



ABB Wind Industry Sector Initiative Greengrowth Tallinn, 16 September 2011

Cutting-Edge Wind Energy Solutions Challenges and Solutions ABB Viewpoint

A global leader in power and automation technologies



- 130,000 employees in about 100 countries
- \$ 31.6 billion in revenue (2010)
- Predecessors founded in 1883 and 1891
- Publicly owned company with head office in Switzerland



ABB deliveries from A to Z into the wind industry

System and electrical drivetrain packages

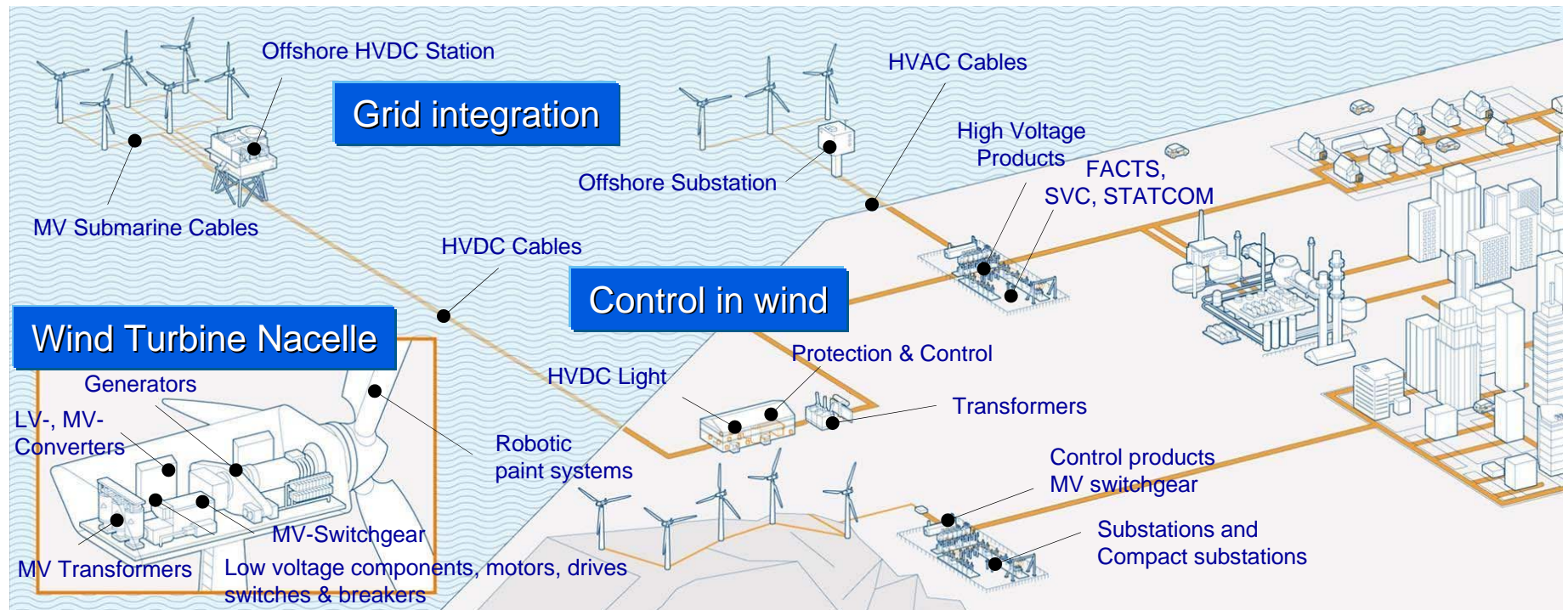


ABB supplies products and services to the wind industry, from products and services used in wind turbines to the power transmission and distribution systems of the wind power plant.

ABB in Nordic and Baltic countries

Renewable energy



- Totally more than 18.000 employees
- Research & Development and main factories for products used in renewable energy such as Generators, Converters, Transformers, Switchgear, Cables, HVDC grid systems etc

Wind & Solar power generation

Statements, beliefs, attitude



Wind Power Generation is:

- Unstable and Unpredictable
- Expensive
- Very nice but:

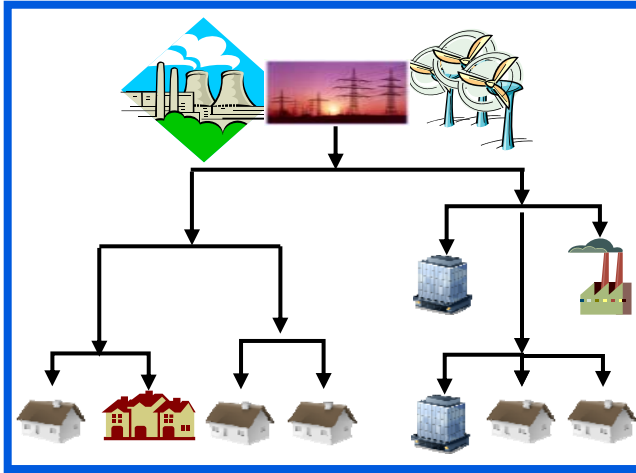
”Not In My Backyard”



Evolution of grid design

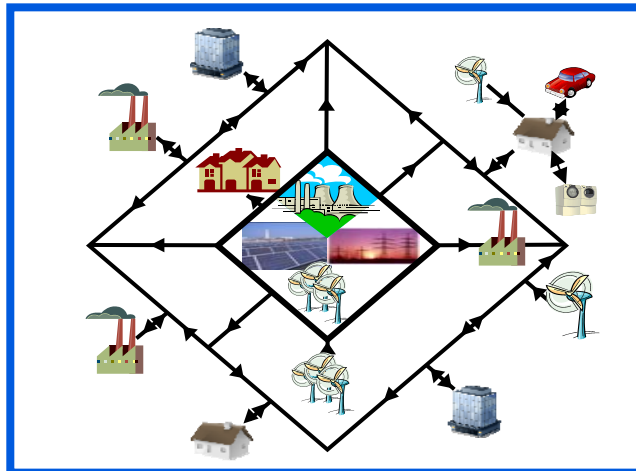
From traditional to future grids

traditional grids



- Centralized power generation
- One-directional power flow
- Generation follows load
- Operation based on historical experience
- Limited grid accessibility for new producers

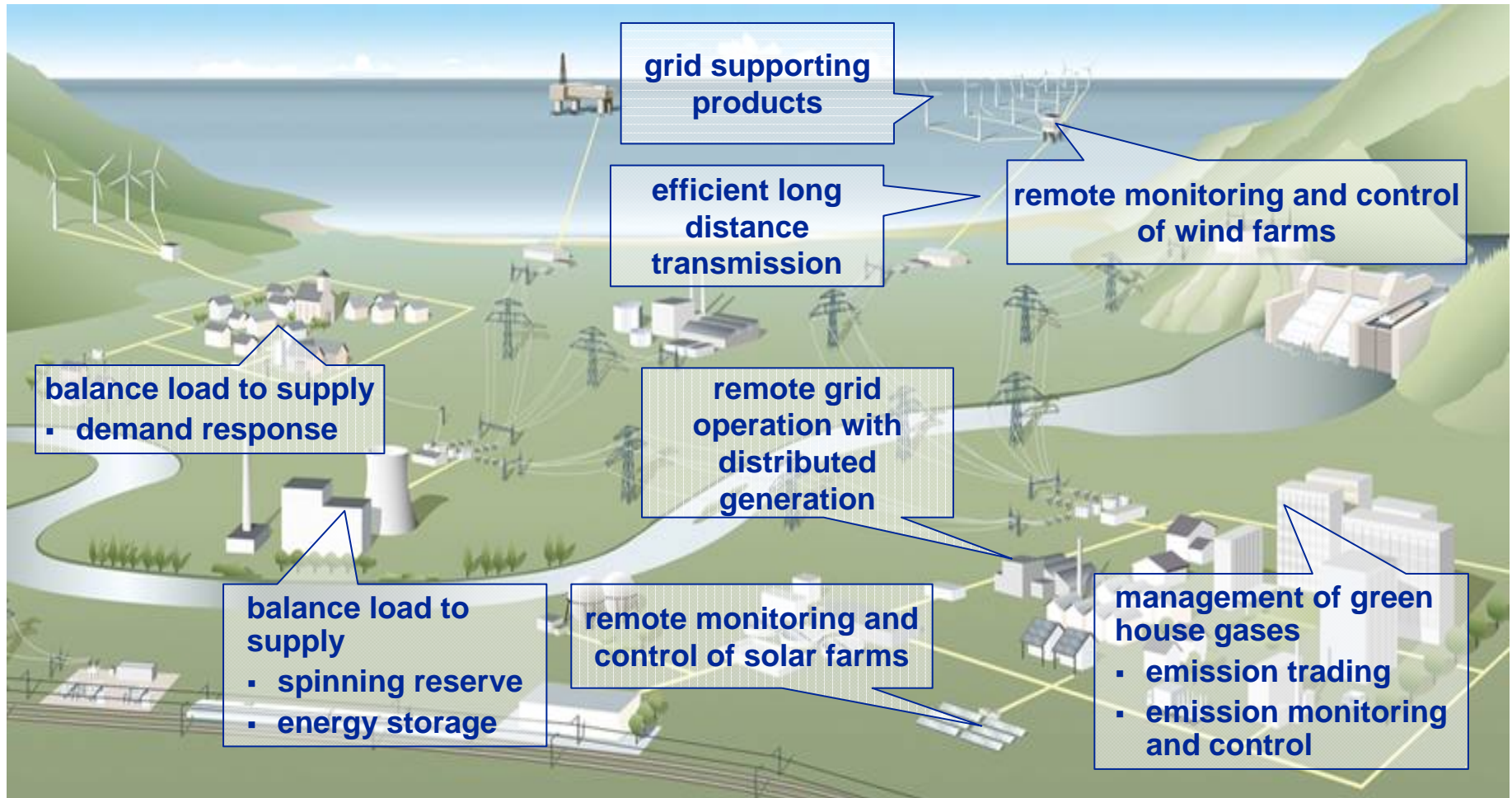
future grids



- Centralized and distributed power generation
- Intermittent renewable power generation
- Consumers become also producers
- Multi-directional power flow
- Load adapted to production
- Operation based more on real-time data

Control and Integration of wind power

Renewable smartgrid framework



Smart grid ABB portfolio

Production



traditional
power plants



solar generation



wind farms



distributed
generation

Smart Grid

- **Network Manager** system including real time pricing and control
- **Substation and feeder automation**
- **Utility communication systems**
- **Flexible AC Transmission Systems** for increased grid stability
- **SVC Light® energy storage** for stationary battery storage
- High voltage direct current for efficient long distance transmission
- **Integration of**
 - **Wind and solar power production**
 - **Electric vehicles**
 - **Smart meters** for demand response
 - **Industrial energy management systems** for demand response
 - **Smart house devices**

Consumption



smart meters



smart house



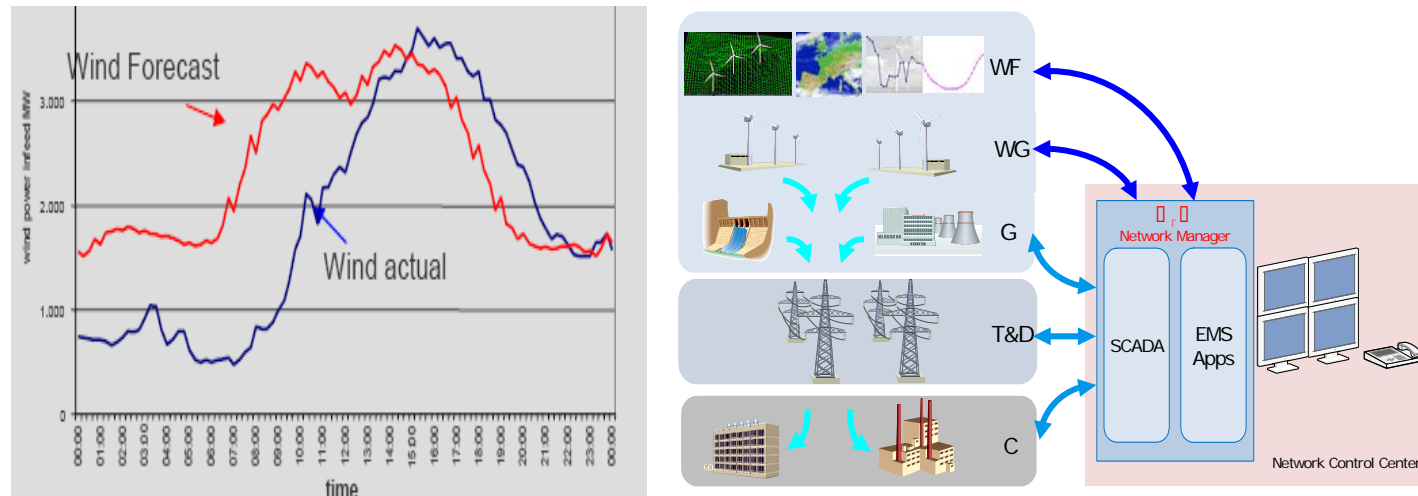
plug-in vehicles



industry

Renewable energy integration

Variability



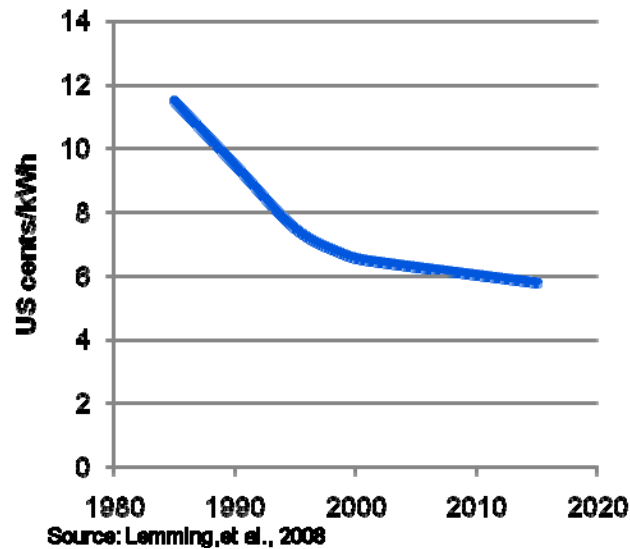
- Unpredictable deviations of forecast and actual generation
 - Integration of forecasts in network planning and operation algorithms
 - Integration of generation reserves, balancing with energy storage and active demand
 - Reliable forecasting tools

Wind power generation

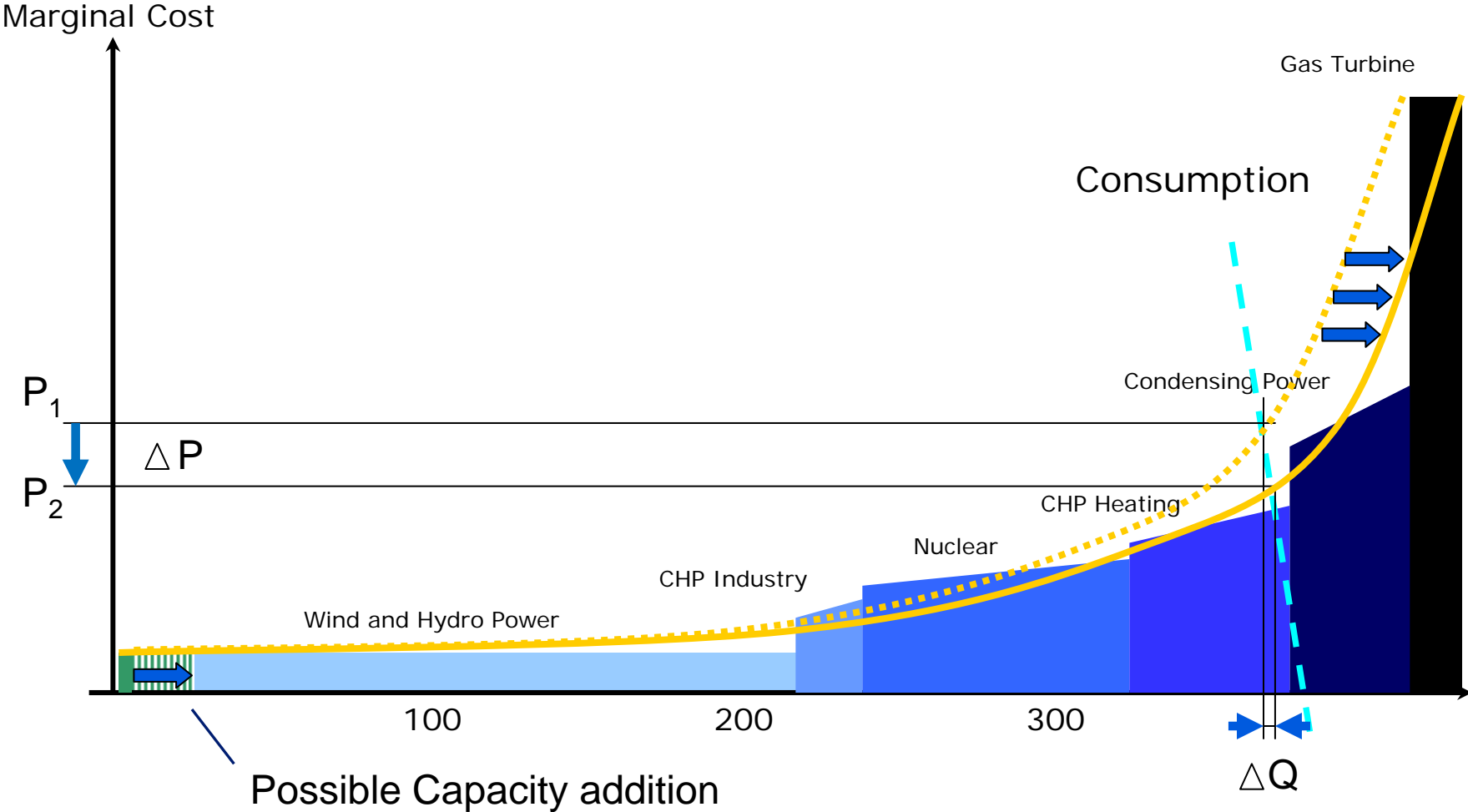
Reduce cost of wind energy



- Efficiency
- Reliability
- Grid supporting
- Efficient transmission
- Forecasting

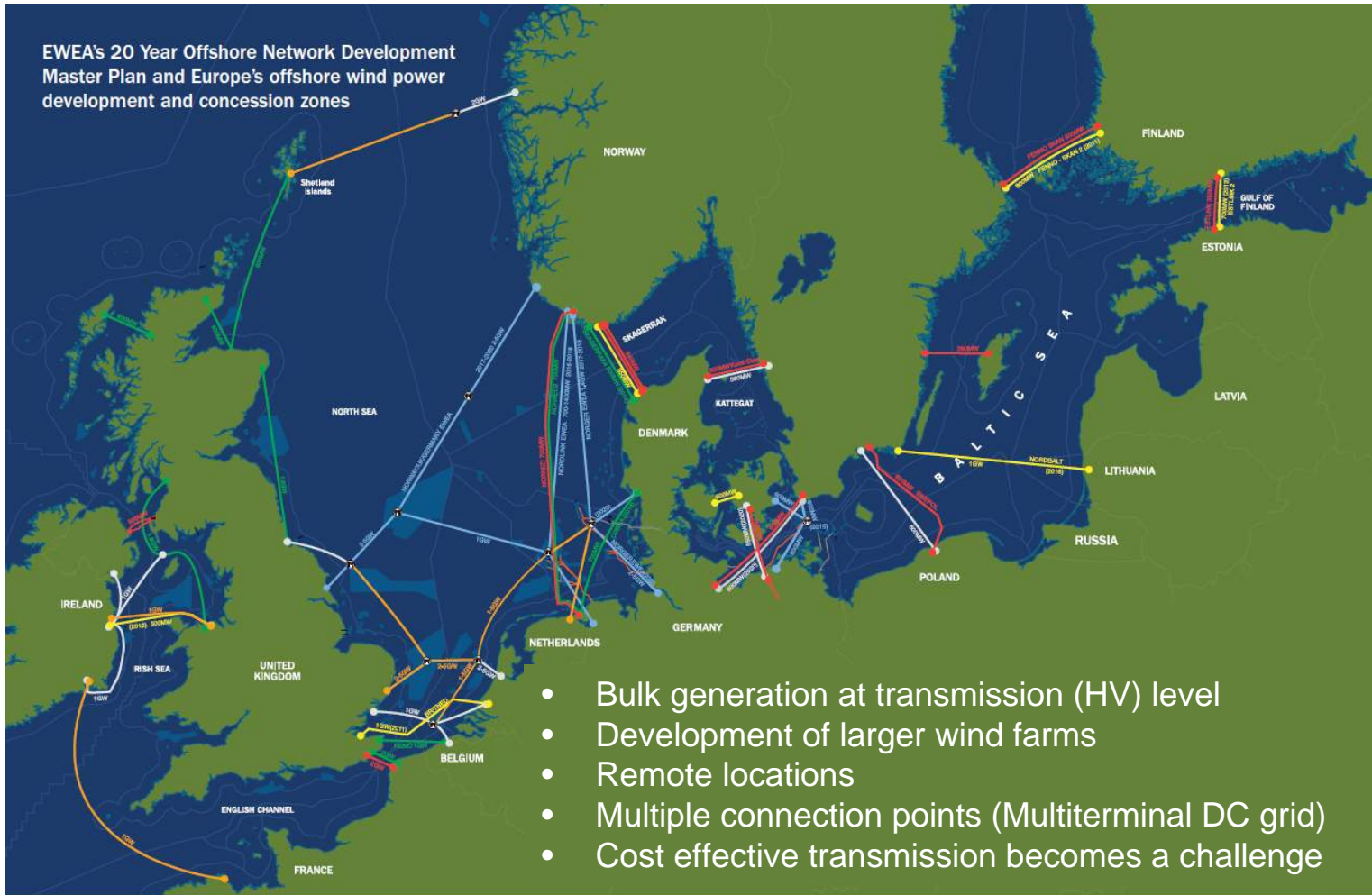


Wind power generation Nordic electricity market



Integration of wind power

Bulk generation at transmission level offshore



■ Currently operating offshore cable
 ■ Under construction or planned offshore cable
 ■ Under study by TSO
 ■ Under study by TSO/EWEA recommendation
■ Proposed by EWEA in the 2020 timeframe
 ■ Proposed by EWEA in the 2030 timeframe
 Proposed offshore node
 ■ Concession and development zones

Power and productivity
for a better world™

