

Time to team up & create value

Bente Hagem
Chair of the Board, ENTSO-E

Network Codes Conference
4 May 2017, Brussels

Network Codes facilitate EU policies



Sustainability

- **260 GW** of RES connected
- **25 GW** in 2016
- **>10 GW** of EU demand side response



Competitiveness & Social Welfare

- **23 states** and **85%** of European consumption market coupled
- **10 million** data files made available yearly for **2500** daily users of ENTSO-E transparency platform

Network codes



Security of supply

- **NO** multi-state interruptions recent years
- **Up to 300** coordinated tasks/day in a RSC
- **Hundreds** trained employees in RSCs programs and offices

Network Codes delivers

3 Market Codes

- Liquidity and competition
- Efficient utilization of grid and generation
- Lower costs to industry and consumers

2 Operation Codes

- More efficient exchange of reserves
- Secure operations in spite of more RES

3 Connection Codes

- More efficient investments and operations
- Better industrial solutions, competition and cost reductions
- Transparency and involvement give further improvements

Case #1: Promote wholesale markets

DAY-AHEAD MARKETS

- **1 B€** in social welfare
- **~100 M€/year** of benefits from flow-based in CWE
- **84%** efficient use of capacity given to the market
- **1500 TWh** (~50% of consumption) traded on exchanges



INTRADAY MARKETS

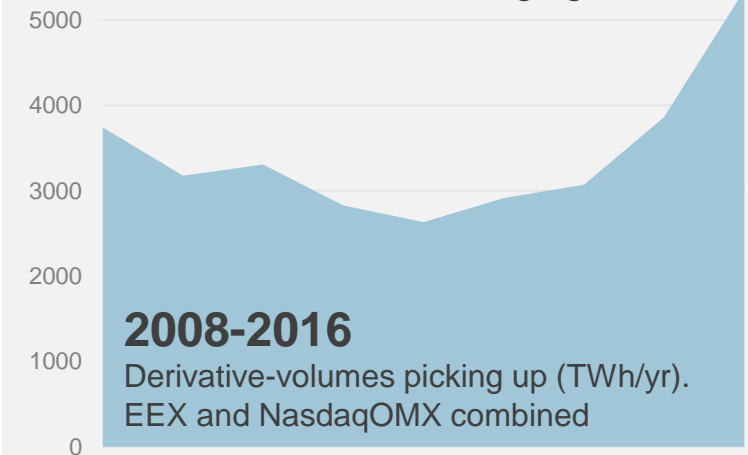
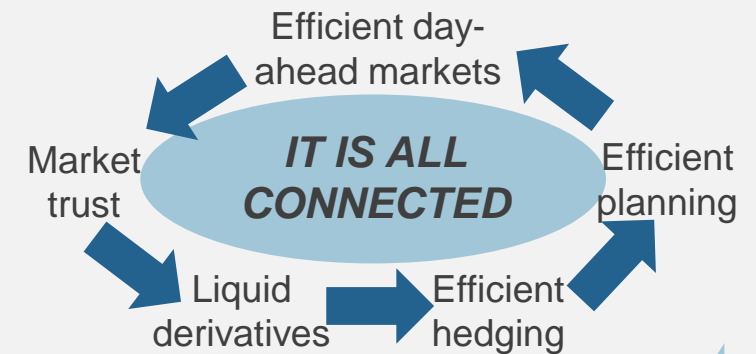
- **120 TWh** traded on main power exchanges in 2016
- **3,6%** average annual volume growth last 5 years

STATES WITH INTRADAY MARKETS

- ✓ **Continuous trading**
- ✓ **15 minutes auctions**



DERIVATIVES MARKETS



Case #2: Integrate balancing markets (1)

Annual benefits:

~ 220 M€

Replacement reserves in the Nordics since 2003

~ 260 M€

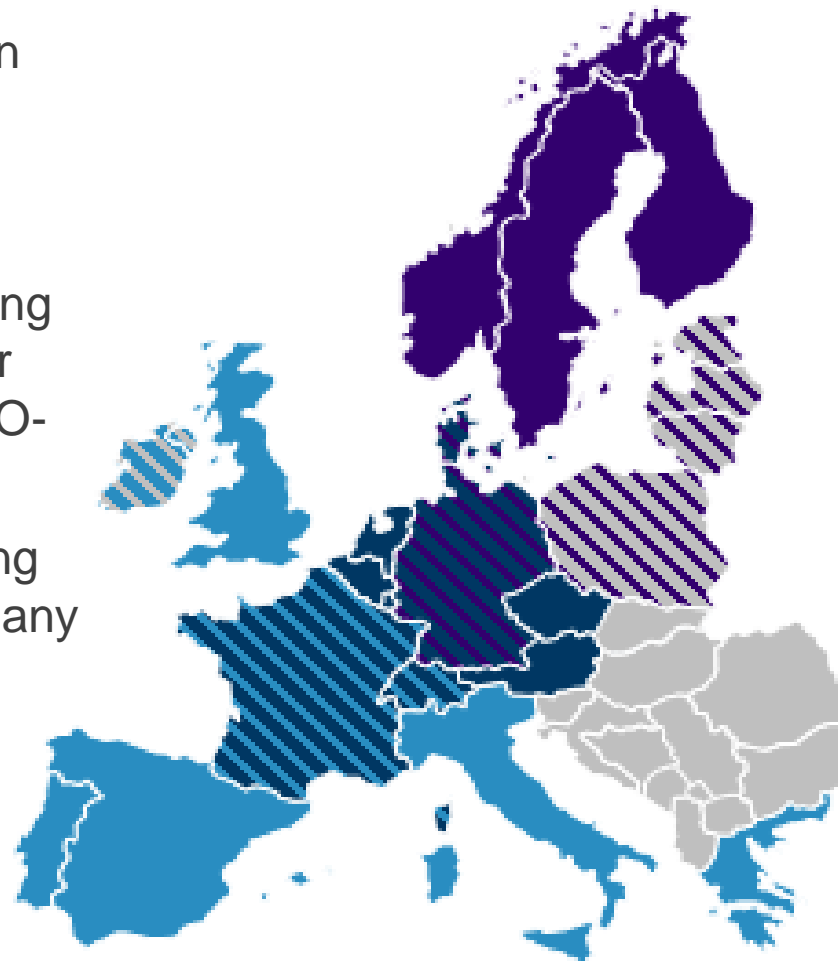
Common reserves, netting and common merit order implemented across TSO-areas in Germany

~ 80 M€

Pilot on imbalance netting within and around Germany (IGCC)

~ 120 M€

Pilot on replacement reserves across the Continent (TERRE)



Theoretical benefits of full integration of balancing markets

Up to 3 Bn€

Case #2: Integrate balancing markets (2)

BALANCING MARKET MILESTONES



Case #3: Secure operations with regional cooperation

Regional Security Coordinators:

1. Capacity calculation
2. Security analysis
3. Common grid model
4. Adequacy forecast
5. Outage planning

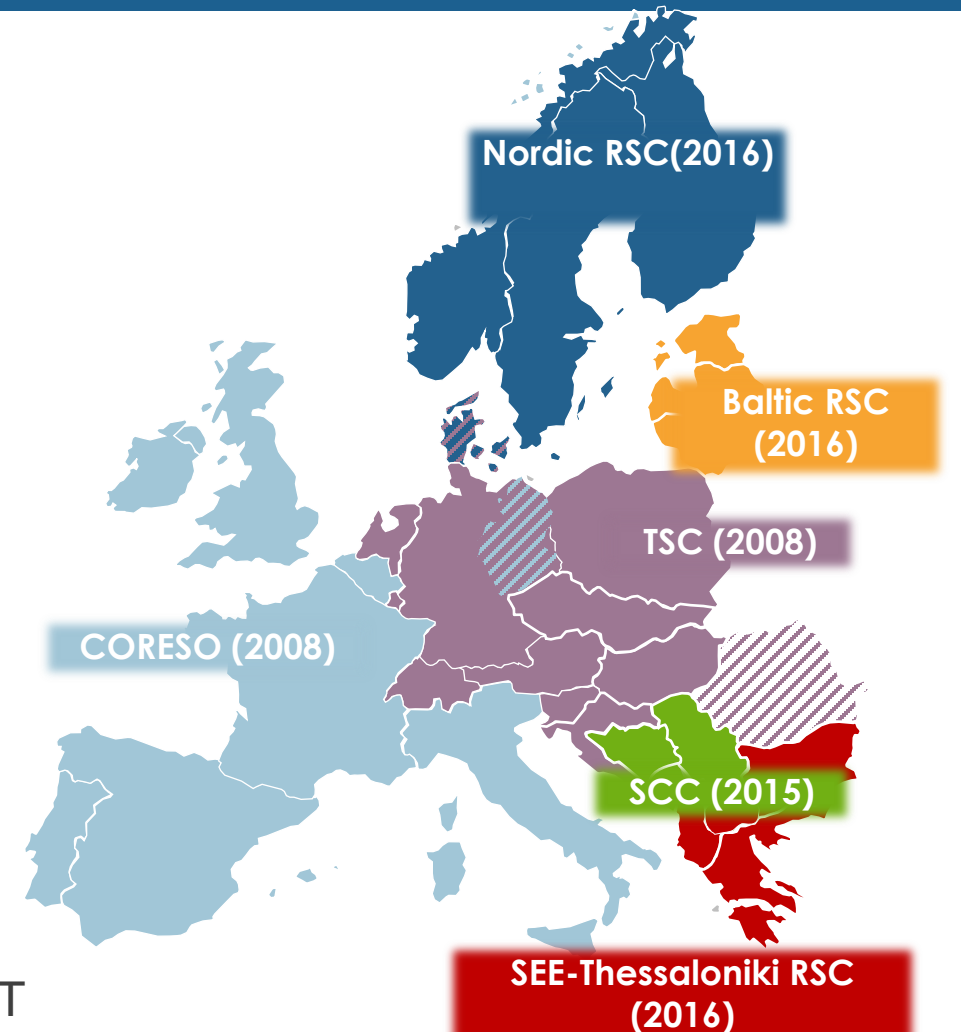
*partially operational
in TSCNET and
CORESO*

➔ Discovered 7 times more potentially critical situations CORESO in 2015 compared to 2014

➔ Mitigate critical grid situations

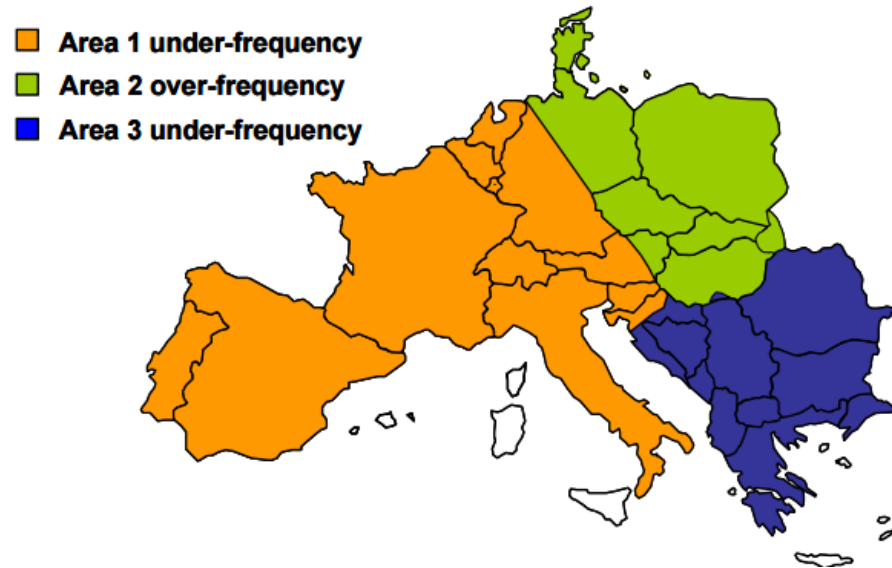
4000 remedial actions proposed/year in CORESO

130 multilateral remedial actions coordinated by TSCNET



Case # 4: Avoid disturbance – “the 2006-case”

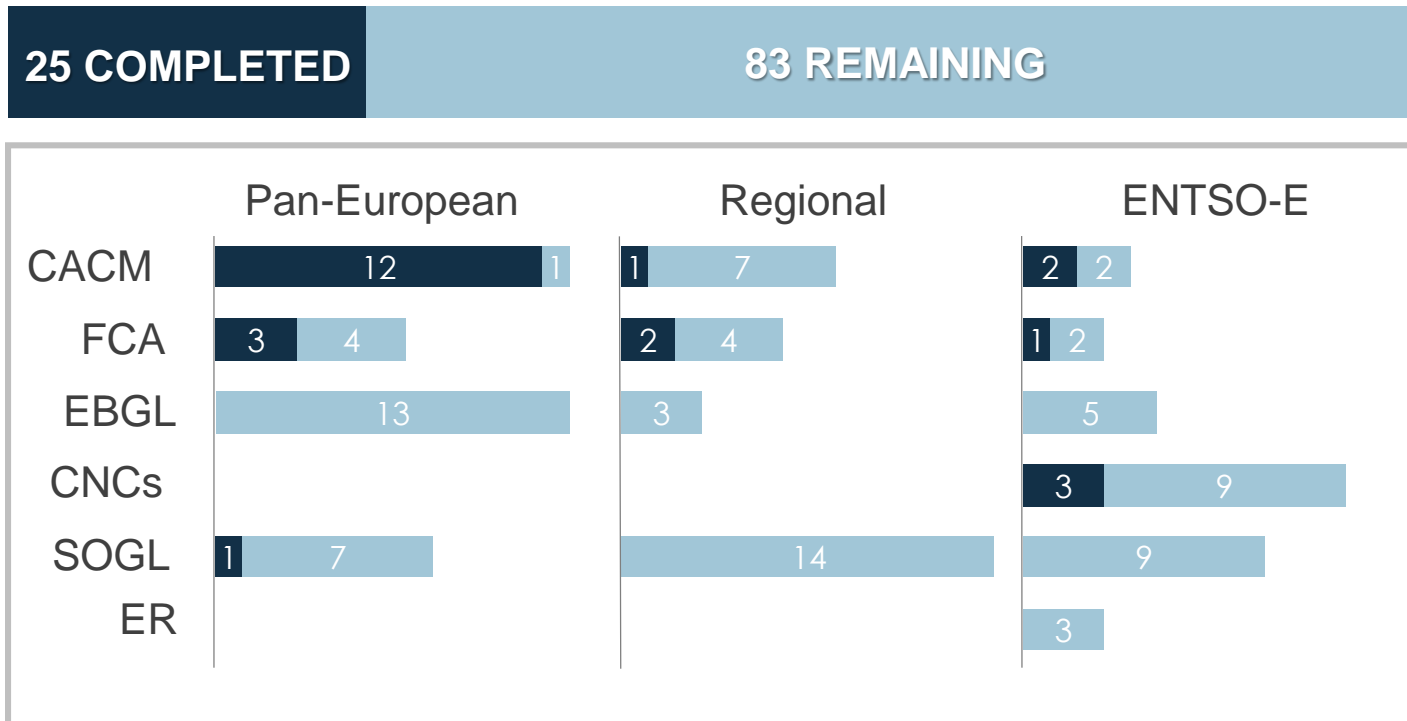
UCTE area split into three areas 4 Nov 2006 22:10



- **15 million households** had a load shed
- **17 GW** of load shedding
- **300-500 M€** of economic losses due to load shedding
- **> 20 GW** of generation tripped or disconnected

Network codes improve coordination and data exchange - and streamline emergency procedures

23% of tasks and methodologies are already developed and completed



Essential European milestones

Intraday coupling
go-live
Q1/2018

RSCs implemented
12/2018 and
Synchronous Area
Operational
Agreement *03/2019*

All connection
codes implemented
09/2019

Common platform for
balancing implemented
Q3/2019

Day-ahead market
coupling fully
implemented
12/2020

And more
to come...

Integrate wholesale
and retail markets

Realize demand
side response

DSO-TSO
cooperation

Cybersecurity

Thank you for your attention
