



ASIA CLEAN ENERGY FORUM, MANILA

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Power Systems of the future - Grid Edge Technologies

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ABB today

Two clear value propositions

Bringing electricity from any power plant to any plug

Automating industries from natural resources to finished products

Partner of choice for...



... a stronger, smarter and greener grid

#1



... electrification of all consumption points

#2



... perfection in automation

#2



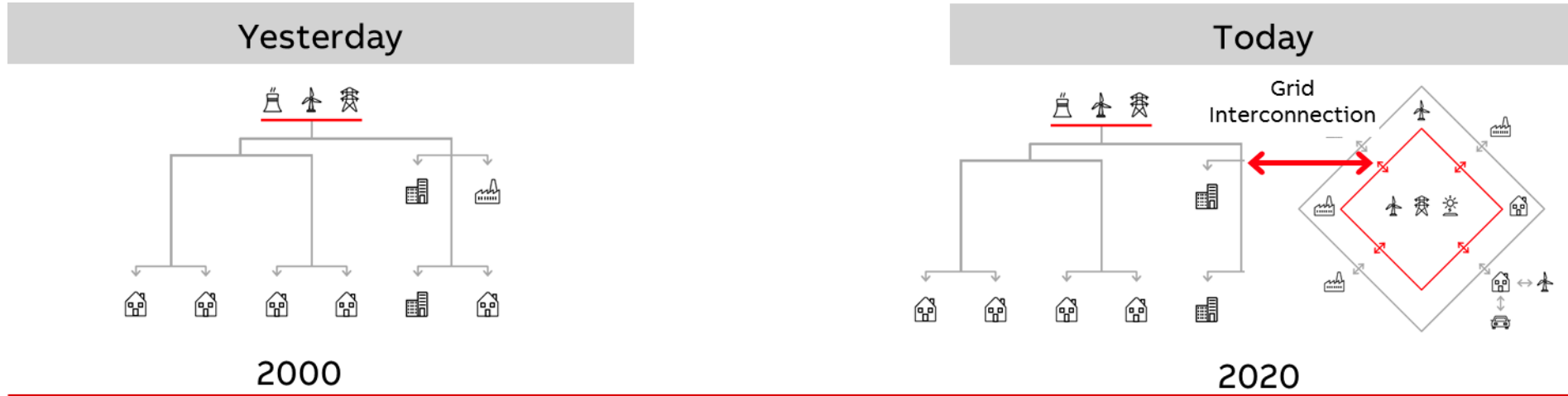
... robotics and intelligent motion solutions

#1 motion

#2 robotics

Grid Evolution

Today and in the near future



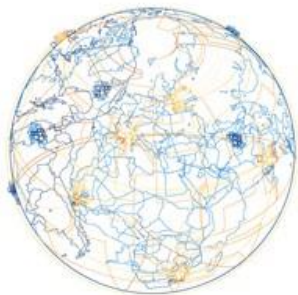
Factors:

- Global warming – ecological threats
- Stimulated, regional introduction of renewables
- Exponential reduction of photovoltaics & battery storage costs
- Consumer to Prosumer development
- Digitalization trend
- Interconnection technology development

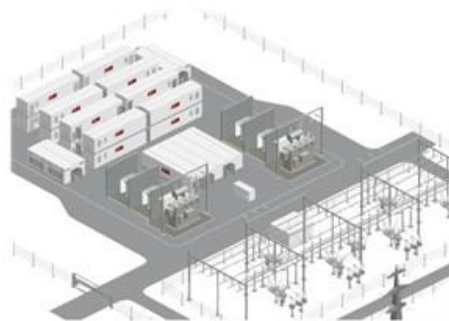
Power systems of the future

Elements of the evolving grid

Grid interconnection



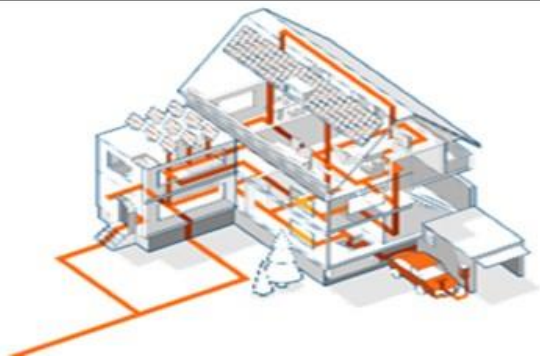
Energy storage



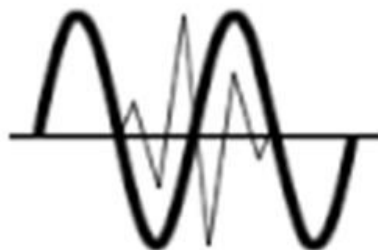
Digitalization



Distributed Energy & Microgrids



Power quality



Partnering & planning, business models

stem

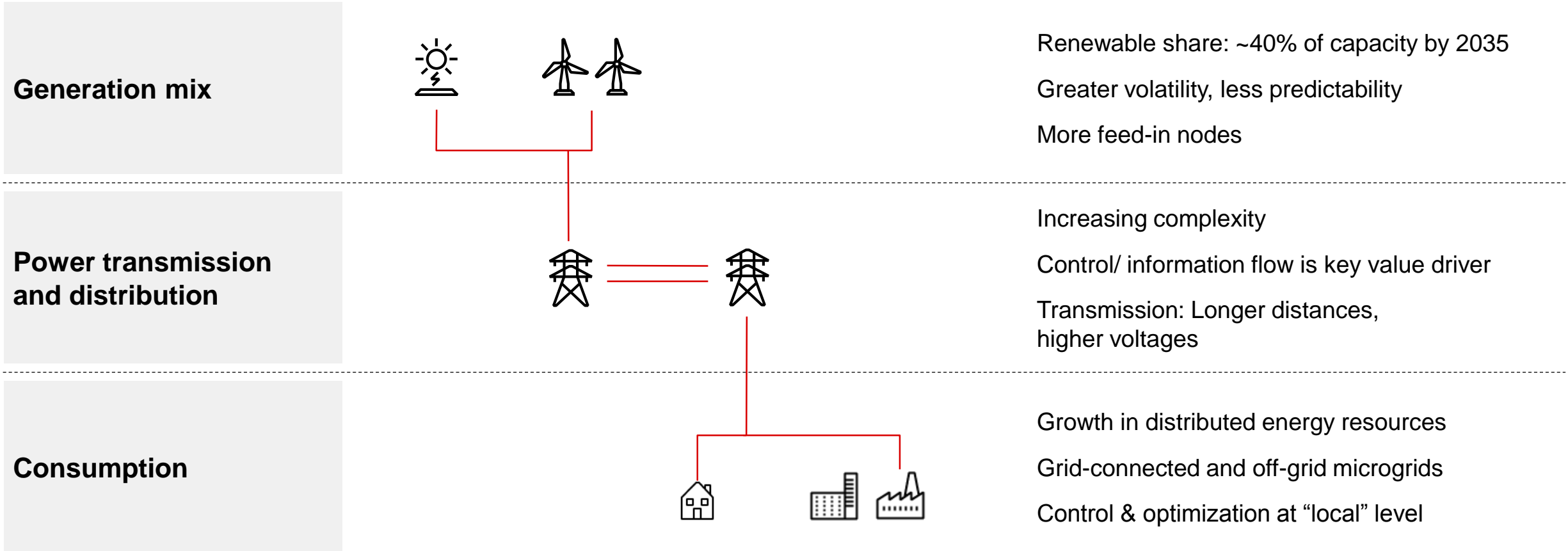
enbala
POWER NETWORKS

NEXT
KRAFTWERKE

Utilities & **ABB**

Power systems of the future

Global trend – Big shift in the electrical value chain



Power Systems of the future

Grid Interconnection

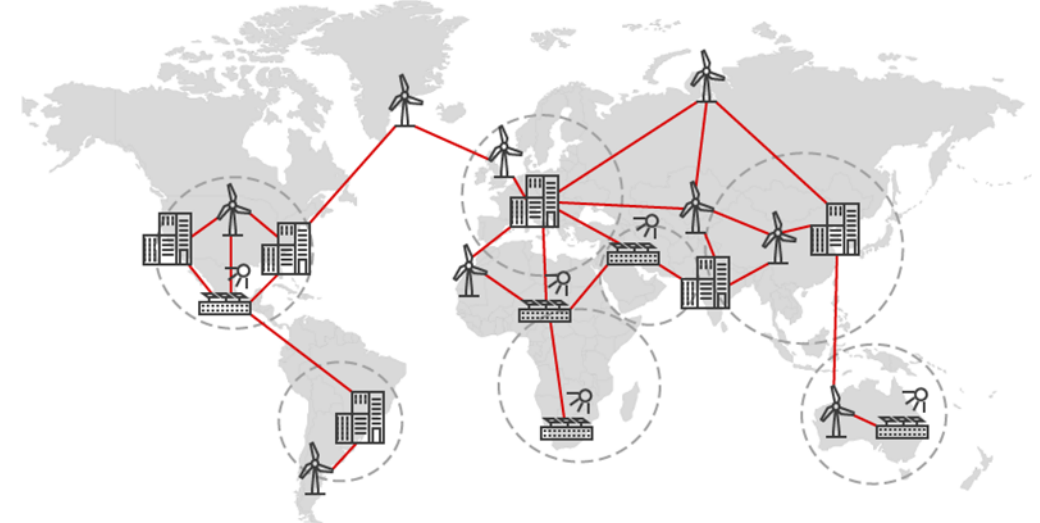
Opportunities

- Renewable integration across regions
- Optimal use of reserve and peaking capacities
- Diversification of electricity supply
- Reduction of wholesale electricity price volatility
- Strengthening grid operation in case of fault conditions
- Increase capacity utilization factor of conventional generation

Challenges

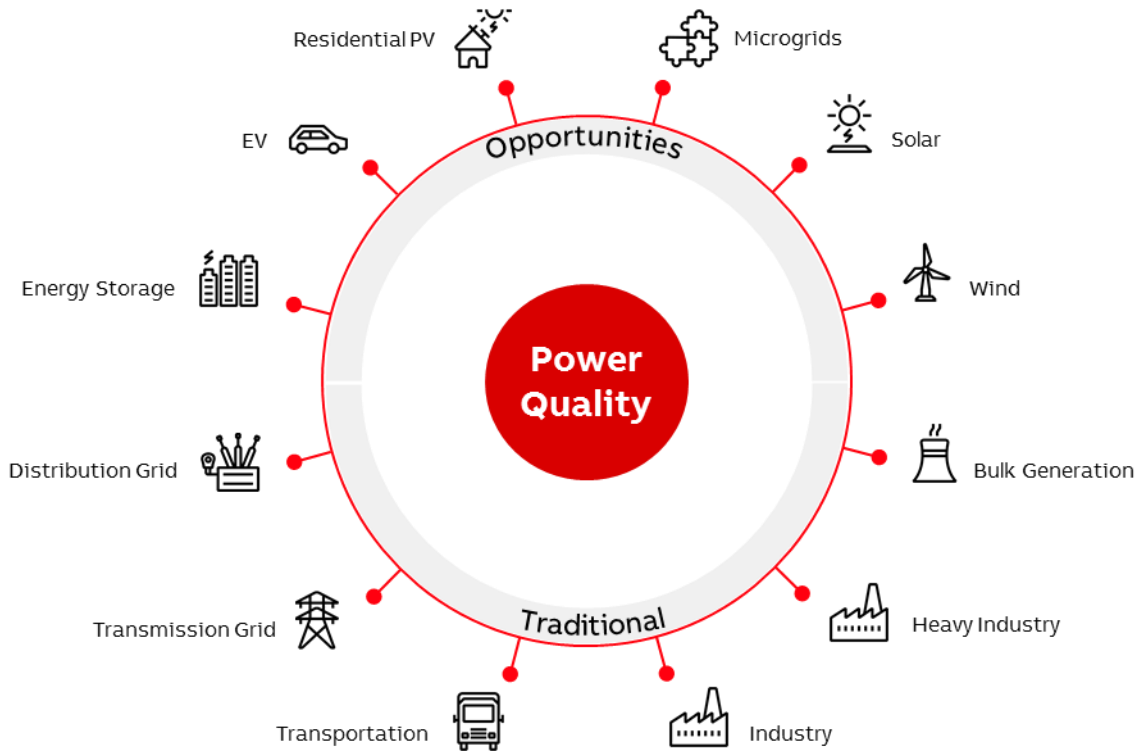
- Political factors
- Economic framework
- Technological capabilities
- Coordinated operation (global harmonization of standards, grid codes and operational practices)

Scenario of globally interconnected regions



Power Systems of the future

Power quality & storage solutions increasingly needed

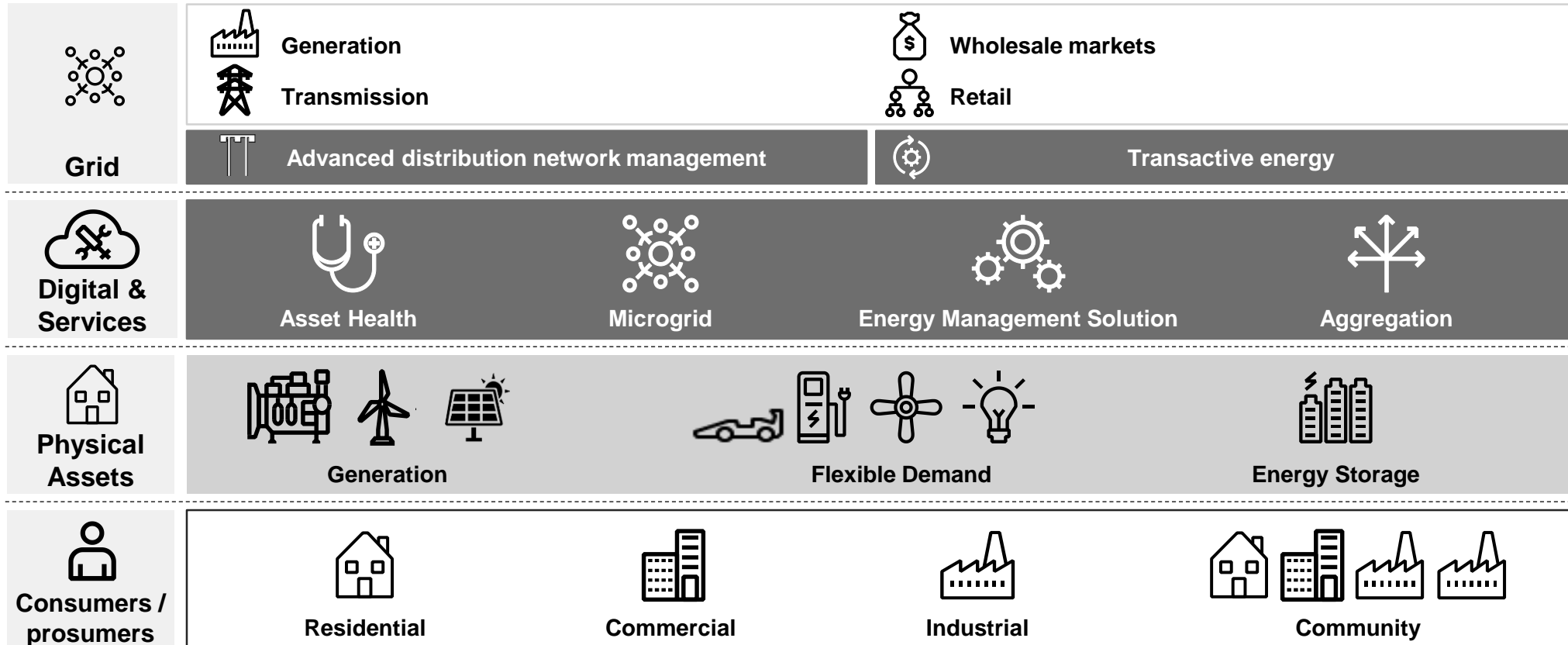


Multiple technical solutions available to address power quality

Energy storage based (chemical or mechanical)	Power electronic based	Capacitive
Inductive	Protection	Software based

Power Systems of the future

New opportunities for digital solutions and services at the edge of the grid



New digital solutions & services required to:

- Optimize system performance
- Ensure grid reliability
- Create business opportunities for energy providers
- Maximize customer value

Power Systems of the future

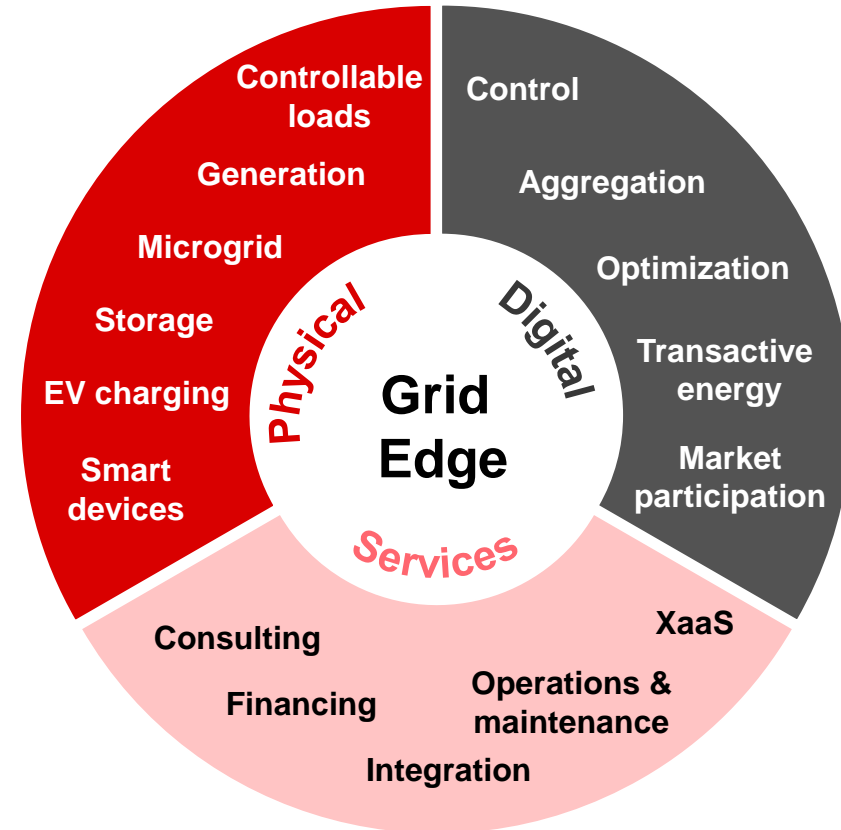
Grid Edge Technologies

Definition

An ecosystem of:

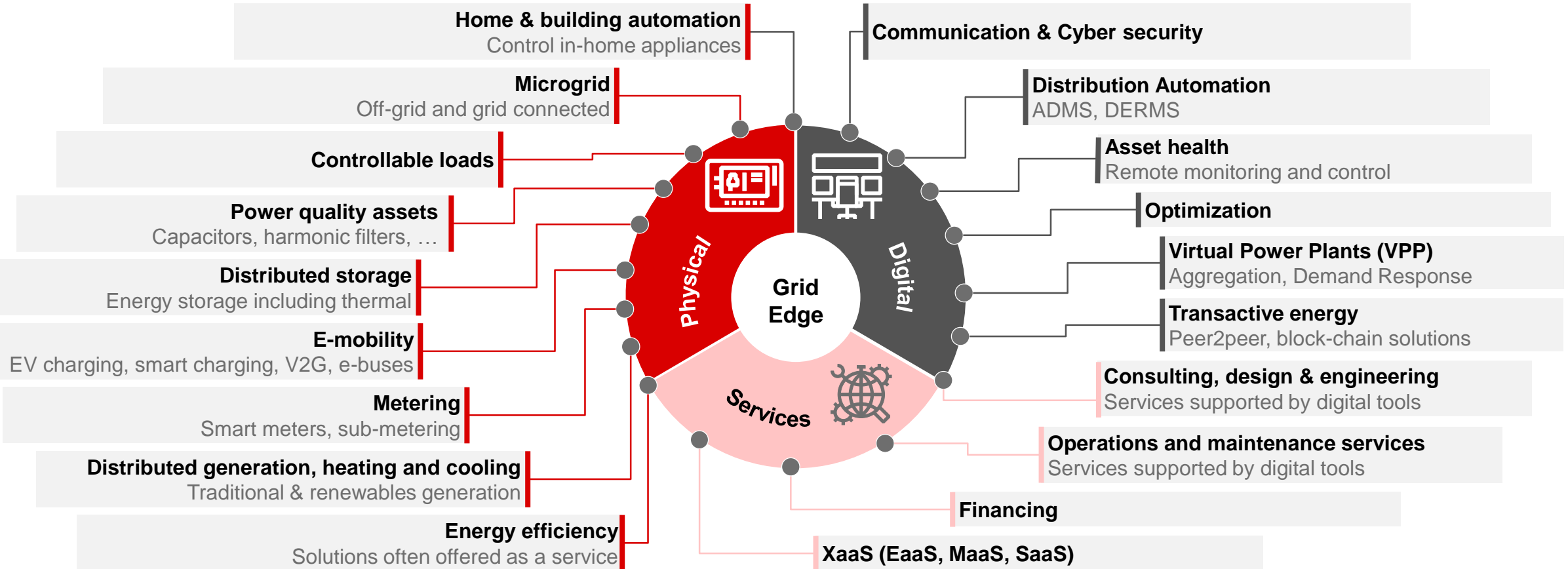
- Distributed energy capabilities,
- digital solutions
- and services

to maximize customer value and retention



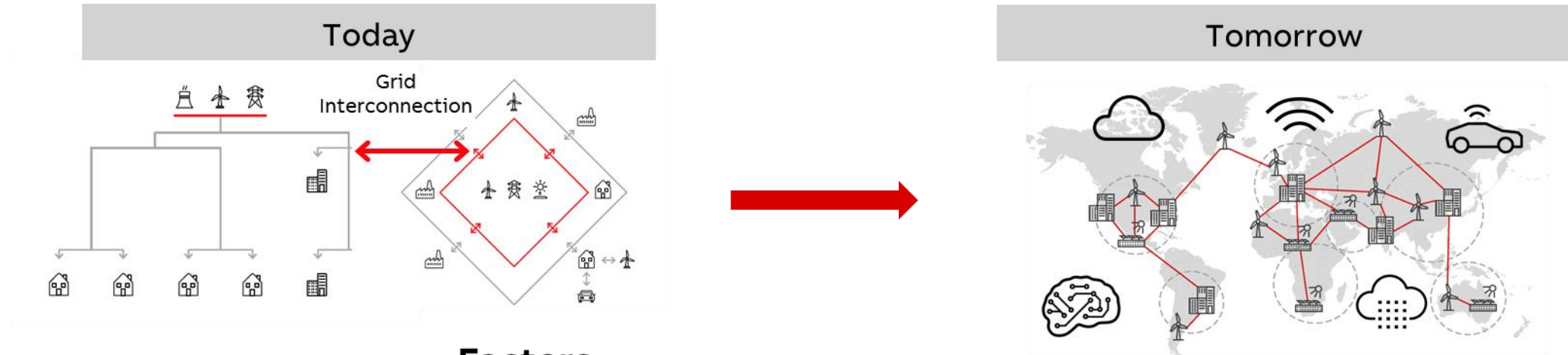
Power Systems of the future

Grid Edge Technologies : Key elements



Power systems of the future – an evolutionary vision

Grid evolution in the future



Factors:

- Full scale deployment of renewables across all regions
- Increased share of energy by wire
- Massive introduction of grid connected Electrical Vehicles
- Utilities adjusting to new, additional business models
- Fully flexible power exchange with related data transfer («Internet of Energy»)
- Artificial Intelligence enabling complex autonomous processes

Grid investments need to be driven by anticipated future requirements and needs

ABB