



# Challenges of RES Integration

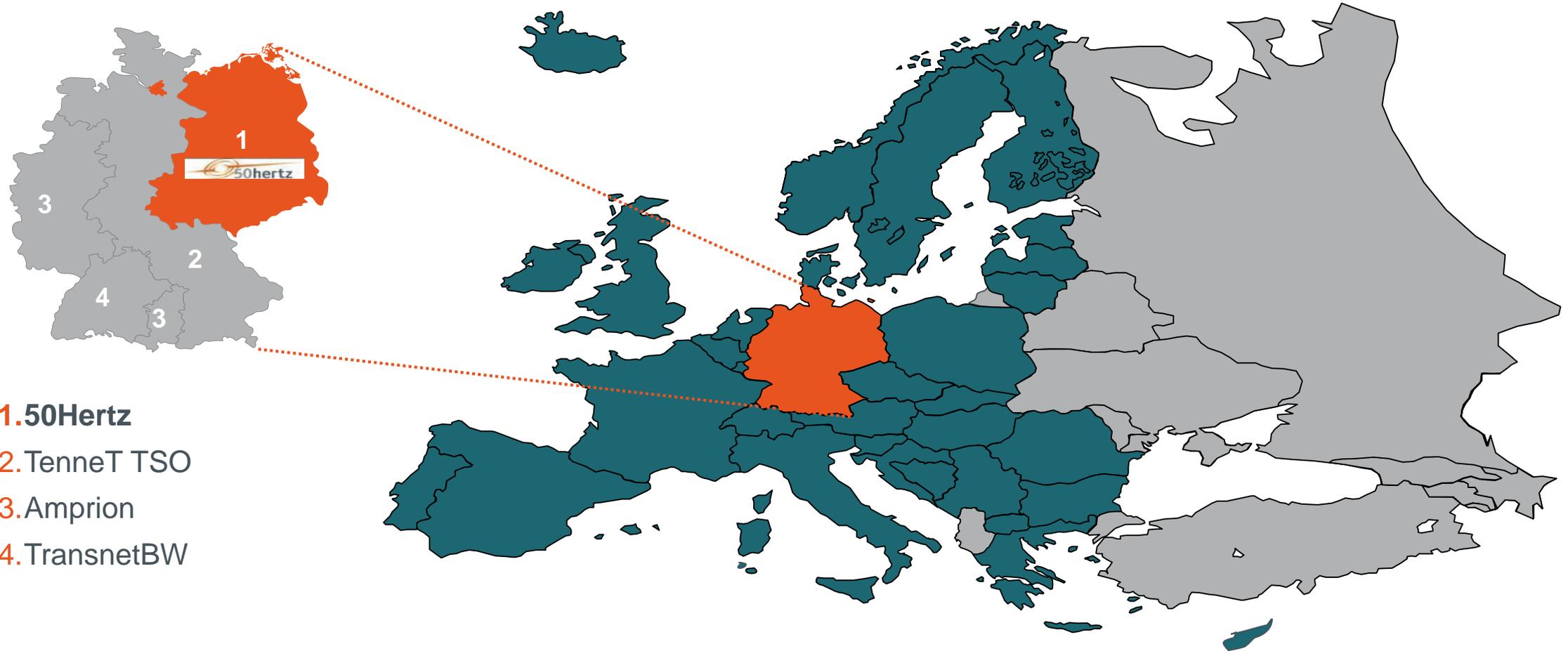
IRENA Innovation Week „The Age of Renewable Power“

Bonn, 13 Mai 2016

Olivier Feix



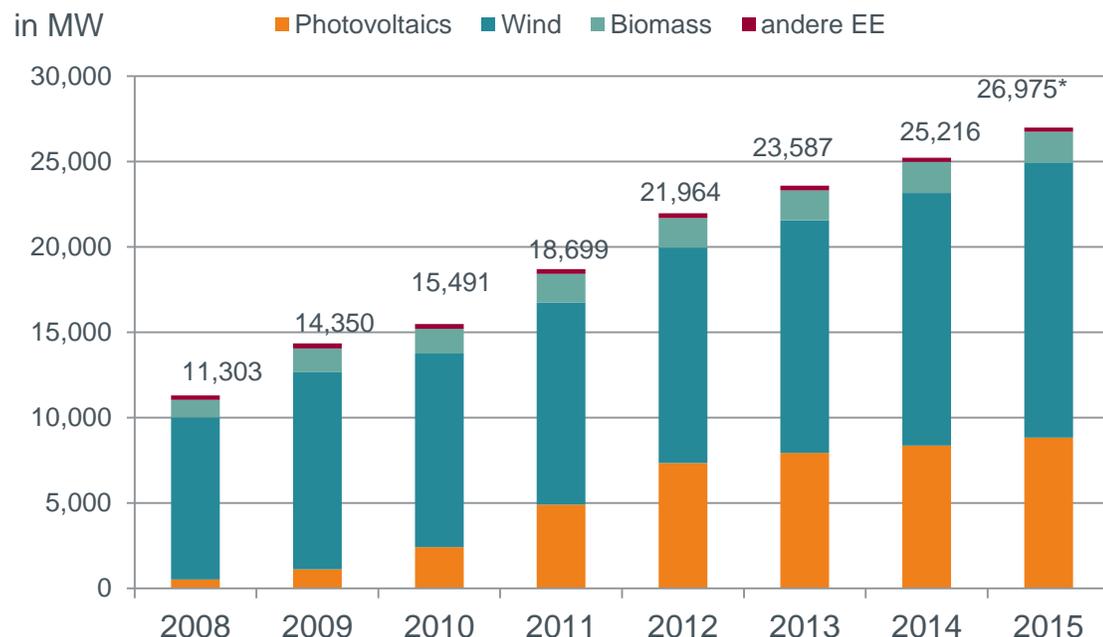
# 50Hertz - part of the Interconnected European Electricity System



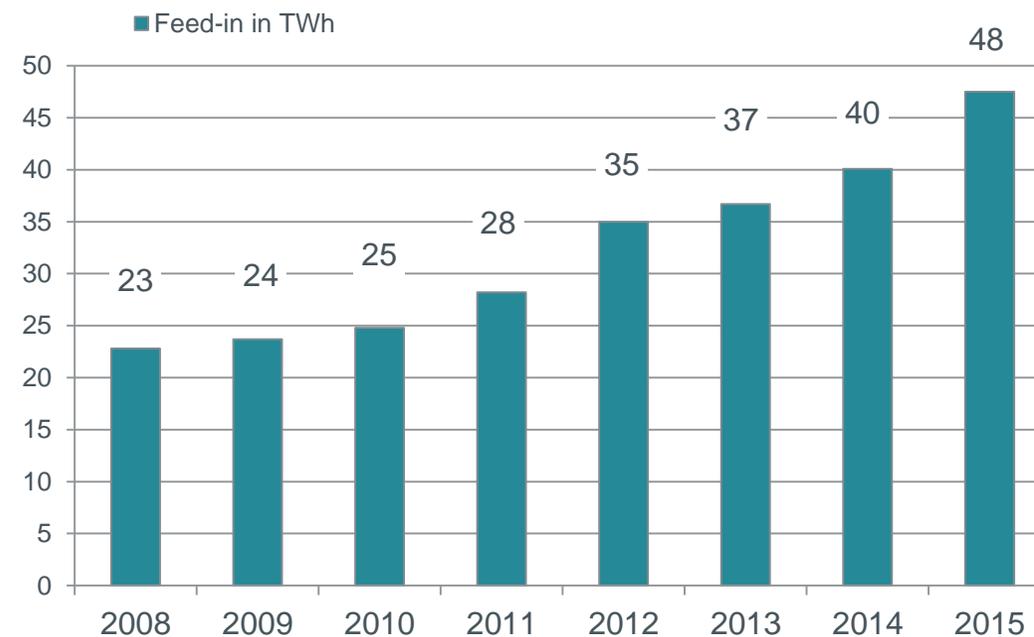
- 1. 50Hertz
- 2. TenneT TSO
- 3. Amprion
- 4. TransnetBW

# RES Integration has been extremely successful in the 50Hertz grid area

## Installed capacity of RES in the 50Hertz grid area [MW]



## Feed-in of RES in 50Hertz grid area [TWh]

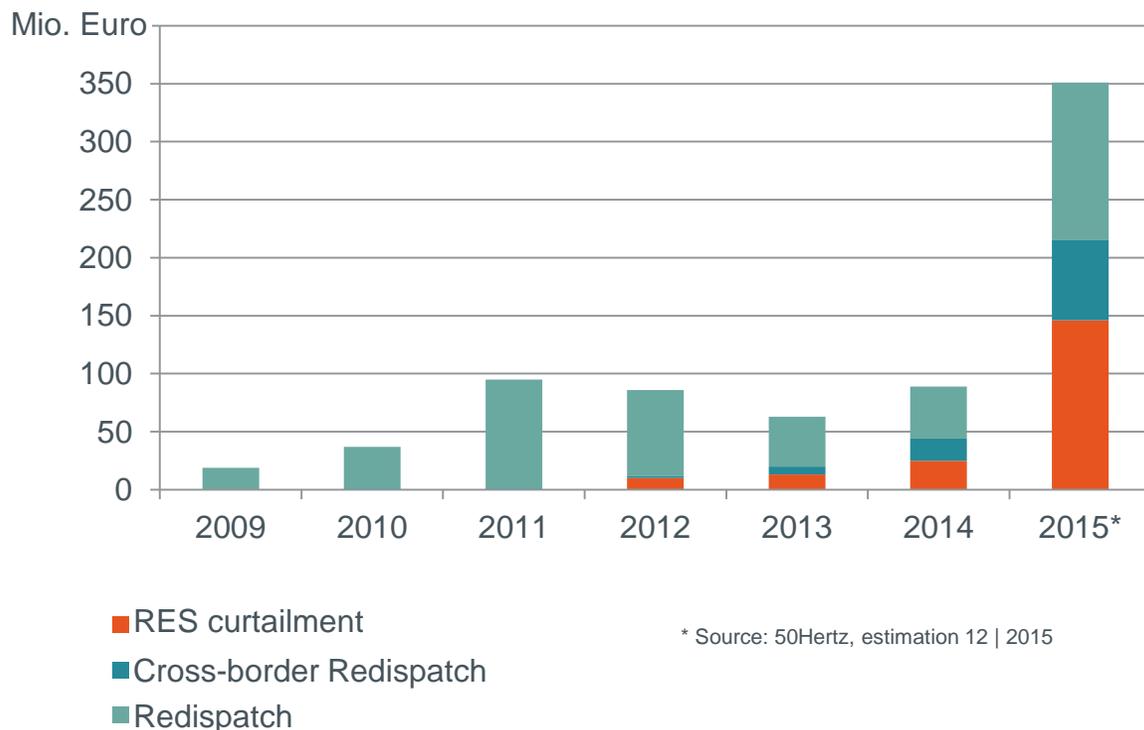


In 2015 RES electricity production covered approx. 49% of electricity consumption in the 50Hertz grid area.

Source: 50Hertz  
As at 31/12/2015 Provisional data; approved figures will be available in August 2016

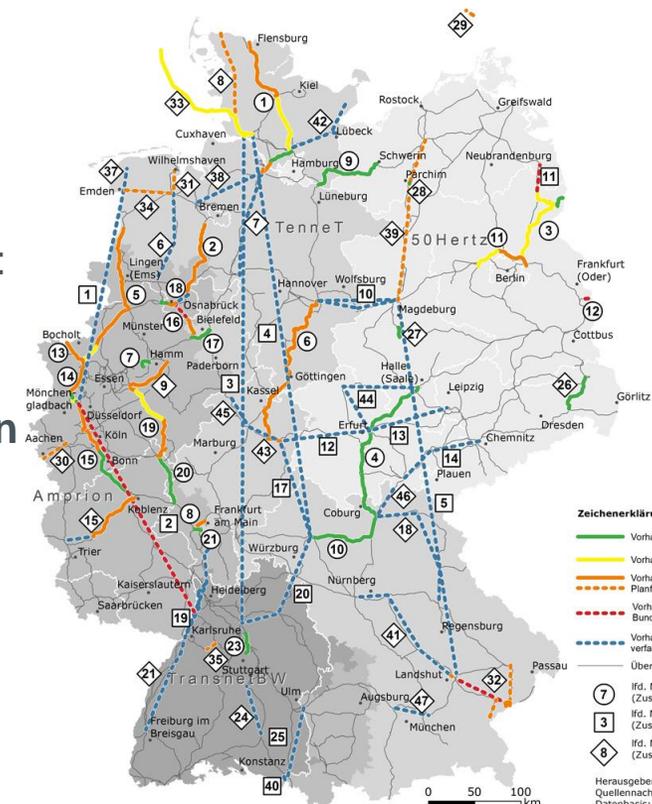
# German Transmission Grids are heavily congested and have to be extended

50Hertz congestion costs [Mio. Euro]



Grid expansion projects

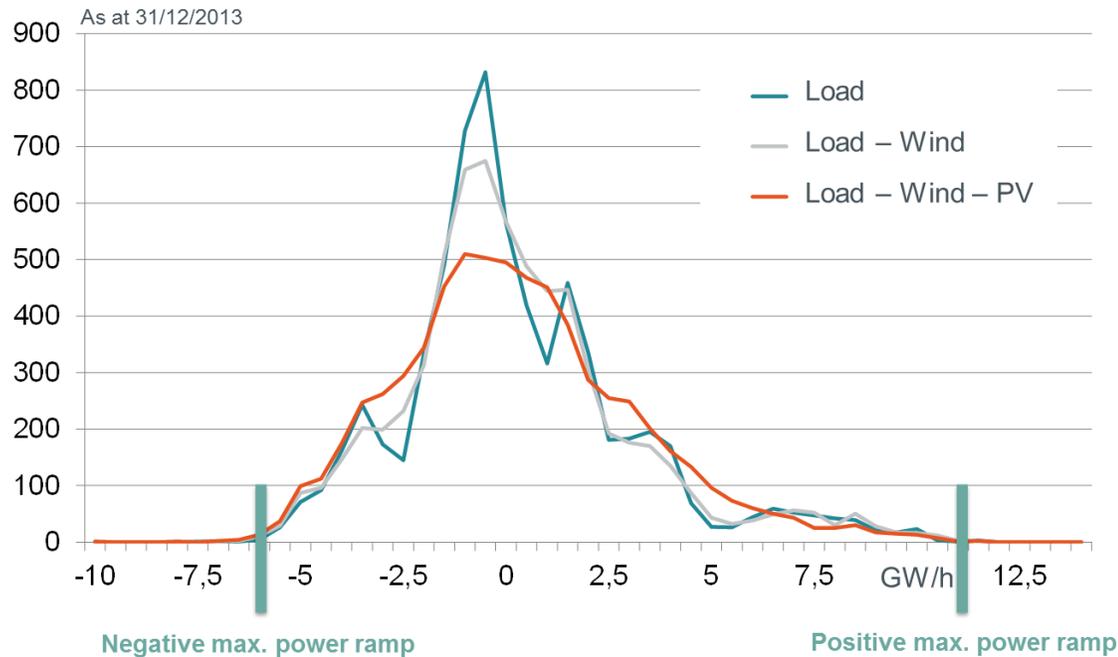
- **Federal Requirement Plan Act** passed by German Parliament in 2013, adjusted in 2015: 3 HVDC lines, 40 AC lines
- **Power Grid Expansion Act**, passed in 2009 adjusted in 2015: 22 projects



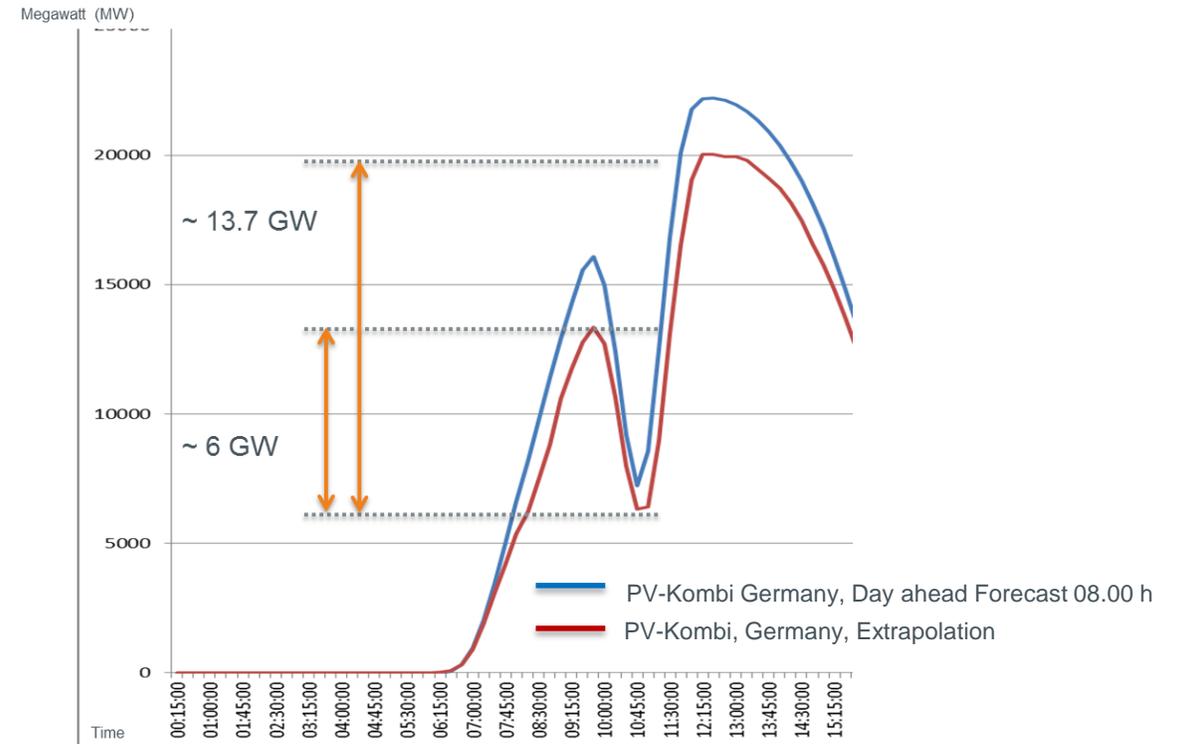
In 2015 German congestion costs at transmission level exceeded 1 billion Euro.

# Flexibility is key for ensuring secure RES integration

## Power ramps Germany 2013



## Solar eclipse 2015



New and improved market products, a level playing field for flexibility technologies and interconnected RES areas allow the integration of large quantities of variable RES.

# High Flexibility potentials are available waiting for technical and commercial realization

## 50Hertz cooperation with DSOs on ancillary services

- Cooperation with DSOs on development of new concepts for the **integration of renewable energies into ancillary services**
- Mutual data exchange as essential prerequisite
- **WindNODE** project as real-life lab for the intelligent energy system of the future
- 50Hertz with more than 70 partners



## Innovative flexibility solutions

- **Wind power in control reserve market**  
Start of pilot phase: wind power plants can be prequalified for negative tertiary control power.  
In February 2016 a pool of two windfarms (60 MW ) was prequalified in the control area of 50Hertz.
- **New batteries**
- **Electric boilers**
- **Industrial facilities**

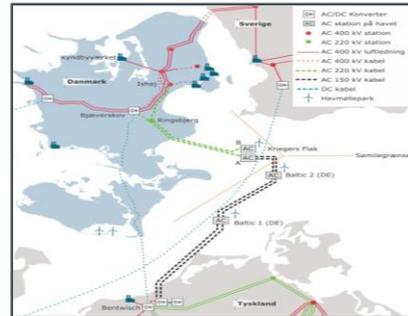


Communication and coordination based on intelligent IT systems is a key success factor.

# European market integration will facilitate further increase of intermittent RES

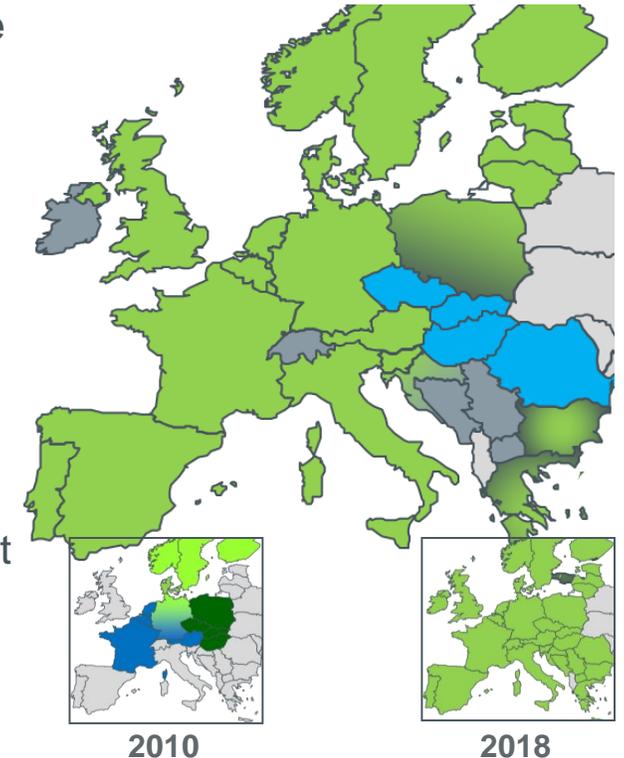
## Offshore interconnections with our Nordic partners

- **Combined Grid Solution**
- Germany – Denmark
- Interconnection between offshore wind farms
- Capacity of ~ 400 MW
  
- **Hansa Power Bridge**
- Germany – Sweden
- Subsea interconnection
- Synergy between wind & hydro
- Capacity of ~ 700 – 1400 MW



## European Market Coupling

- **Single European Price Coupling (EPC)** successful on the day-ahead-market in the „MRC - Multi Regional Coupling“ region (green)
- Next steps: Expansion to other regions, EPC in the intraday spot market, flow-based Market Coupling in **Central Eastern Europe (CEE, blue)**.



Markets will become more short term to accommodate for increasing fluctuation.

# Summary: Elements for a successful Energy Transition

