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ATOMEXPO-2018. 15 MAY. ROUND TABLE “RUSSIA'S OPPORTUNITIES IN NEW POWER GENERATION”

# Contemporary technological solutions

To enable energy transformation

Enver Shulgin, Vice President, Local Division Manager, Robotics and Motion, Russia, Belarus and Central Asia



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# Agenda

Key industry trends

Technological solution to reduce LCOE – gearless generator with permanent magnets

The digital revolution – coming now to utility markets

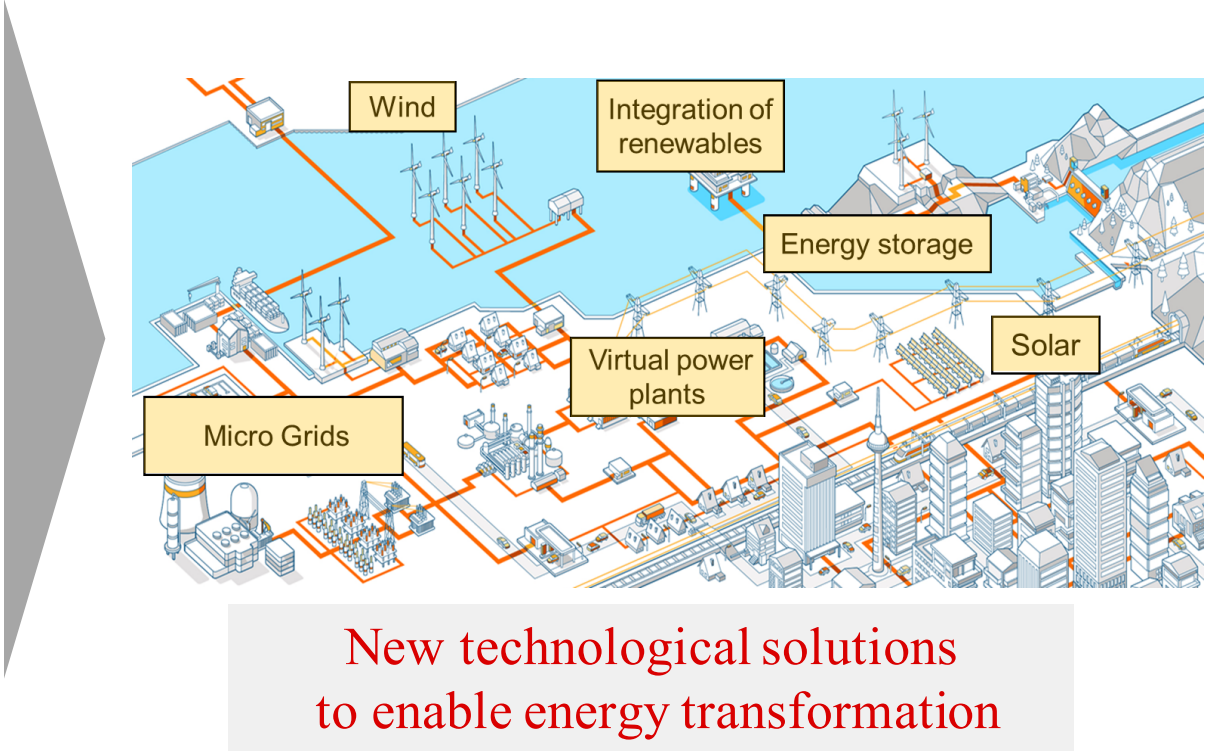
Digital solutions in service

# Key industry trends

More renewables, Decentralization, LCOE reduction and Digital solutions

Industry trends - 2020

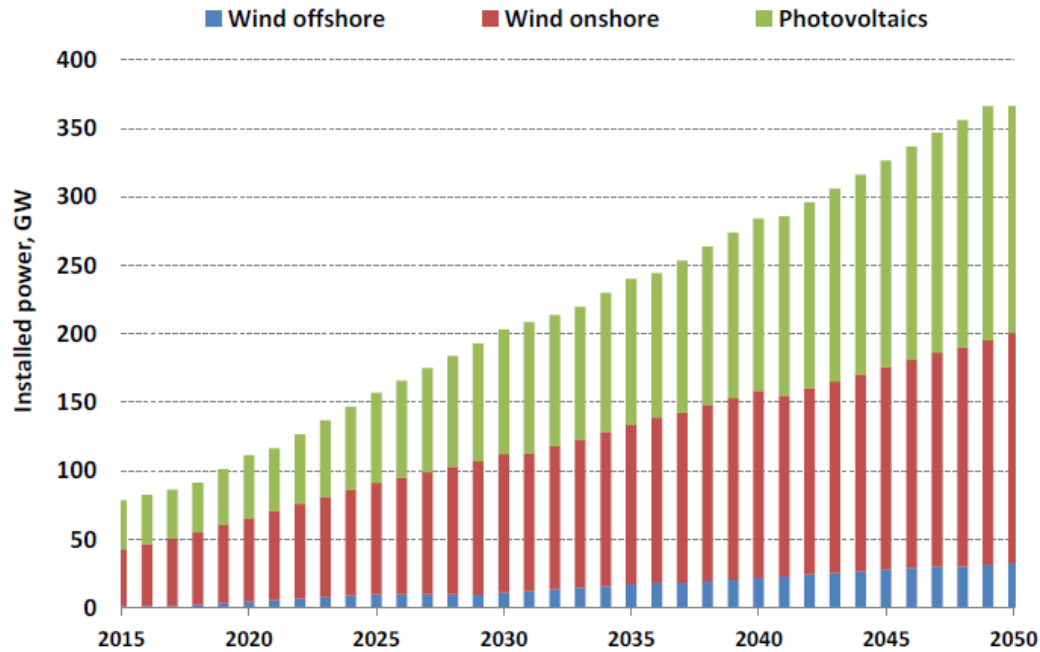
- More renewable energy is needed in main markets
- Decentralization of power generation
- Several mergers between main wind customers
- Reduction of Levelized Cost Of Energy (LCOE) of renewables
- Increase power of on-shore wind turbines up to 4-5 MW
- Development of digital solutions



# Key Industry Trends

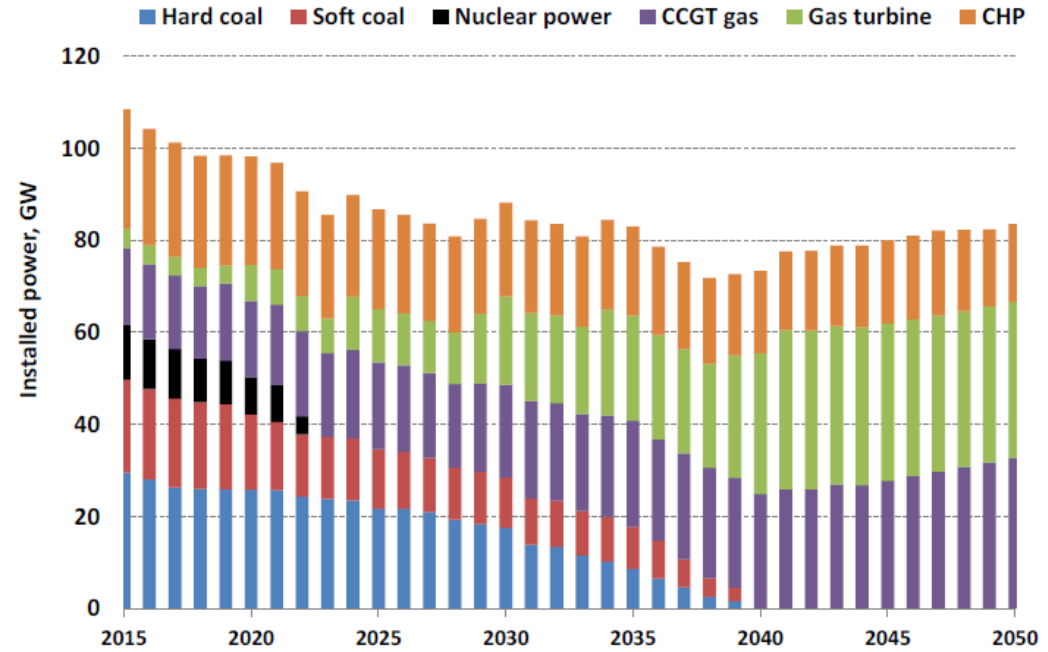
## Reference with power transformation in Germany by 2050

Profile of the total installed power of wind turbines and photovoltaic plants



A mostly constant increase of wind turbines and photovoltaic plants over the entire period

Profile of the installed power of thermal power plants and electrical power of CHP plants.



The installed electric power of thermal power plants and combined heat and power (CHP) plants decreases overall from more than 100 GW to slightly above 80 GW.

# ABB Wind power in a nutshell

## Proven facts about **ABB Wind economy**



**40,000+**

Wind turbines installed around the globe use ABB components



**80+**

ABB Production facilities worldwide



**24/7**

ABB service and support / hotline



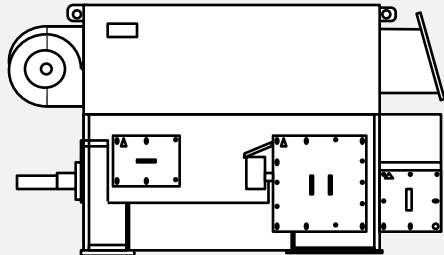
**40+ years**

Of ABB wind power experience



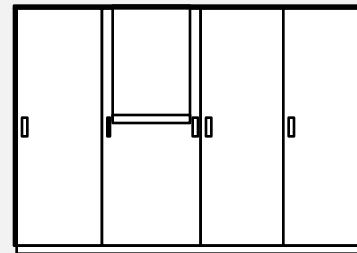
**1 billion**

USD spent in R&D



**35,000**

generators delivered for wind turbines around the world



**50,000**

generators and converters delivered around the world

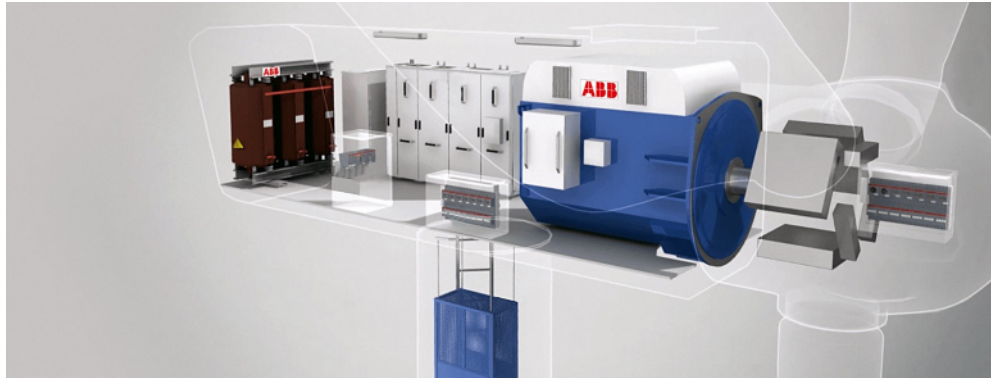
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# Largest supplier of electricals for the wind industry

Grid code compliance and technological leadership

## Wind turbine components

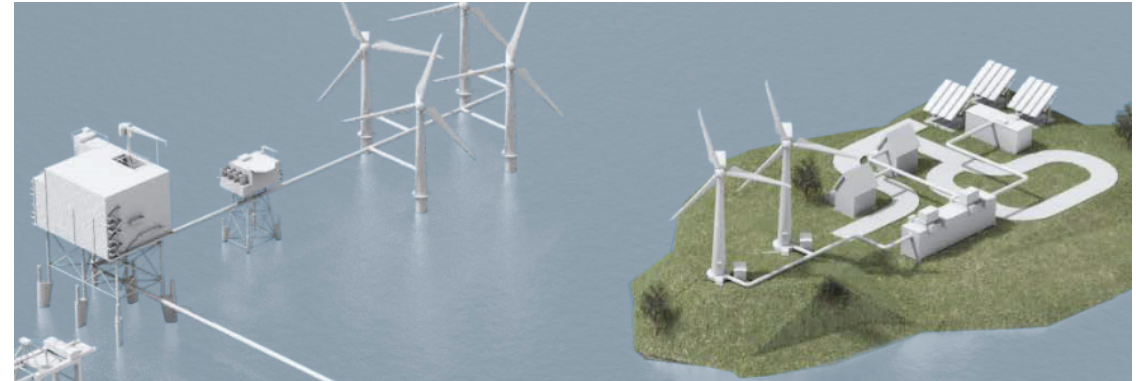
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Generators and Converters  
Transformers, Switchgear  
Control and Protection  
Low voltage products

## Wind park systems

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Turn key substations  
Grid connection, FACTS  
AC and DC cables  
HVDC systems for offshore



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# ABB expertise

## Grid codes

ABB is globally active in grid code and electrical standards working groups.

ABB's fault ride-through laboratory enables grid code compliance testing and simulation.



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# ABB – experienced partner in all main drivetrains

On time and within budget, from design to certification

## ABB has been supporting most large turbine OEMs since the 70's

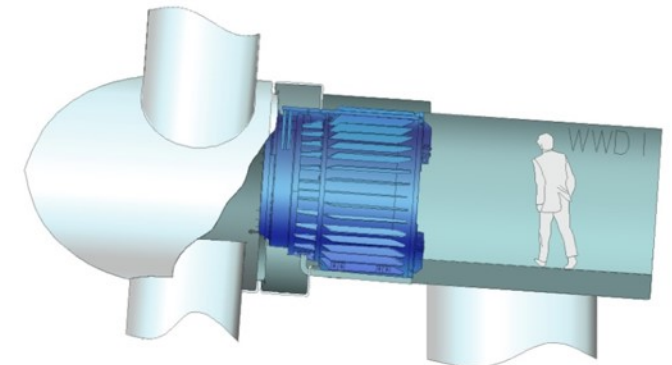
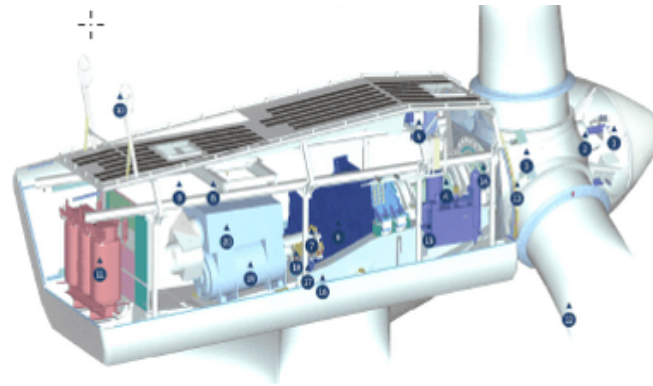
We have proven solutions for all main concepts.

We have the know-how to develop a system in a short time-to-market.

We offer full system compatibility without compromising reliability.

Our experience in certifying bodies enables smooth product approval.

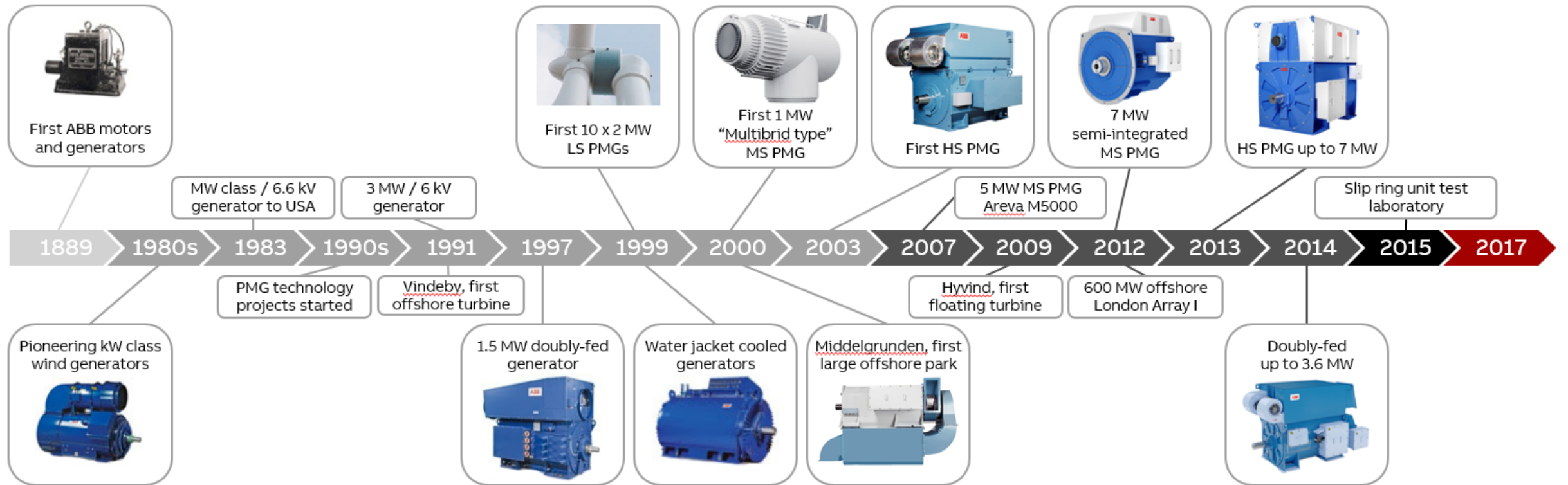
We help our customers to maximize their profitability.





# ABB – pioneering the wind power development

More than three decades of wind technology leadership



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# Products for wind turbines

## Generators

### Leading global generator manufacturer

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- Over 30 years know-how in wind power
- Over 35,000 generators / 30 GWs
- Powers 1 – 8 MW; up to 20 MW
- Leader in PM technology  
1990's
- Manufacturing: EU, USA,  
India, Brazil



### Doubly-fed

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- Standard product platform
- Patented rotor design
- 2.5 kV rotor insulation
- Carbon-fiber winding support
- Overspeed up to 3000 rpm
- Proven slip ring unit

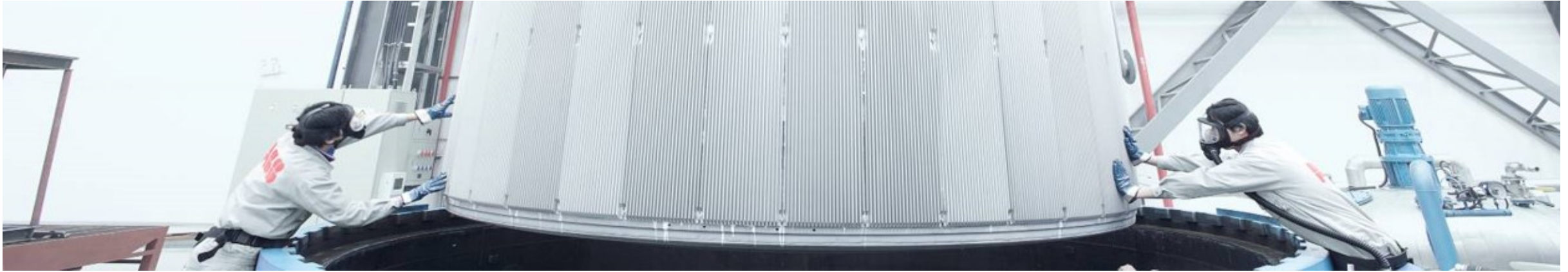
### Full converter

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- Induction and permanent magnet generators
- Low, medium and high speed
- High efficiency at all wind speeds
- Maximum production of kWhs
- High power and small size

# Technology highlights - 20 years know-how in PMGs

DD 1999, Medium-speed 2000 and High-speed 2002



## Magnetic circuit design know-how

- No demagnetization at fault situation

## Optimized magnet geometry

- Highest efficiency and reliability

## Fatigue load resistant design

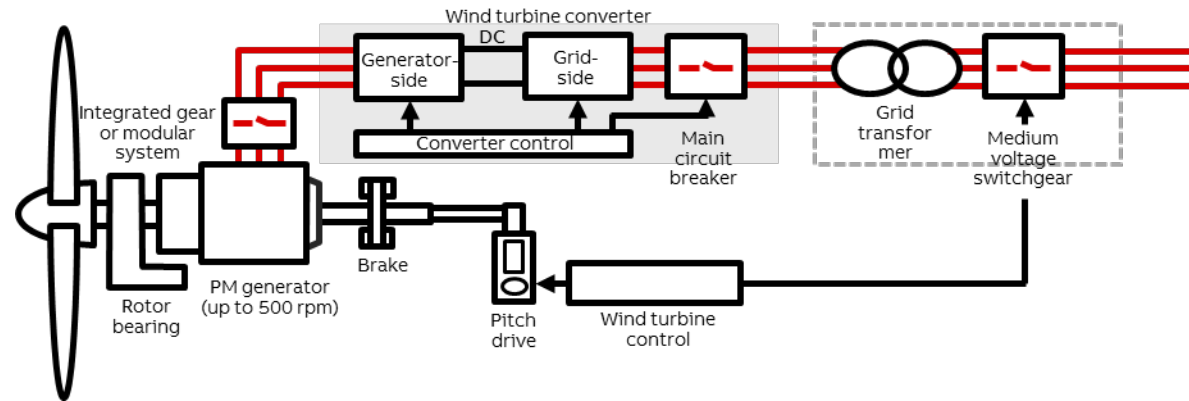
- Reliable fastening of magnets

## Special ABB magnet modules

- Maximum corrosion protection of magnets

## Standard product platforms

- Reliable – cost-efficient – fast delivery



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# Wind power generators

## Product offering

### Permanent magnet, low speed, Direct Drive

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#### Description:

- Speed typically: 3 – 80 rpm
- Multi-pole generator
- Powers from 1.5 MW to 10 MW
- Gearless generator with full converter

#### Advantages:

- All benefits of full converter drive
- Low mechanical wear, low maintenance, no gearbox
- Full speed control

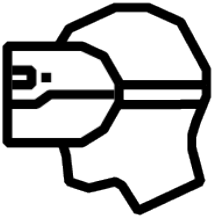


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# Digital technologies are driving new innovation in industrial markets

Media is focused on B2C but the “killer app” is in B2B

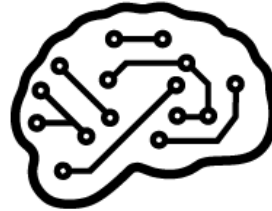
Virtual/augmented reality



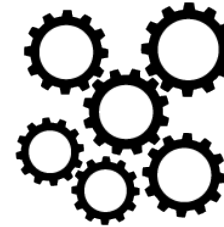
Software-defined machines



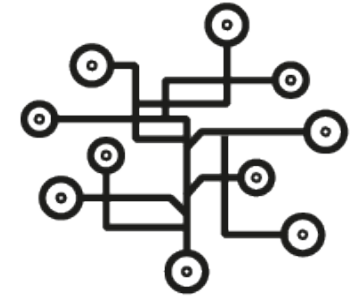
Machine learning



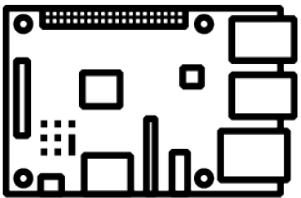
Time-sensitive networking



Big data



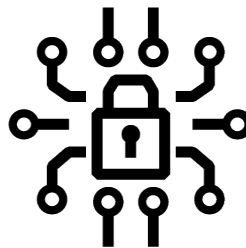
Inexpensive computing



Cloud computing



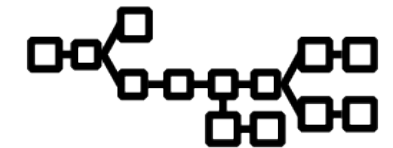
Cybersecurity



Connectivity



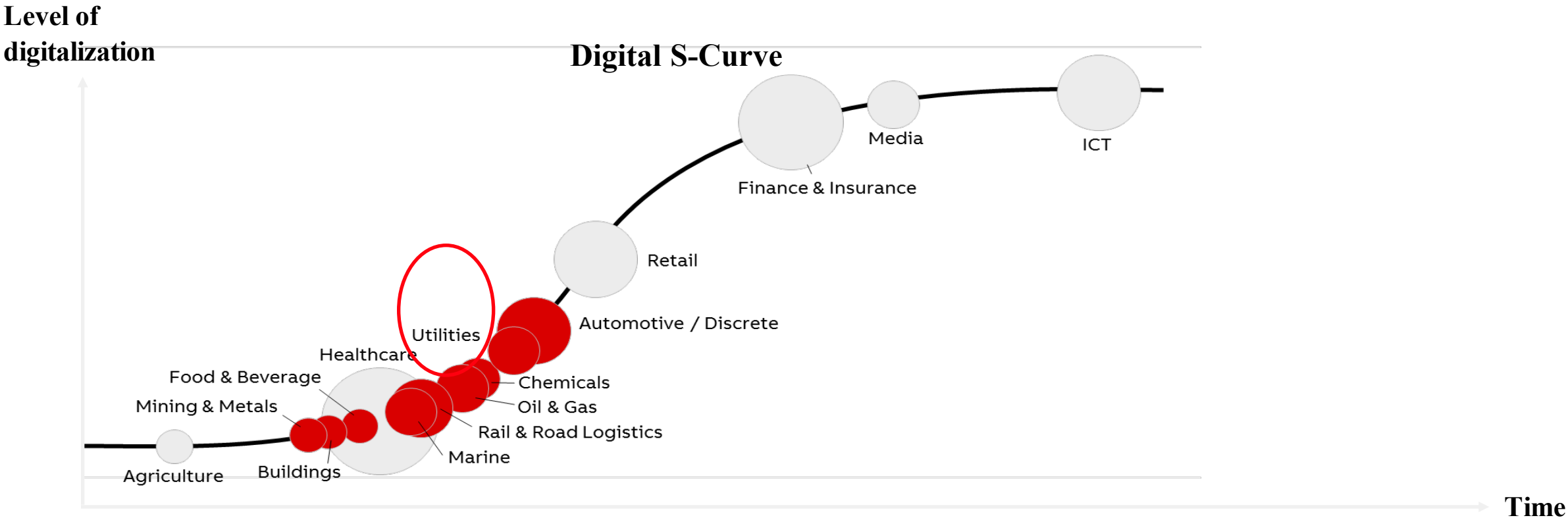
Blockchain





# Utilities adopt digital technologies

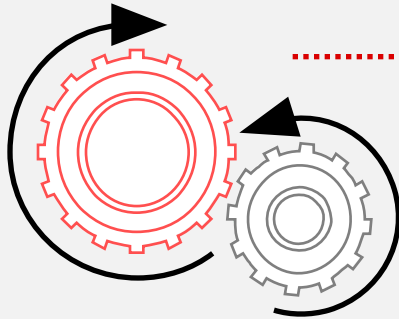
Computing + connectivity + cloud + analytics set to unlock value



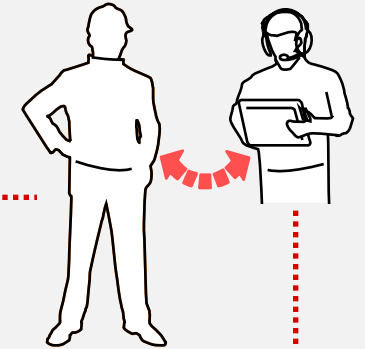
# ABB Global service and support network

Reduced installation time (-40%), maintenance costs (-50%) and outage time (-50%) with local expertise

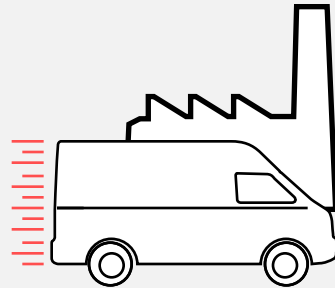
Your **service needs** are **unique** and critical to your business



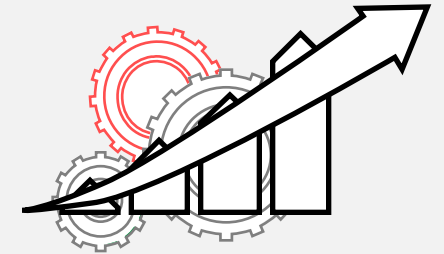
That's why we've developed a **global service network**...



... that help ensure your service needs are **met fast**...



...with **local** service teams that **speak your language**...



... that help keep your **production running!**

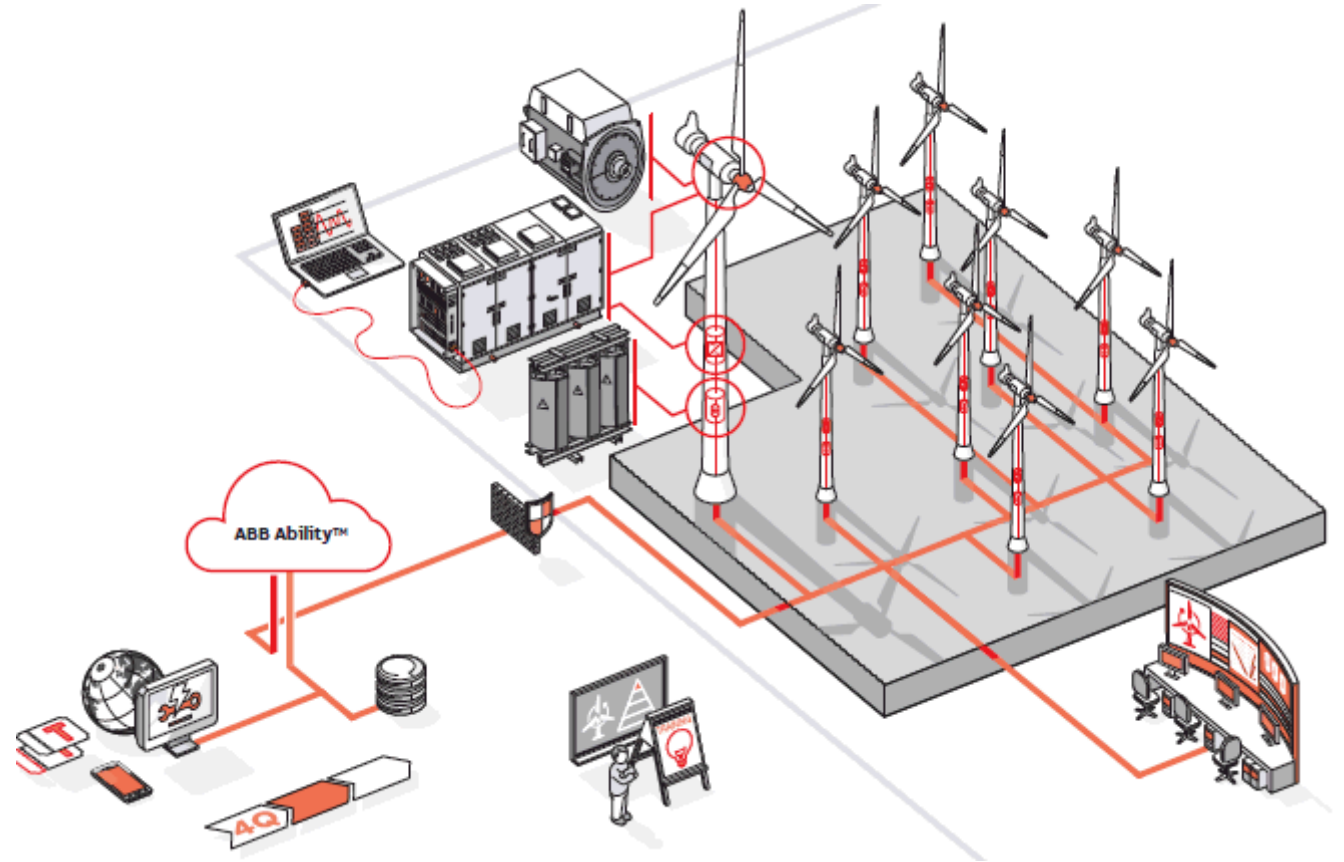
# ABB Ability™ - Digital solutions for wind farms

Minimize downtime, optimize costs and reduce LCOE

**ABB Ability™ - Condition monitoring** and visualization of data on operation of wind farm that gives operator information in an intuitive, easy to understand format. Operators receive email alerts and automated reports enabling them to respond in a timely manner when a potential problem is detected.

**ABB Ability™ – Remote assistance** by technical support team, providing quick access to effective solutions 24/7.

**ABB Ability™ – Predictive maintenance** based on automated analysis and expert estimation of various factors and operational data, providing optimization of maintenance schedule, reduction of idle time and improved overall performance.



# Global service network



**AABB**