



Innovations in the Transmission System

as a response to challenges related to the „Energiewende“

Development of Transmission Grids in the Context of the „Energiewende“
Berlin, 21.11.2017
Dr. Johannes Henkel



Three exemplary Innovations

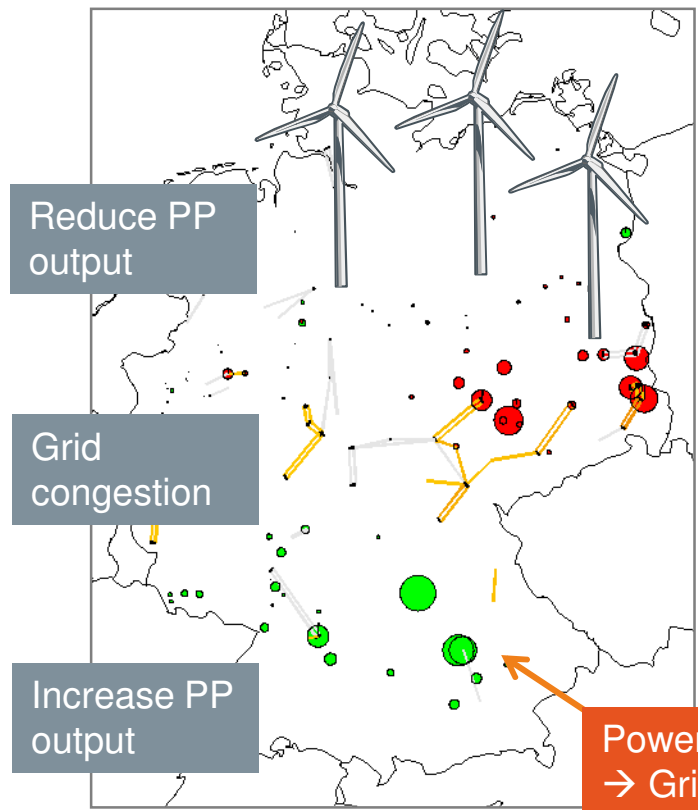
1. WindNODE Flexibility Platform
2. International Grid Control Cooperation
3. Innovations in System Operation



WindNODE Flexibility Platform

Grid Congestion and Redispatch

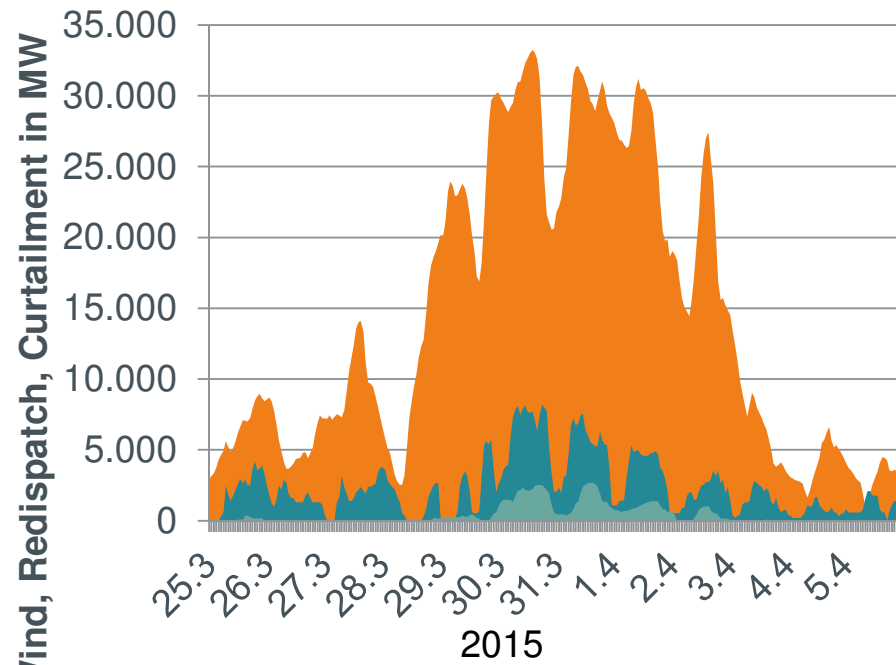
Grid Congestion



Source: Scenario calculation IAEW, RWTH Aachen 2013

Power Plants relevant for Redispatch
 → Grid Reserve
 → PP not allowed to be taken from grid

Redispatch



- Wind feed-in
- Redispatch
- RES Curtailment

Distinction of congestion management measures in germany: Redispatch and RES curtailment

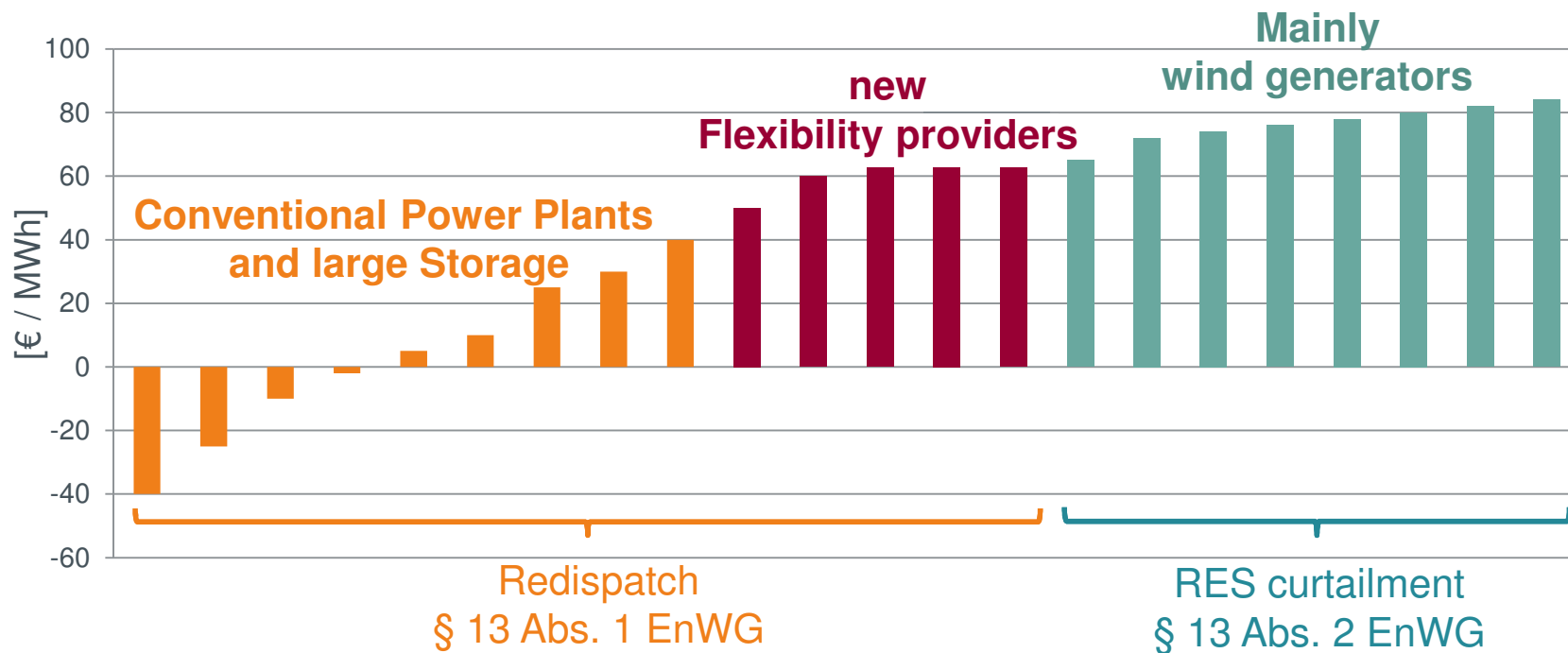
Redispatch

- Legal basis: § 13 Abs. 1 EnWG
- Units > 10MW are obliged to report their redispatch potential
- Flexibility request as a result of an optimization process
- Energetic and financial compensation of balancing groups

RES-curtailment (Einspeisemanagement)

- Legal basis: § 13 Abs. 2 EnWG
- Demand for reduction estimated for each node - Reductions of feed-in executed by DSOs
- No energetic or financial compensation of balancing groups
- Uncertainty about actual effect
- Balancing group deviations compensated by balancing power

Concept of the Flexibility Platform



In order to reduce RES curtailment additional flexibility sources will be incorporated in the redispatch process. Therefore new processes and communication structures (between grid operators and between flexibility provider and grid operator) are needed

→ **WindNODE Flexibility Platform**

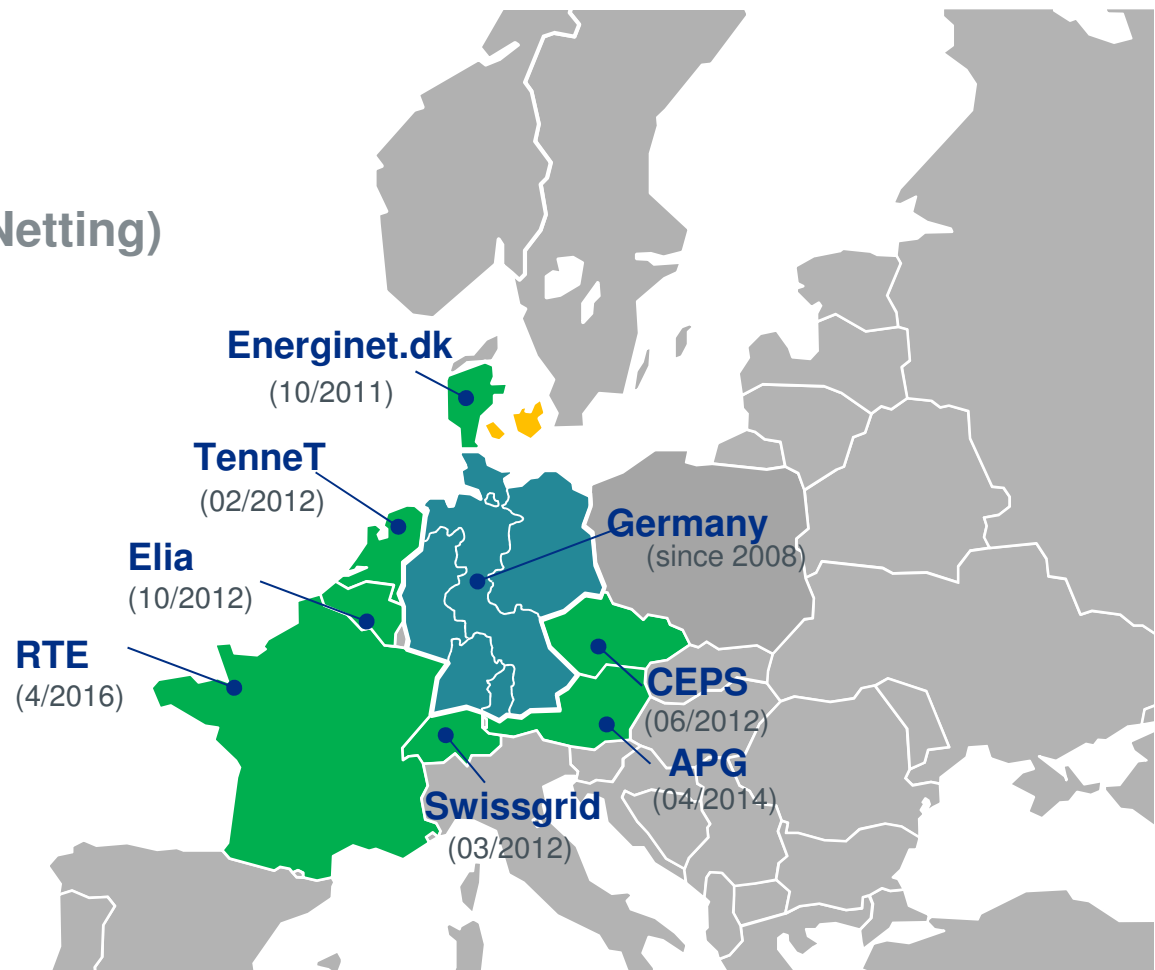


International Grid Control Cooperation

Grid Control Cooperation – Avoiding Counteractive Balancing

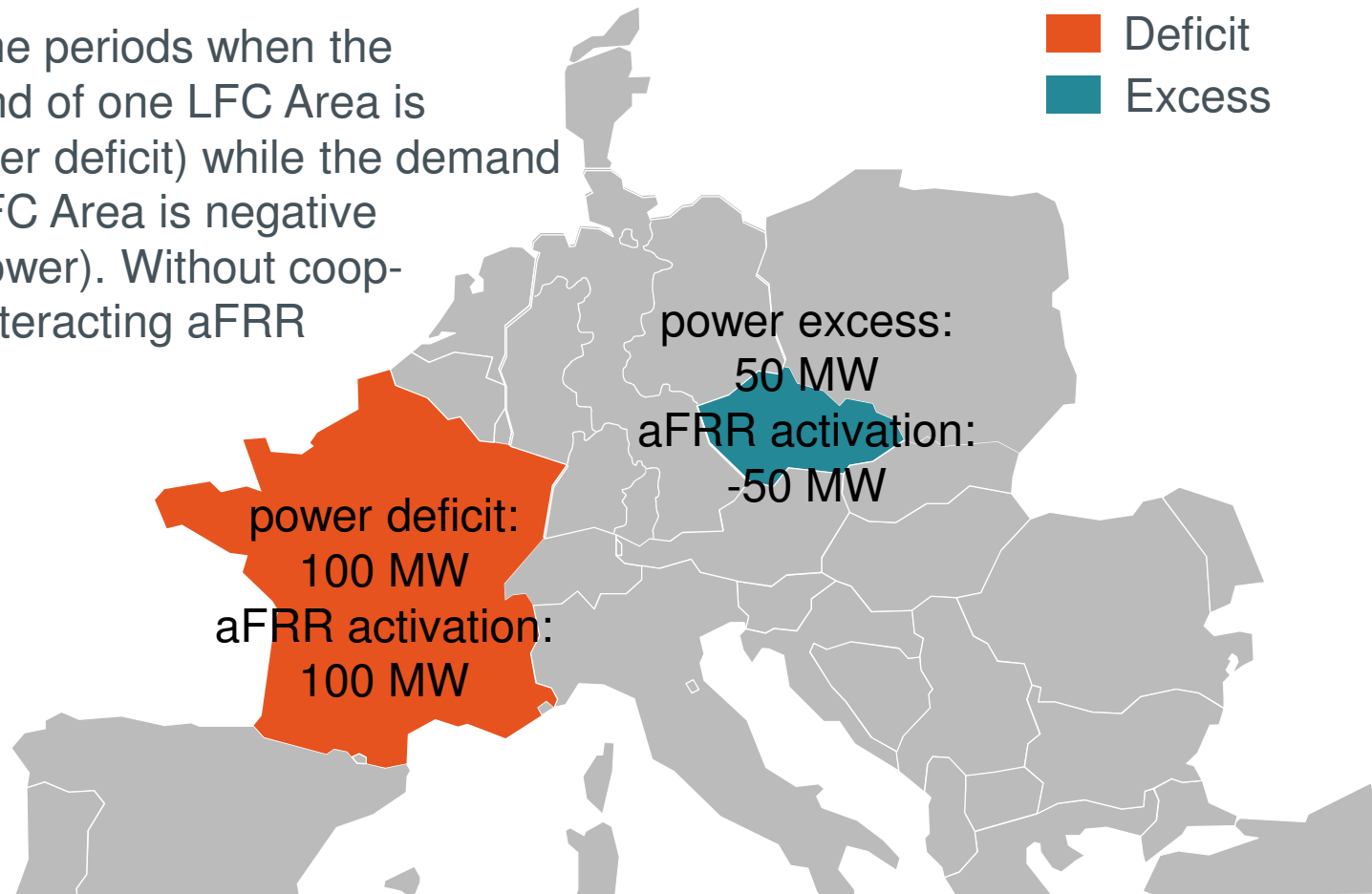
- National GCC (Module 1-4)
- IGCC (Module 1 Imbalance Netting)

Module 1 - IGCC:
Avoid Counteractivation
Module 2:
Common Dimensioning
Module 3:
Common Procurement of capacity
Module 4 – National GCC:
Activation based on common
Merit Order List



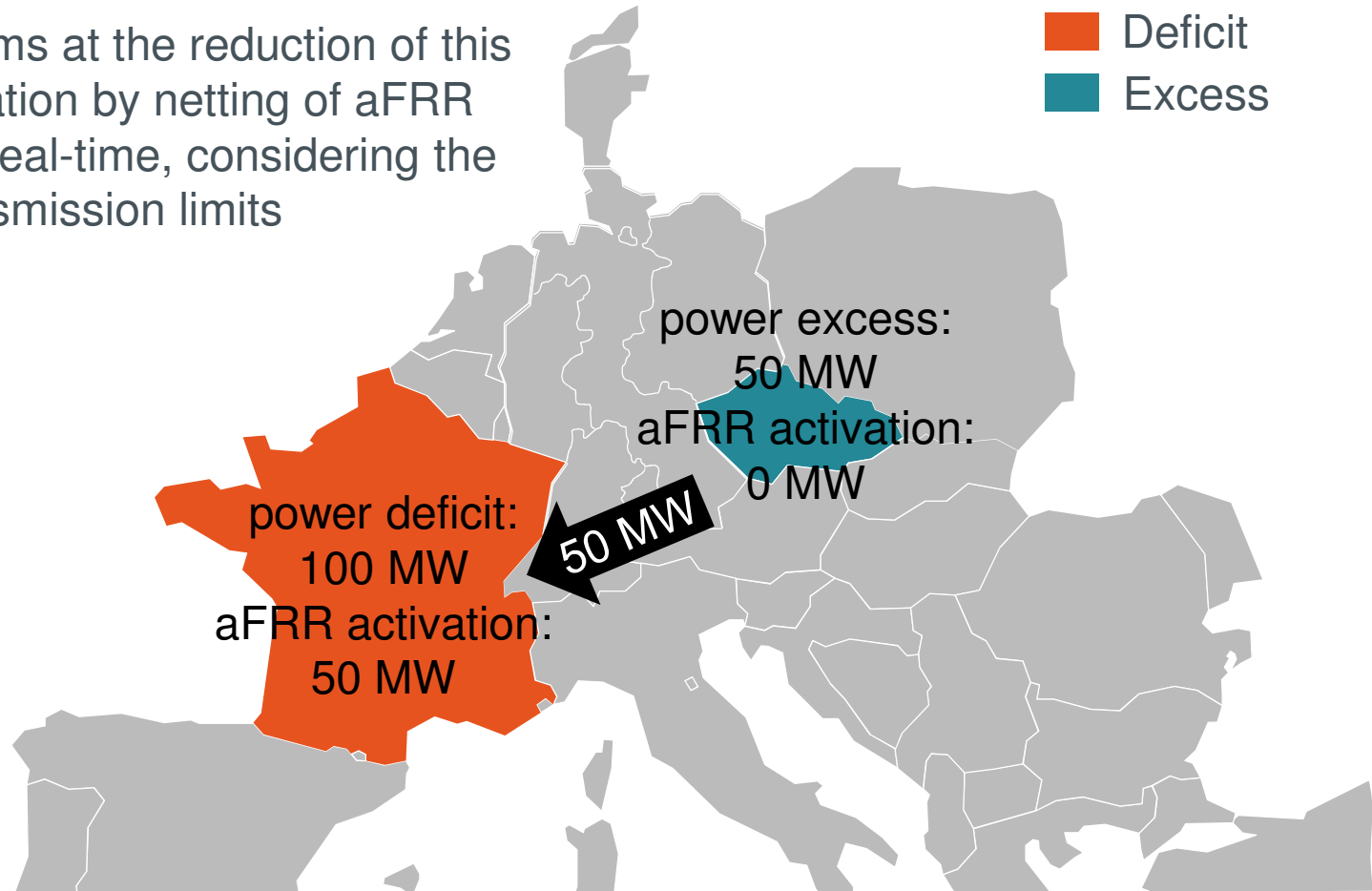
Counteractivation of aFRR

There are time periods when the aFRR-demand of one LFC Area is positive (power deficit) while the demand of another LFC Area is negative (excess of power). Without cooperation, counteracting aFRR is activated



Imbalance Netting in the IGCC

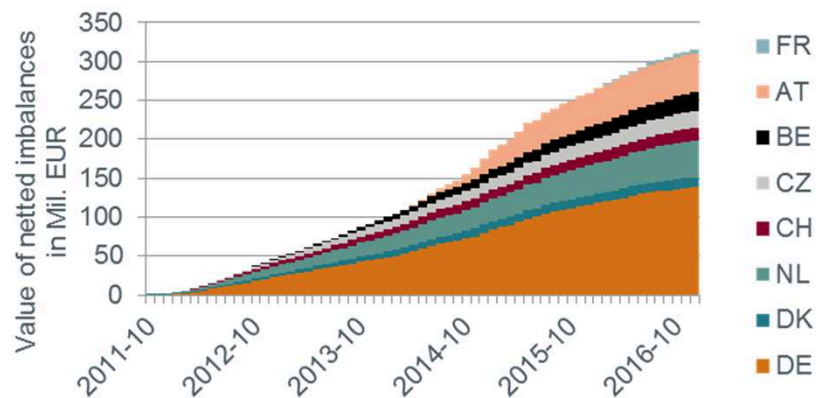
The IGCC aims at the reduction of this counteractivation by netting of aFRR demands in real-time, considering the relevant transmission limits



50Hertz' achievements in integrating balancing markets on a cross-border scale

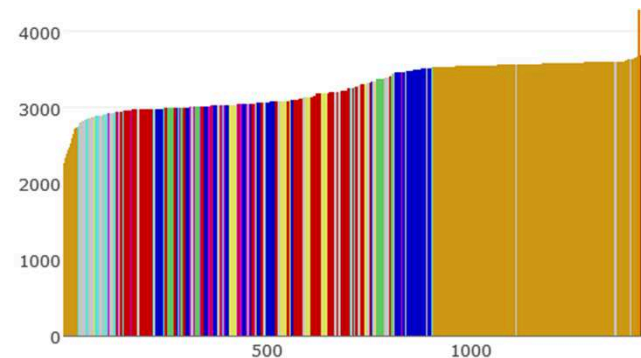
International Grid Control Cooperation (since 2012)

- Eight countries
- Cooperation started in 2011
- Main feature: Imbalance netting
- >300 Mil. EUR saved since 2011



Frequency Control Reserve (FCR) cooperation

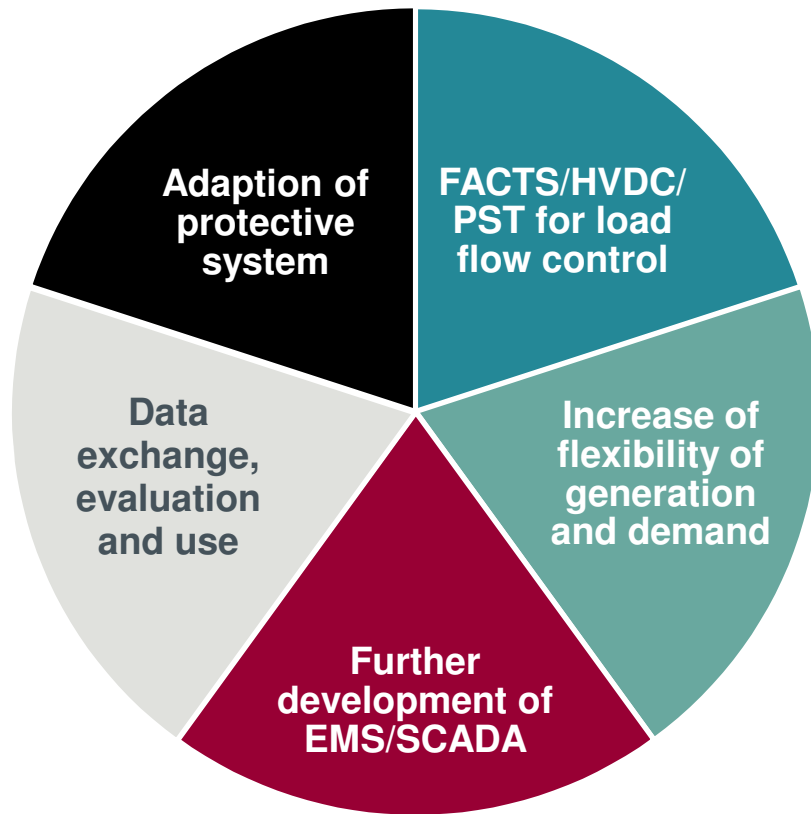
- Six countries
- Cooperation started in 2012
- Main features: Common procurement





Future Innovations in System Operation

Ideas of innovative system operation



Background:

- Increase of RES in the power system leads to increasing transmission task
- Therefore the grids have to be extended
- At the same time an optimised use of the infrastructure shall be assured without decreasing today's level of security of supply

Goal: Development and testing of innovative system operation concepts, technologies and strategies

Components of Innovative System Operation

EPC: Emergency Power Control
 UPFC: Unified Power Flow Controller
 TCSC: Thyristor Controlled Series Capacitor

Horizontal and vertical adjustment of flows in normal as well as fault operation and alert state

