



MARCH 2017

ABB Power Quality Seminar

Introduction

Kurt Schipman, Global Marketing and Sales Manager Capacitors and Filters

ABB Power Quality Seminar Agenda

1. Welcome / Thank you /Expectations
2. Introduction to ABB
3. Introduction to ABB Capacitors and Filters products and solutions
4. Technical review of Capacitor and Filters products and solutions
5. Glance at the future: Power Electronics in HVDC, FACTS and Energy Storage systems

A global leader in power and automation technologies

Leading market positions in main businesses



120,000 employees in about 100 countries

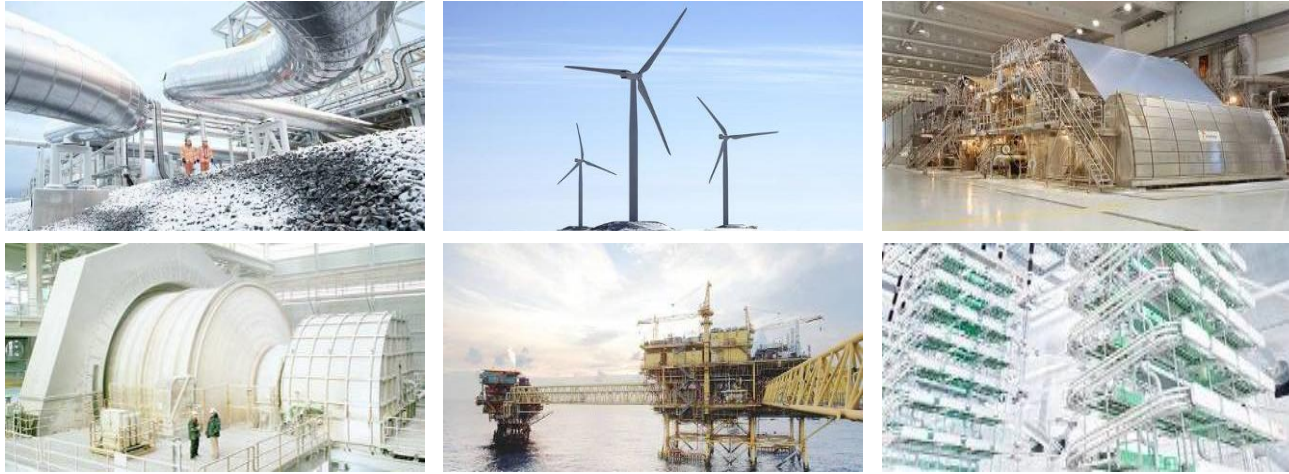
Formed in 1988 merger of Swiss and Swedish engineering companies

Predecessors founded in 1883 and 1891

Publicly owned company with head office in Switzerland



Power and productivity for a better world ABB's vision



As one of the world's leading engineering companies, we help our customers to use electrical power efficiently, to increase industrial productivity and to lower environmental impact in a sustainable way.

How ABB is organized

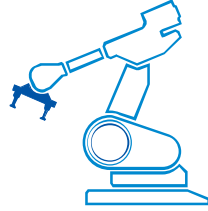
Four divisions



Electrification
Products

42,000
Employees worldwide

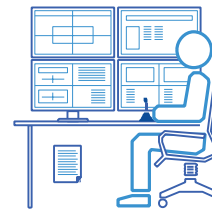
Electrification Products delivers products and systems designed to connect, protect and control electrical systems, ensuring reliability, efficiency and safety for your equipment and personnel.



Robotics and
Motion

30,000
Employees worldwide

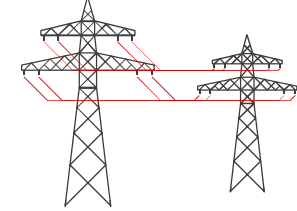
Discrete Automation and Motion products, systems and services help improve efficiency and reliability throughout the energy value chain.



Industrial
Automation

24,000
Employees worldwide

Process Automation products, systems and services help optimize operations and processes across the energy value chain.



Power Grids

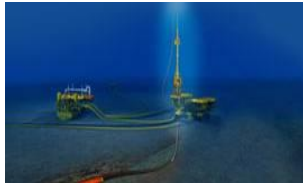
39,000
Employees worldwide

Power Grids helps improve efficiency and reliability throughout the power value chain from generation to transmission and distribution.

You will find ABB technology everywhere...



orbiting the earth and working beneath it,



crossing oceans and on the sea bed,



in the fields that grow our crops and
packing the food we eat,



on the trains we ride and in the facilities
that process our water,



in the plants that generate our power and
throughout our homes.

Tackling society's challenges on path to low-carbon era

Helping customers do more using less

Forecast rise in electricity consumption by 2030
Source: IEA, World Energy Outlook 2008

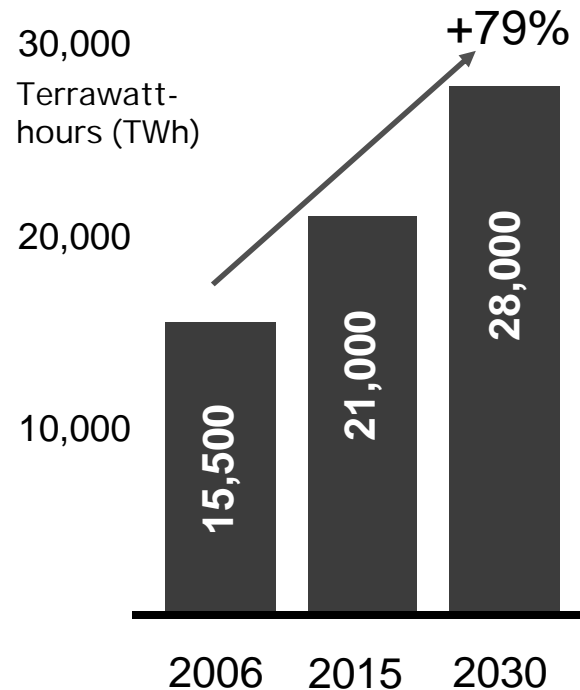


ABB products and solutions are:

- Meeting rising demand for electricity
- Increasing energy efficiency and reducing CO₂ emissions
- Improving productivity to raise competitiveness of businesses and utilities

Improving capacity, reliability and efficiency in the grid

A pioneer in smart technologies



Challenge

- **China:** deliver 6,400 MW of hydropower over 2,000 km

ABB solution

- Transmission at ultrahigh voltage
- Minimal losses with direct current solution



- **India:** Improve reliability in grid serving 53 million people in Karnataka

- Network management with real-time control
- Key building block for smart grid

Renewable energy

ABB supports renewable energy solutions



Generation and transmission solutions for:

- Hydro
- Wind
- Solar
- Wave

Project examples

- Three Gorges Dam (China)
- Totana solar (Spain)
- Pelamis wave energy (Portugal)

ABB scope

- Grid connection
- Transformers
- Turnkey execution
- Customized generators

Boosting productivity and energy efficiency

Example: Stora Enso, world's biggest paper maker



Skoghall mill, Sweden:

- No. 1 maker of board for drink cartons

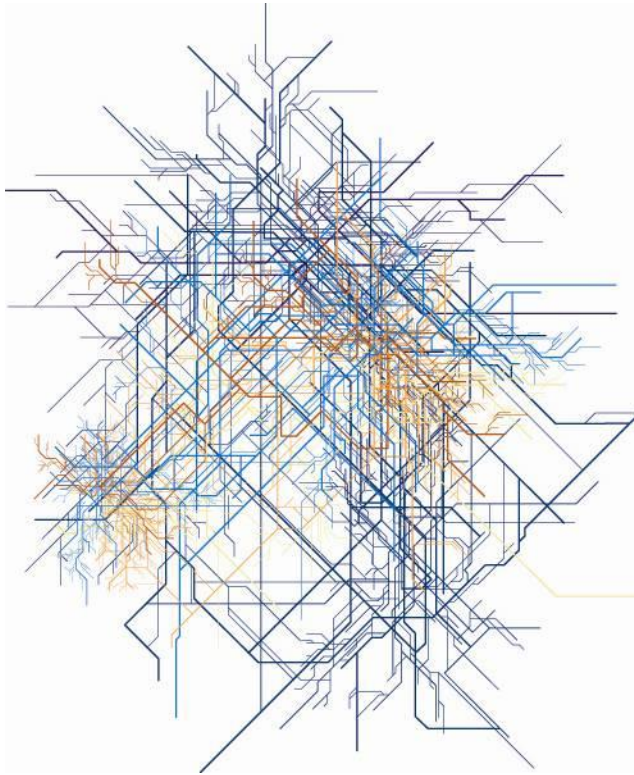
Two-year revamp boosted productivity and cut CO₂ by 170,000 tons/year

ABB provided key control systems:

- For boiler, collecting and analyzing data on pressure, flow, temperature, etc. from thousands of instruments
- For total control over power supply with real-time data

Leading power system's biggest-ever transformation

Smarter, greener grid for more efficiency and reliability



Merging power and automation technologies makes electricity network more reliable, flexible, secure and efficient. Smart grid benefits include:

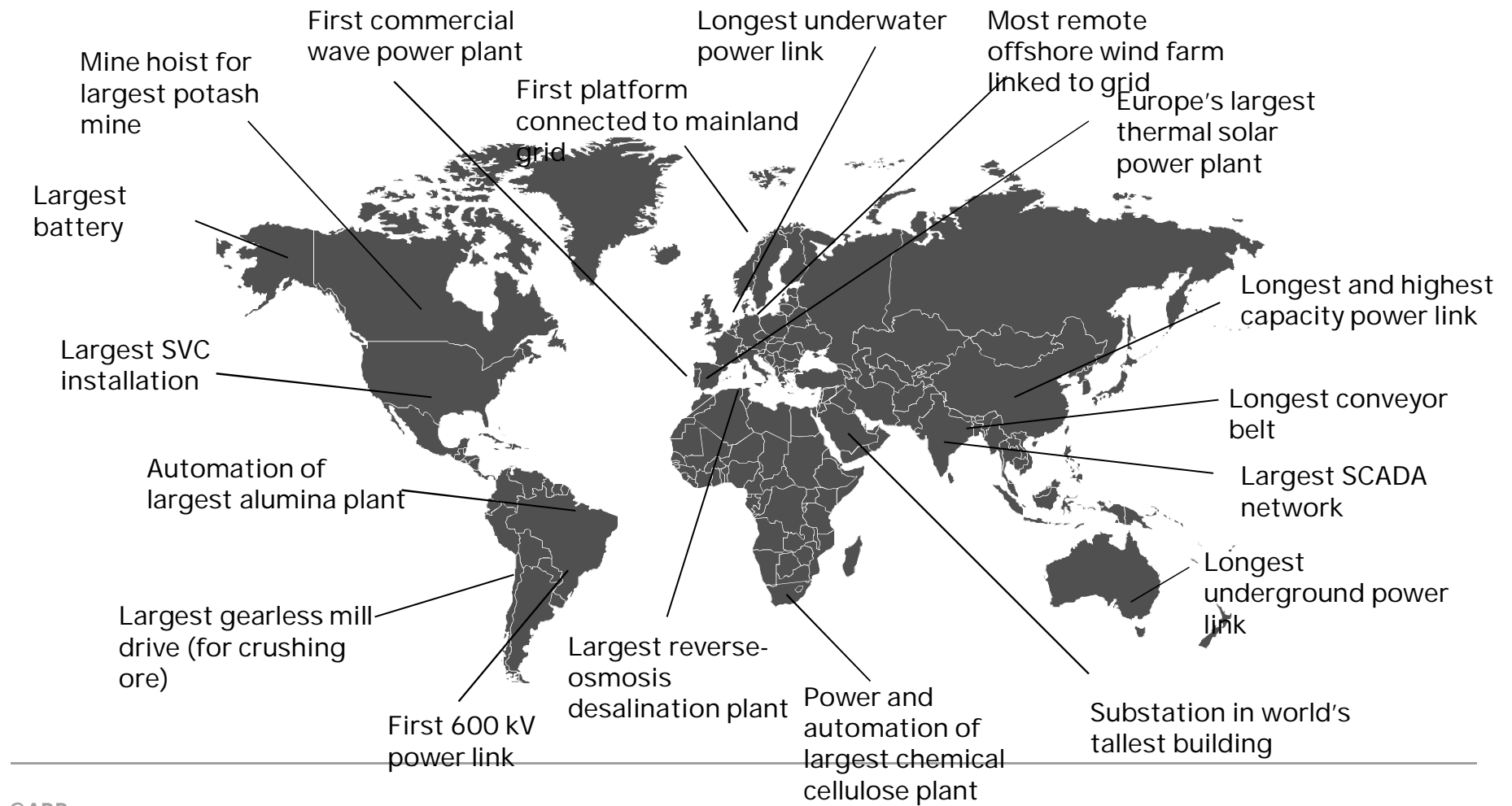
- Lower power consumption
- Greater use of renewable energy

ABB's broad offering in both power and automation technologies positions it uniquely to support this evolution

Transformation of grid to take place over several decades

Ground-breaking and nation-building projects

Pushing the boundaries of technology



Shaping the world we know today through innovation

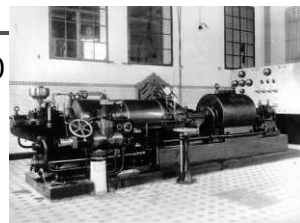
Pioneering technology since 1883

Founding fathers



1900

Steam turbine



1920

Turbochargers



1930

Gas turbine



1940



Industrial robot

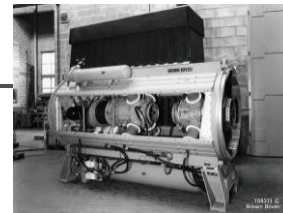


1980

Variable-speed motor drives



Gas-insulated switchgear



1970

Gearless motor



1960

HVDC



1950

Electric



1990

2000

Extended control systems



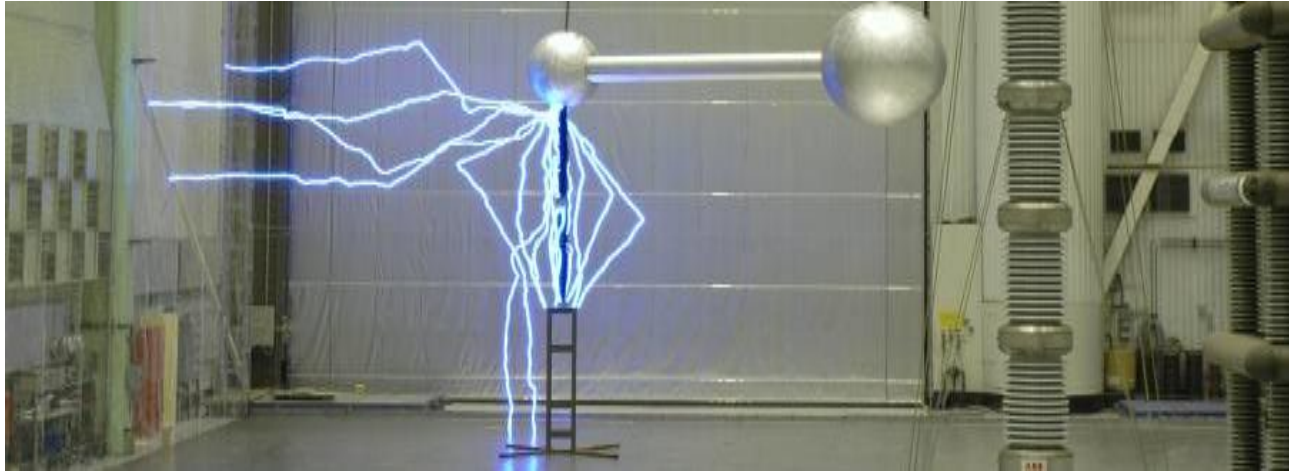
Ultrahigh voltage



Innovation is key to ABB's competitive advantage

Leadership built on consistent R&D investment

* Comprises non-order related R&D and order-related development



More than \$1 billion invested annually in R&D*

6,000 scientists and engineers

Collaboration with 70 universities

- Tsinghua (China), KTH Royal Institute of Technology (Sweden), Indian Institute of Science (Bangalore), ETH (Switzerland), Karlsruhe (Germany)

People make the difference

The best want to work in a first-class environment



ABB is one of the world's most global companies

A culture of openness, flexibility and inclusiveness helps to attract top performers

ABB strives for excellence in personal development, operational execution, health and safety, business ethics

A Group-wide staff development program aims to bring a culture of leadership to every level of the organization

Committed to the highest standards of business ethics Integrity as bedrock of ABB's global culture

“Whatever change may be going on in the world around us, one thing remains unchanged: ABB's commitment to maintain the highest standards of business ethics and integrity.”

Code of Conduct defines relationships with all stakeholders

Employees acknowledge Code of Conduct and take compulsory training courses

- Zero tolerance toward violations
- Several reporting options in place for employees to report suspected violations; each report thoroughly investigated

Power Quality offering from ABB

Defining Power Quality

Definition

A quantifiable measure signifying availability, quality and efficiency of the power being utilized and supplied

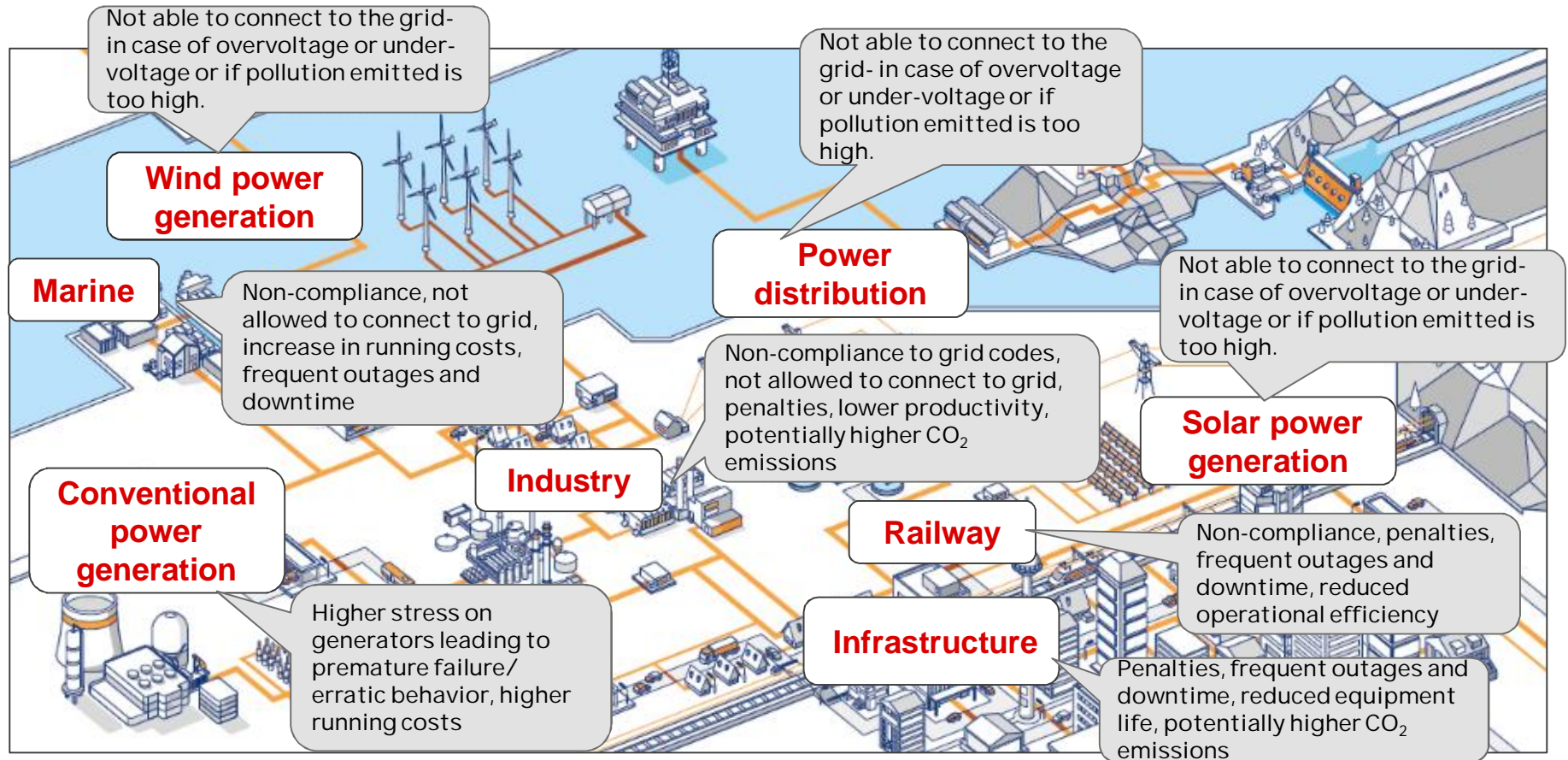
Benefits of good Power Quality include:

- Supply network reliability and availability
- Energy efficiency
- Industrial productivity
- Eco-efficiency/ lower environment impact



Power Quality offering from ABB

Consequences of poor power quality



Reasons for investing in Power Quality

Poor Power Quality costs

Sector	Financial loss per incident
Semi-conductors production(*)	3 800 000 €
Financial trade(*)	6 000 000 € per hour
Computer center(*)	750 000 €
Telecommunication(*)	30 000 € per minute
Steel industry(*)	350 000 €
Glass industry(*)	250 000 €
Offshore platforms	250 000 € per day
Dredging/land reclamation	50 000 – 250 000 € per day



Poor Power Quality:

- Reactive power
- Harmonics
- Load imbalance

That ultimately results in down-time and high running costs

Reasons for investing in Power Quality

Examples of impact of harmonics

	Losses/ year	CO ₂ emissions/year
Small/medium transformers	3000 €	30 T
Large transformers	10 000 €	100 T
LV cables (per 100 m)	1500 €	15 T
Motors	10% additional losses	10% additional emissions



Reasons for investing in Power Quality

Your benefits of having good Power Quality

- Reduction of technical problems
- Compliance with (utility) regulations
- Increasing the production efficiency
- Rendering your installation more environmental friendly



Poor Power Quality:

- Reactive power
- Harmonics
- Load imbalance

That ultimately results in down-time and high running costs

Power Quality offering from ABB

Value proposition: Ensuring stronger, smarter, greener grids



Stronger
Enhancing grid / power network reliability

Industrial productivity
– Increase in plant capacity due to reduced equipment failure and downtime

Smarter
Efficient power for a sustainable world

Industrial productivity
– Increased network reliability and energy efficiency

Greener
Energy efficiency
– Due to lower network losses

Eco-efficiency
– Due to lower carbon emissions

Improved power quality leads to stronger, smarter and greener power networks for power generation, transmission, distribution, industries and infrastructure projects

Capacitors and filters offering from ABB

Our vision and mission

Vision

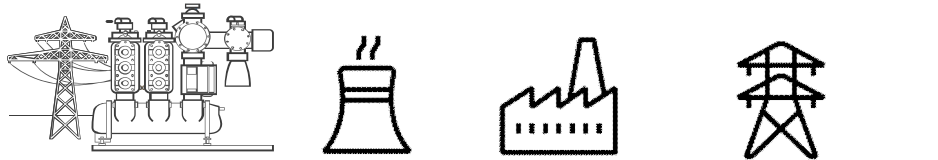


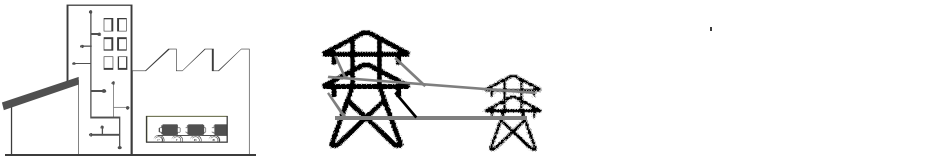


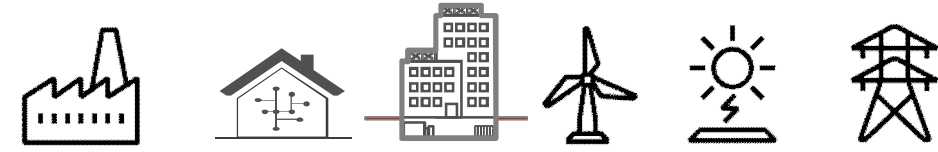





Be recognized as the leading supplier of power quality solutions, focusing on filtering and reactive power compensation

Mission

Provide value to customers by presenting them with the right power quality solutions and products for their applications



Capacitors and filtering offering from ABB Products for all voltage levels and segments

220- 800 kV		 
40- 130 kV		 
12- 36 kV		 
0.2- 1 kV		 

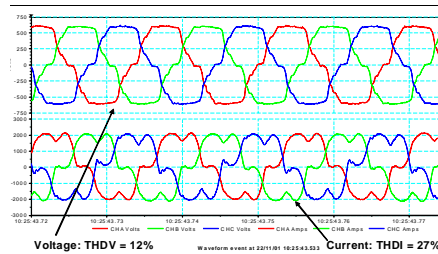
Capacitors and filtering offering from ABB

Offering what the customers need

Measurement



Analysis



Solution



Products



Service



Training



Capacitors and filtering offering from ABB

Complete portfolio




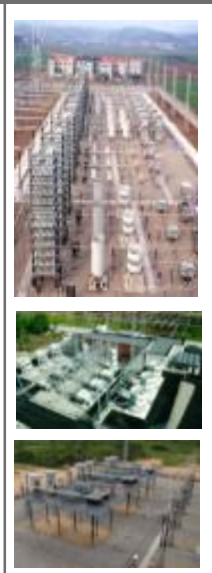





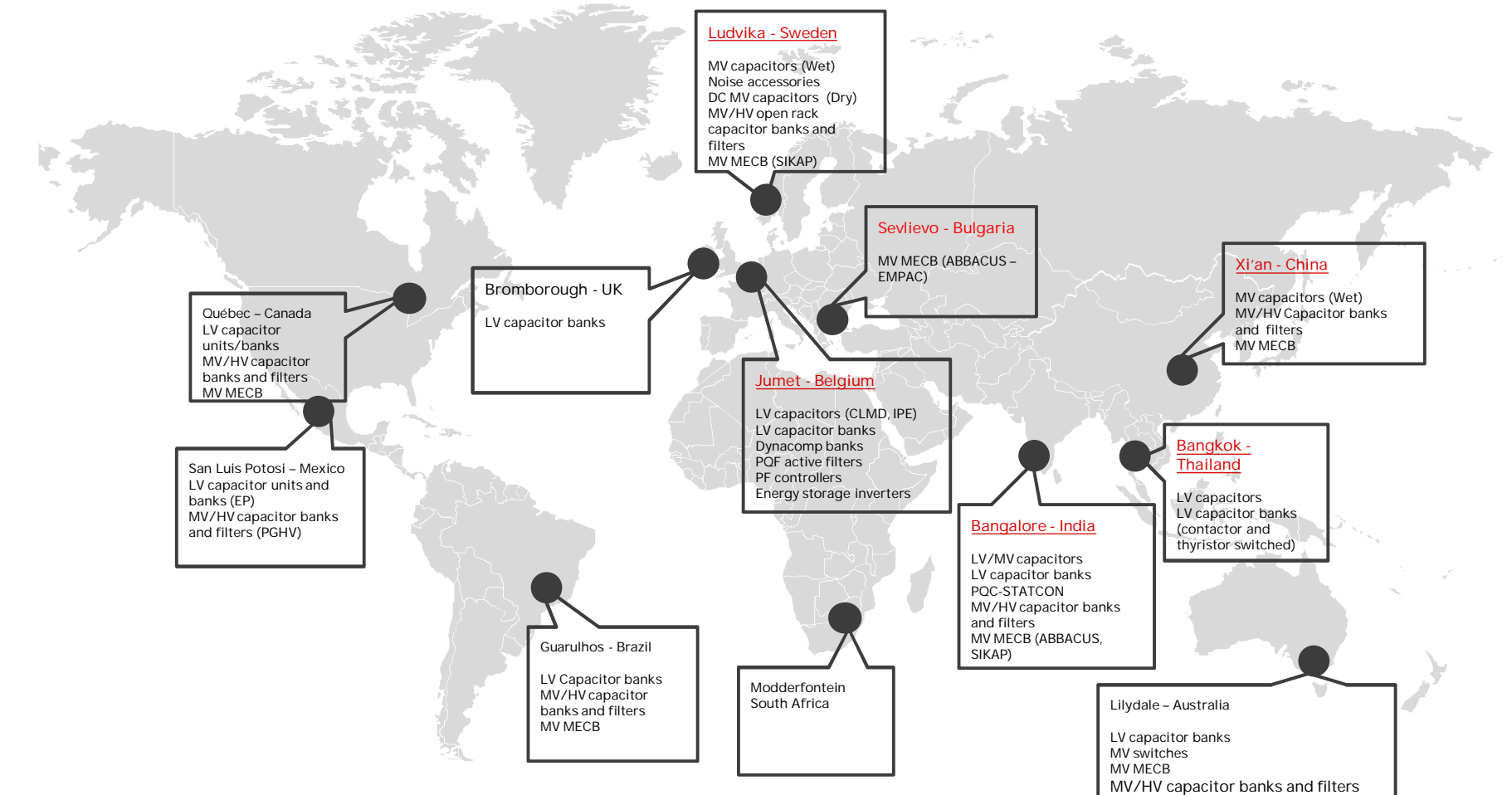
Capacitor units for MV and HV	MV/HV shunt banks-open type	MV shunt banks-metal enclosed	Capacitor solutions in HVDC and FACTS	Capacitor units and banks for LV	LV dynamic compensation	LV active filters	Capacitor accessories
						 <p style="text-align: center;">Energy storage solutions</p> 	

ABB Capacitors and Filters organisation

Organised to be close to the customer with Global Quality



—
Next...

Technical sessions...

—

ABB