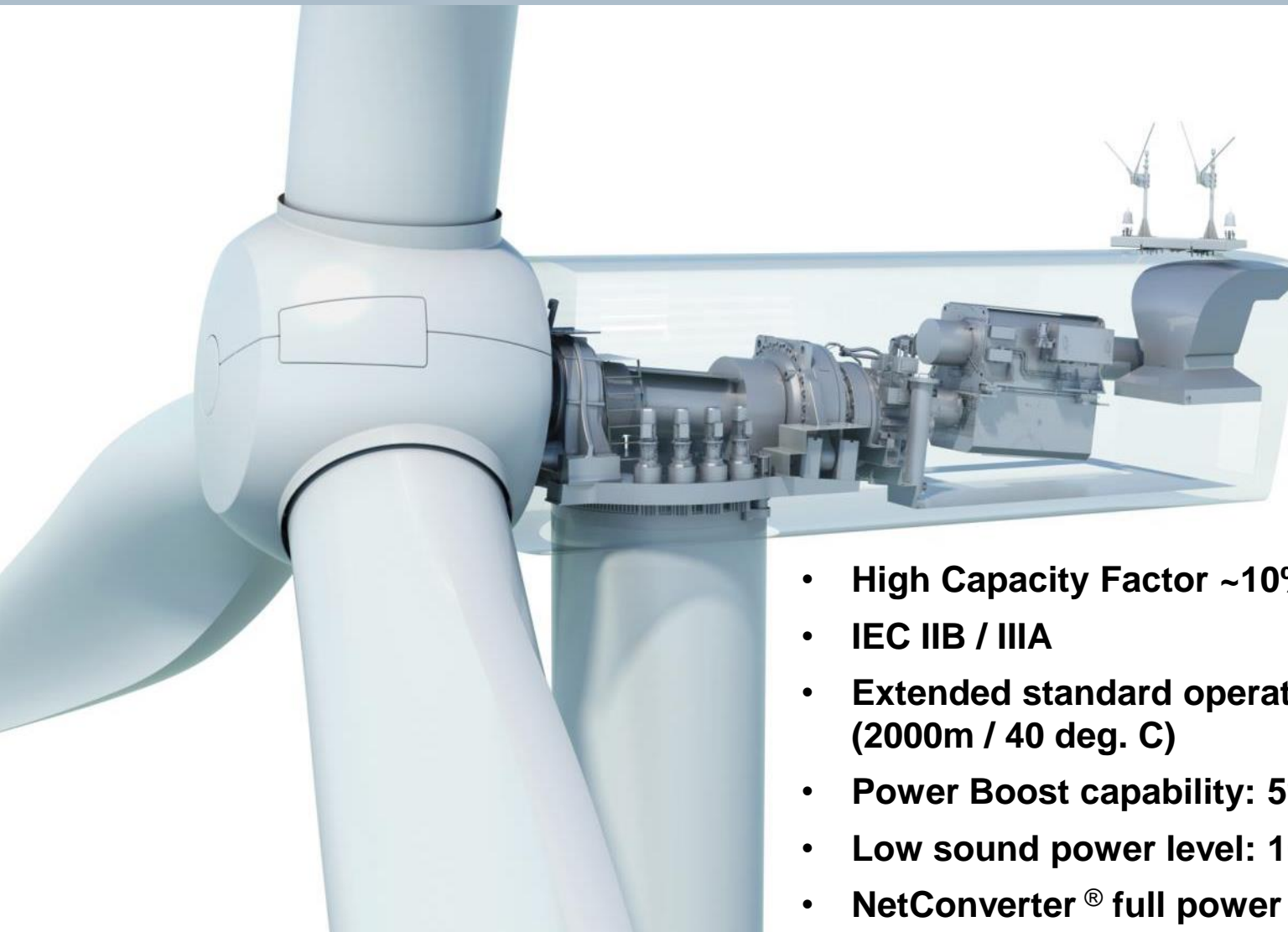


- Maximum flexibility to comply with different grid codes.
- Low OPEX due to less wear and tear of components
- Potential remuneration from ancillary services



SWT-2.3-120

The new standard



- **High Capacity Factor ~10% more AEP**
- **IEC IIB / IIIA**
- **Extended standard operating conditions (2000m / 40 deg. C)**
- **Power Boost capability: 5%**
- **Low sound power level: 106 dBA**
- **NetConverter[®] full power conversion**

SIEMENS



Thank you.

