



Turn to one of a kind service for all kinds of turbines

SGRE Multibrand

We never compromise on safety

I'm Making Safety Personal

"Safety is truly our top priority. Everyone is obligated to stop work if there is a safety concern, regardless of the commercial impact. A mindset that all accidents are preventable will drive our business to zero injuries."

Mark Albenze
Service CEO
Siemens Gamesa Renewable Energy



Service by the numbers*



More than
€10 bn
combined backlog
in the service unit



In 2017 more than
~ **€1.1 bn**
combined revenue



More than
6,000
employees in our
business unit



55,4 GW
under service



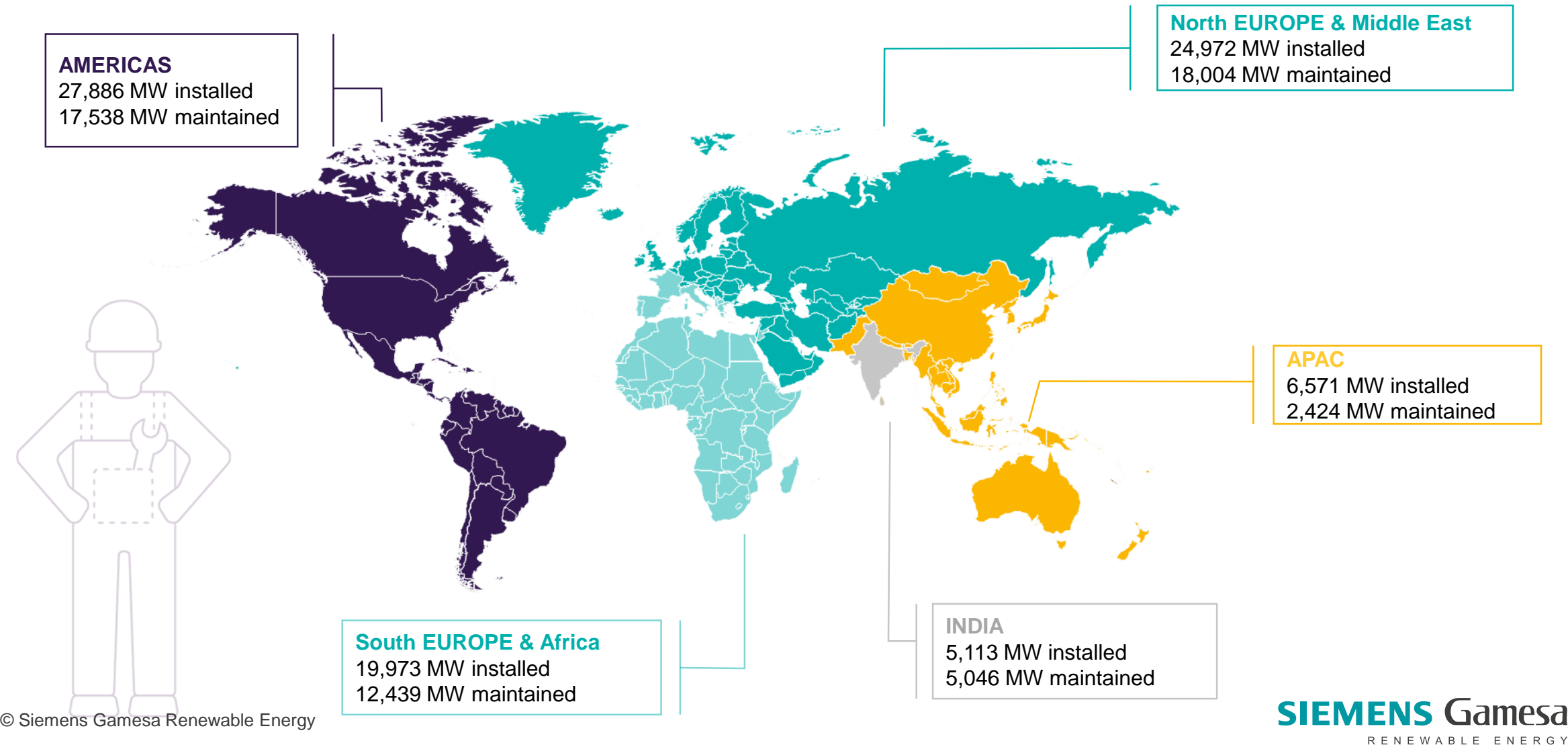
More than
28,000
turbines serviced worldwide



55
countries with
service operations

Service Organization – Regions

+84 GW of capacity installed worldwide & 55 GW in O&M at December 2017.



The Wind Service market is experiencing a period of transition

A changing wind service market



The wind service market is experiencing a period of transition...

- Price erosion
- Reduced government support
- Highly active M&A landscape



But customer requirements remain unique



Customers have and will continue to need a variety of servicing requirements...

- Different fleet compositions
- Different scope needs
- Different metrics driving their business



Within this market, our customers need to continue to thrive enhancing the value of their fleet, not just keeping turbines turning

1

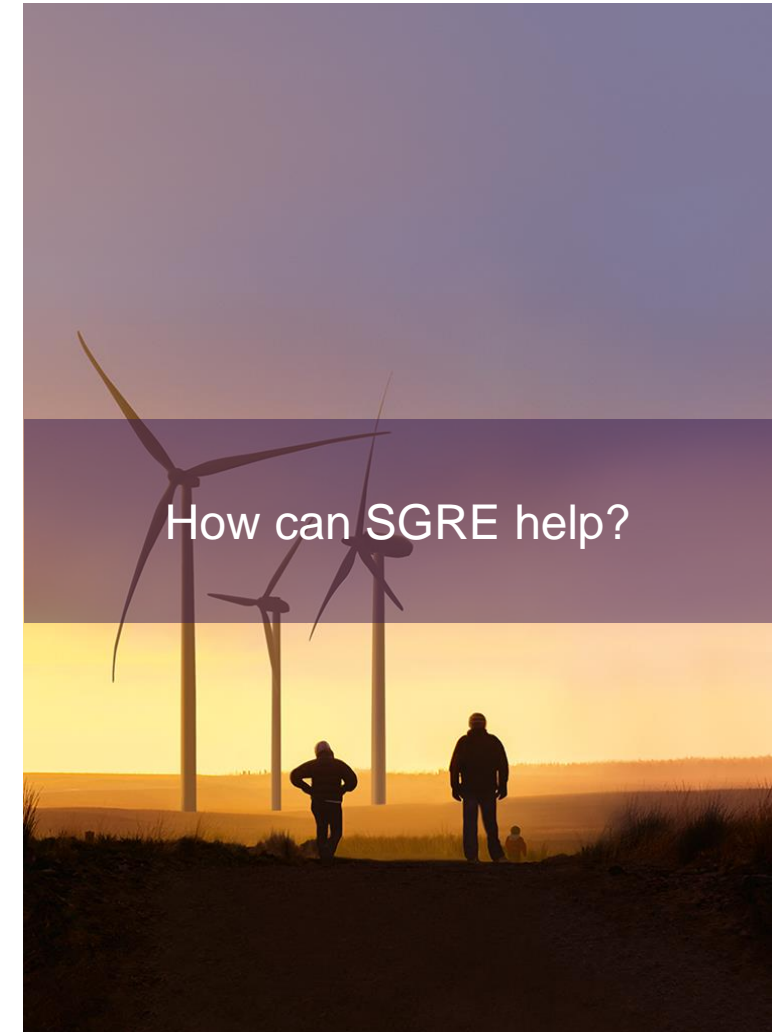
Increase the value of WTG assets

2

Reduce the cost of production

3

Reduce complexity of managing a portfolio of different turbine types

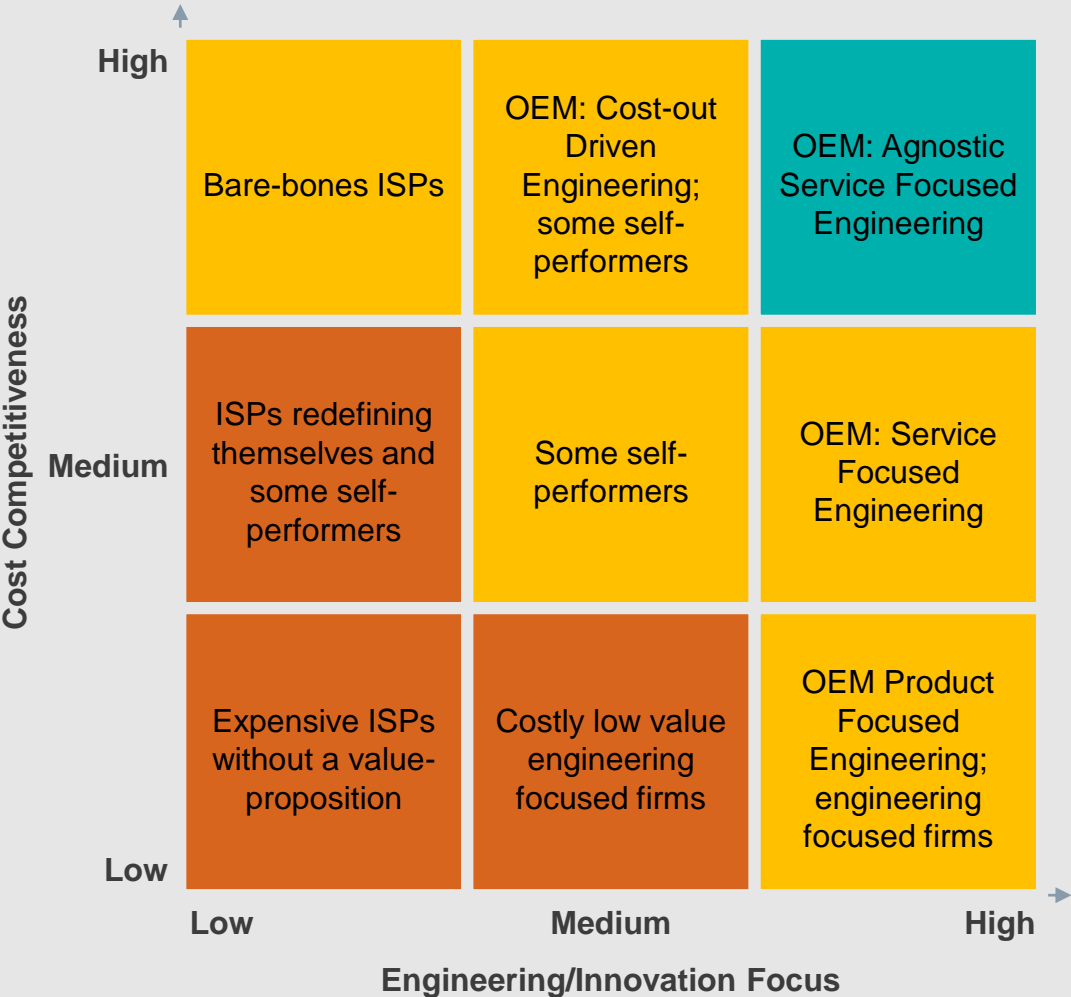


SGRE Multibrand Offering

SIEMENS GAMESA IS A MULTITECHNOLOGY COMPANY!

- SGRE is a culmination of years of mergers & acquisitions most recently between Siemens Wind Power and Gamesa
 - Gamesa entered Wind being a supplier of Vestas
 - Gamesa acquired Made in 2003
 - Siemens purchased Bonus in 2003 and has both Geared and Direct Drive WTGs and became the world leader in offshore

How to differentiate in the crowded wind service market?



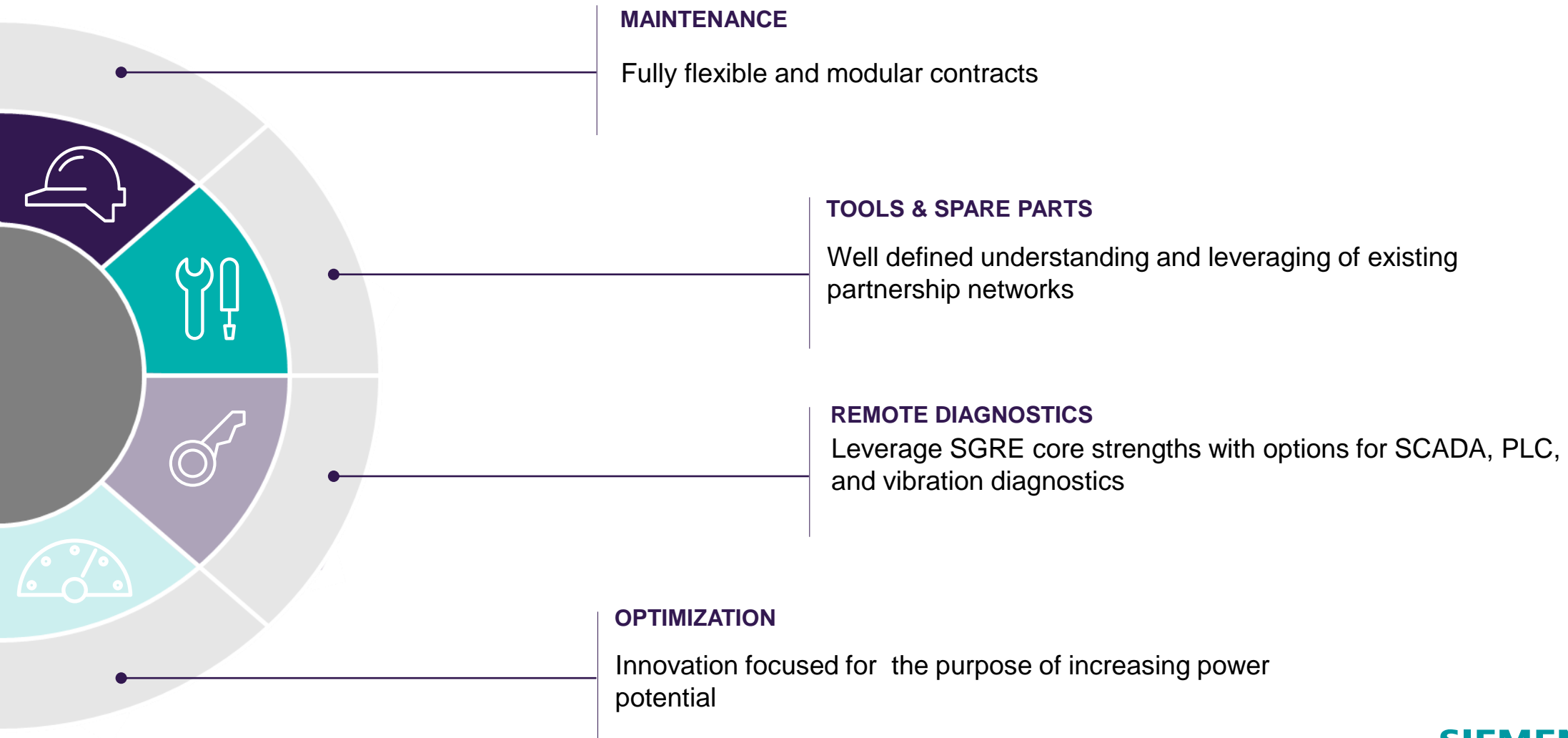


Innovative Engineering is our backbone

Engineering strength drives customer cost-out and value-up

Leveraging the industrial power-house of Siemens A.G, SGRE has developed a strong focus on Big Data & best in class data analytics

Key for owners: Be flexible, leverage core competence, enhance customer business case



SGRE Multibrand Organization

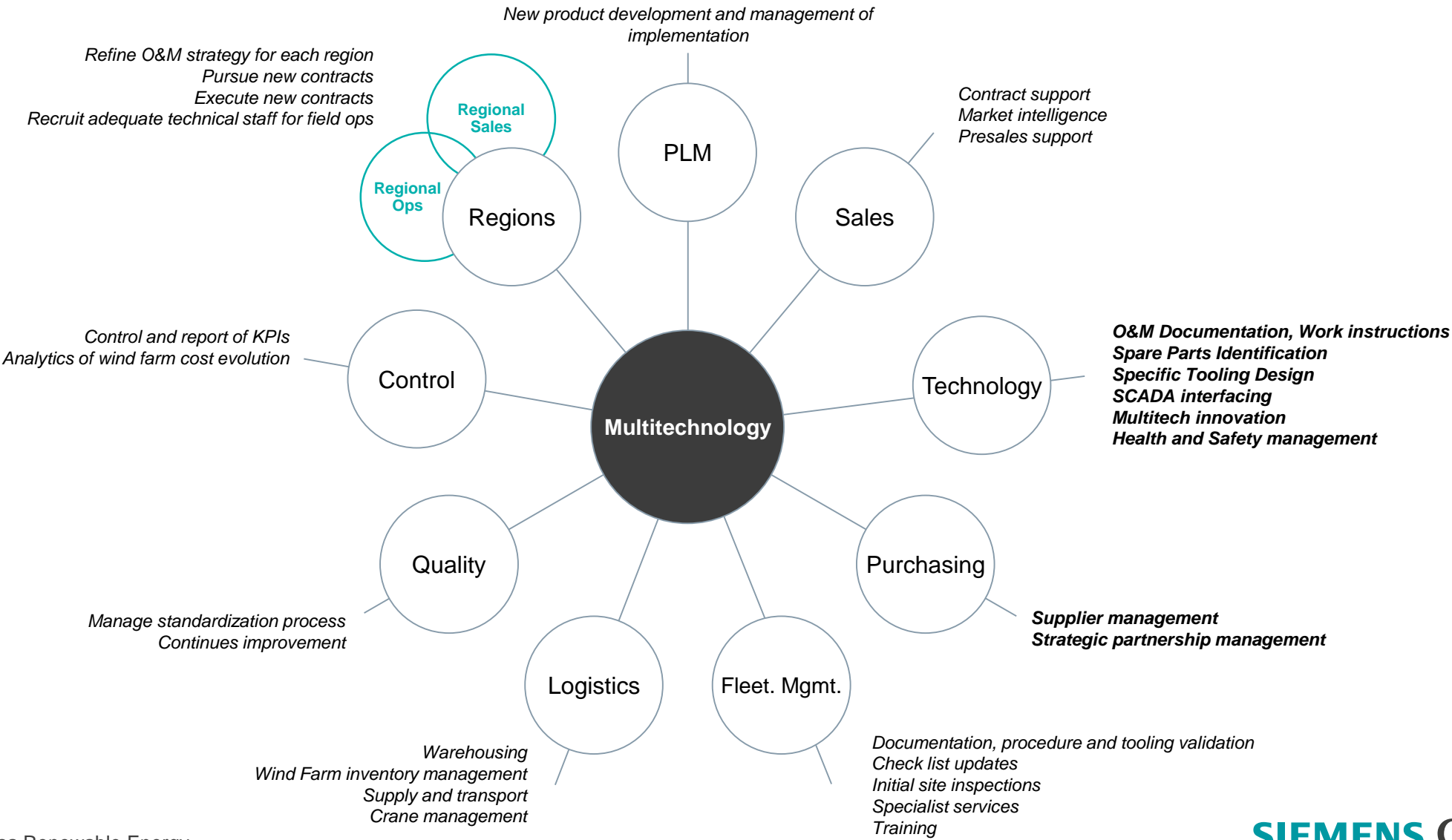
A dedicated multibrand group has both non-SGRE dedicated engineers and leverages the broader organization



Mark Albenze
Service CEO



Multibrand group is built to duplicate Engineering Prowess and Service Excellence



Development Milestones for Selected Technologies

Priority	Action	Resp	Weeks	W0	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14
Development Technical Documentation																		
H	Safe Access Manuals	Technology	4															
H	Master Maintenance Plan	Technology	2															
H	Preventive maintenance TD (Task Descriptions)	Technology	3															
H	Small corrective TD (Task Descriptions)	Technology	8															
H	Large corrective TD (Task Descriptions)	Technology	8															
H	Alarms Manual (Remote operation)	Technology	2															
M	Evaluate safety risks preventive task	H&S																
M	Evaluate safety risks SC and LC task	H&S																
M	Validate Nacelle rescue & evacuation Plan	H&S																
Spare Part availability																		
H	Define Generic RSPL & consumables	Technology	8															
H	Define windfarm RSPL & Strategic Stock	Technology																
H	Update Generic RSPL to a specific site	Technology																
H	Strategy for captive spare parts	Technology	4															
H	Identify suppliers	Purchasing	8															
M	Homologation of components	SQA	2-8															
Small & Large Correctives																		
H	Tooling definition	Technology	12															
H	Procure & Validate Tools Preventive Maintenance	Fleet Mgmt	15															
H	Procure & Validate Tools Small Correctives	Fleet Mgmt	15															
H	Procure & Validate Tools Large Correctives	Fleet Mgmt	15															
H	Identify possible subcontractors O&M, Repairs	Purchasing	4															
L	Develop LC SOLUTIONS (cranelee, uptower repairs,...)	Fleet Mgmt																
SCADA																		
H	Inspection SCADA installed on site.	Technology	1															
M	Scada Integration in Gamesa central systems	Technology	2	once contract is asigned and take over close														
H	Technical documentation for troubleshooting in the park SCADA	Technology	6															
Others																		
H	In situ Technology inspection	Technology	2															
H	In situ Global Op. inspection	Fleet Mgmt	2															
M	PLC Software backup	Technology		once contract is asigned and take over close														
M	CCU Software	Technology		once contract is asigned and take over close														
H	Hire skilled technical staff (former site techs)	Operations		not a developement task														

What do we need to know from the owner

Information requested from client	
Project Data	Client
	Wind Farm Name
	Location
	WTG OEM
	WTG Model
	WTG Version
	Nominal Power
	Nº Turbines
	WF Start Up Date
	Scope requested
	Term
Stock	Client stock available on site (minor & major Components)
	RSPL for the wind farm
	List of spare parts used (last 2 years) (or monthly O&M reports)
WTG Configuration	Tower Height
	DM's installed (high or low temp. Kit,...)
	Manufacturer & Model Gearbox currently installed
	Manufacturer & Model Generator currently installed
	Manufacturer & Model Transformer currently installed
	Manufacturer & Model Blades currently installed
	Manufacturer & Model Switch Gear currently installed
	Manufacturer & Model Climb Assist currently installed
	Manufacturer & Model Elevator currently installed
	Manufacturer & Model Life Line currently installed

Information requested from client	
Software	Manufacturer & Model Converter and its Software
	Manufacturer & Model SCADA
	Manufacturer & Model Pitch (and its Software if electric)
	SCADA Software & Version
	PLC Software & Version
	Software interface available? Is it protected by password and/or dongle?
	Can this password or dongle be provided by owner?
	Other software (Vibration sensors, Yaw Drives,...)
Operational Data	Availability OPC server
	List of large correctives done (per WTG and component)
	List of alarms recorded (last 2 years)
	Historic Technical Availability figures (per month & WTG) indicating reasons for unavailability
	List known defects/malfunction/problems of the WTG
	List known obsolete and captive spare parts
	Target Price

Multibrand Track Record in SGRE

Siemens Gamesa Multi-technology Know-How

- More than 900 turbines under O&M
- 20+ years of experience with multibrand
- Brands: Vestas, Ecotecnia, Nordex, General Electric, Neg Micon, Suzlon, Nordtank, and Acciona
- Support from a State-of-the-Art Diagnostic center with 15+ years of experience
- Several Cooperations in place to support the approach



Multi-Technology wind farms under O&M

AMERICA

+

EUROPE

+

ASIA

=

1.092 MW

- USA
 - Brazil
 - Uruguay
- UK
 - Ireland
 - Italy
 - France
 - Spain
 - Greece
- India

Technologies:



Suzlon projects in Brazil are examples of where we have leveraged our Engineering organization to add concrete customer and project value



Customized service solution based on OEM structure and customer need



Internal documentation and leveraging of supply chain in place



CMS competence applicable today on multi-tech fleet



Third party diagnostics to supplement (NEM)



Software access allows for SGRE innovation to be assessed on Suzlon turbines

Modifications & Upgrades

Maintenance: genuine parts, repairs & upgrade services

SGRE not only provides an easy access to spare parts for the full service life of the project. It also provides sourcing alternatives for its customers through its reconditioning services.

- SGREs' component reconditioning and repair services provides its clients with **an economic alternative to buying new spare parts**.
- SGRE offers expert advice on how to achieve the **optimum balance when choosing between standard repairs and our component life extension services**, by using the latest technological advances and making preventative changes that reduces premature breakdowns.
- SGRE has repair and reconditioning shops in the United States, Mexico, Brazil, Spain, Italy, India and China. This local focus speeds delivery, lowers shipping costs and, ultimately, **reduces the Cost of Energy for the fleet**.
- SGRE's component reconditioning services go beyond Gamesa's own technology to include that **of other manufacturers**. This adaptability makes SGRE a "one-stop shop" alternative for its clients, which facilitates spare parts management and reduces costs.



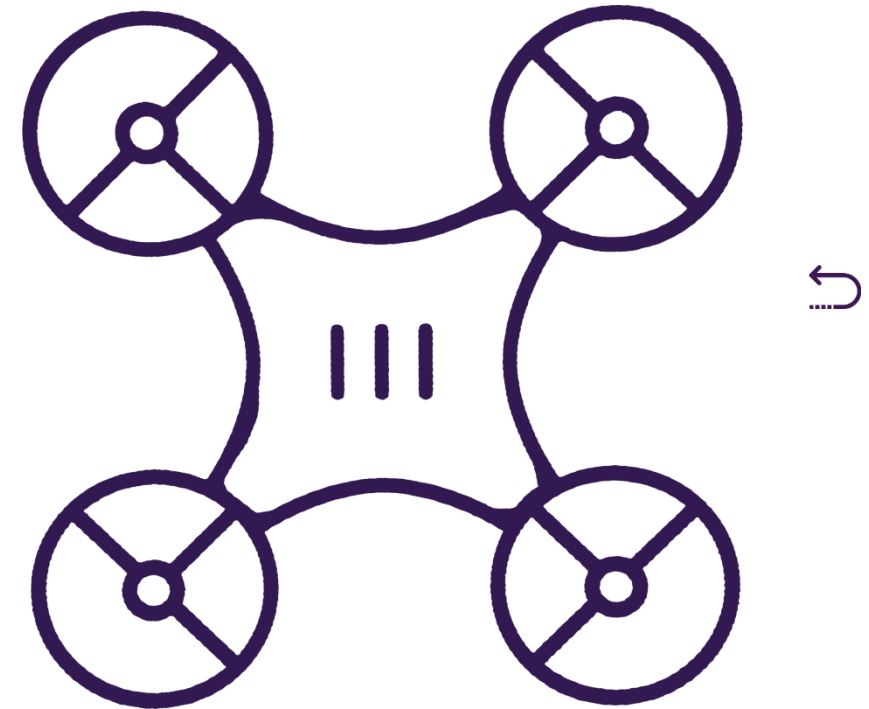
Maintenance: Blade inspection & diagnostics efficiency

Autonomous drones

- Are safe, and much faster than telephoto lens cameras or hanging inspections.
- We capture high-resolution images which are later stitched together to form a virtual replica of the blade. We immediately generate a detailed report providing customers the necessary insights and recommendations to **prioritize the necessary repairs.**

Thanks to our drones technology, do not take any more excessive risk on your blades

- As customers can now have a yearly and holistic view of their blades' fleet, they achieve efficiencies through a control and ensure a better planning of maintenance actions.



Remote Diagnostics Services: Leverage Data Intelligence

Wind turbines are often located in remote areas that are challenging to reach. With remote diagnostics, we can limit service visits to a minimum – and even fix issues remotely – without ever compromising reliability, detecting potential errors before they become serious.

Your benefits

- Reduces downtime and optimizes production by fast remote response.
- Improves onsite first time fix rates by analytics and advices to site.
- Optimizes maintenance strategy, reduce risk and operational expenditure by predictive methods.

Products included

- | | |
|---------------------------|----------------------------------|
| • 24/7 Alarm Notification | • Vibration Diagnostics |
| • 24/7 Alarm Management | • Advanced Vibration Diagnostics |
| • Software Version Update | • Antivirus |
| • Diagnostics Support | • Oil Particle Counter |
| • Turbine Setup Control | • Main Bearing Surveillance |



- **Remote Diagnostics: Proactivity is the smartest response** to prevent developing damage and assure an optimal performance.
- **Turning data into valuable knowledge:** Pythia® diagnostics, an agile platform that allows for digital twins, health checks, optimized spare part forecasts and the early prediction of potential damage up to 3 years in advanced.

Upgrade Energy Production: Power curves improvements

Energy Thrust & Power Boost: Instantaneous increase in production

- **Up to 5%** increase in annual energy production thanks to a turbine performance boost in all ranges of the power curve*
- Improved adaptation to the turbine's location.
- No impact on the components life.
- Energy thrust is available for all platforms until G97. Power boost function is available for SWT-2.3, SWT-3.0 turbines with STC-1 and DD22 and SWT-3.6 turbines.



Power Curve Upgrades

- Up to 5% AEP improvement compared to the original warranted power curve.
- 3 hardware components that improve blades' aerodynamics: Vortex Generators, DinoTail®, DinoShell®
- With a possible noise reduction in some sites.
- Installed at-site or at-factory to increase the lift of blades from different manufacturers.

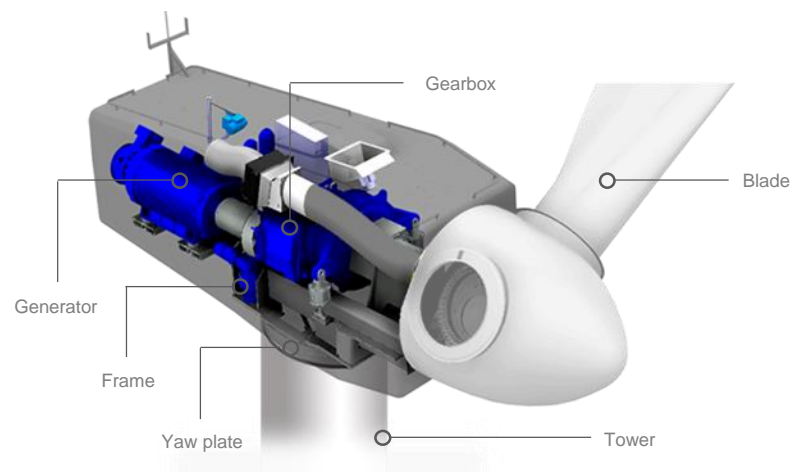
* Including Safe mode, extra power, high wind ride through, yaw optimization.

Upgrade Energy Production: Life Extension

A **stand-out product** that maximizes profitability by defining and applying actions to increase the turbine service life by 10 years. Life Extension is entirely customize based on the project; upgrades are implemented only when necessary, guaranteeing completely safe operational conditions for both personnel and turbine.

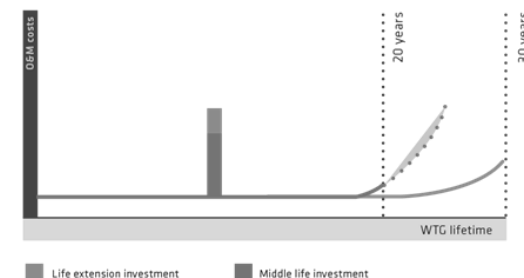
Pioneers in the Life Extension program

- Main component upgrades based on the most advanced technology.
- This program is applicable to Gamesa and Vestas 660 kW turbines (will soon be available for Gamesa 850 kW & 2.0 MW and Siemens platforms).



Risk-free investment

- **10 additional years of revenue** assured through an energy availability guarantee.
- Stabilized and guaranteed O&M costs until year 30 of operations.
- An optimized cash flow that automatically increases asset value.
- **Turbine specific maintenance plan** based on individual inspections and wind farm data analysis.





Any questions?

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Thanks