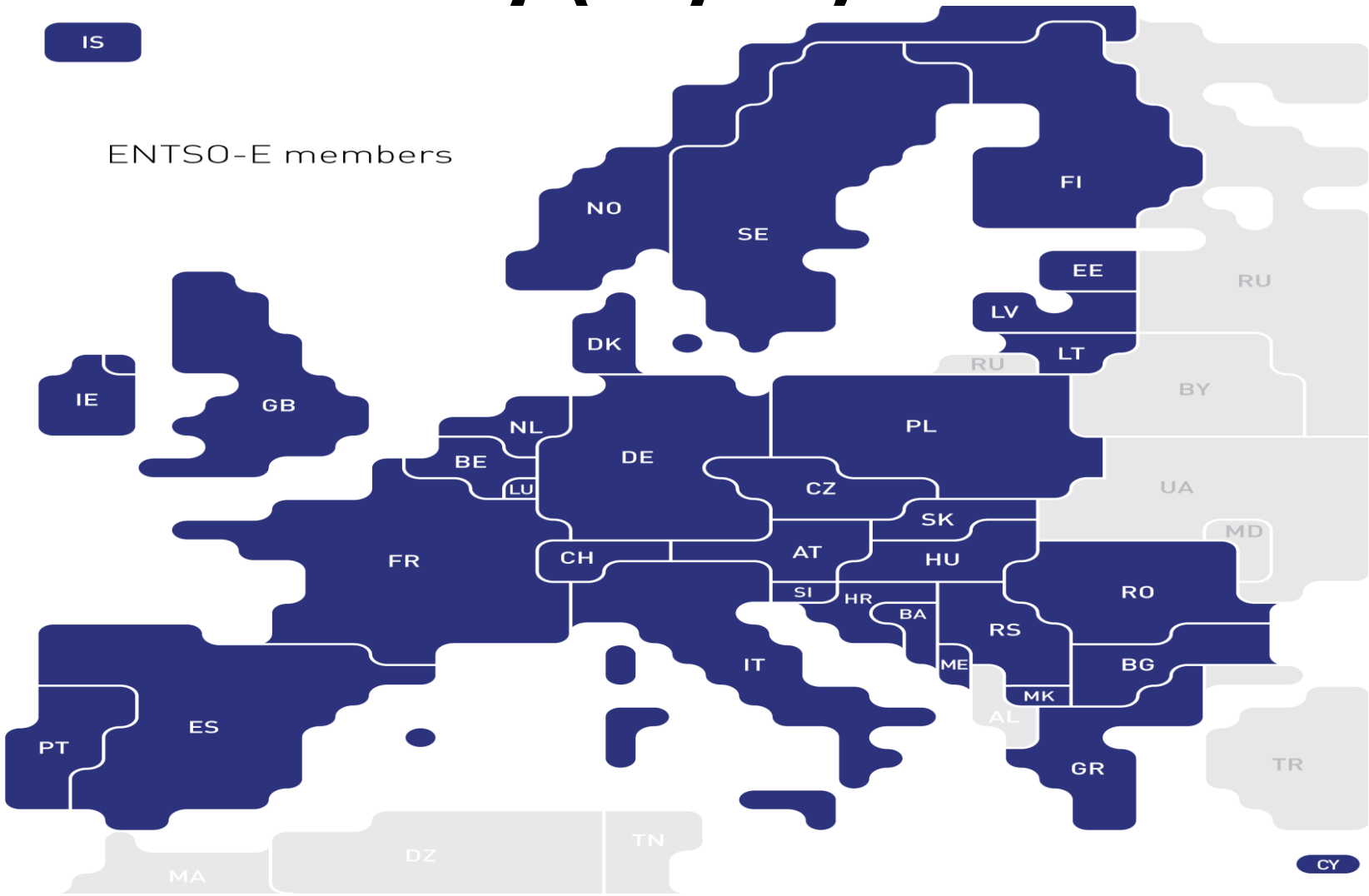
The new faces of electrical power networks coordination

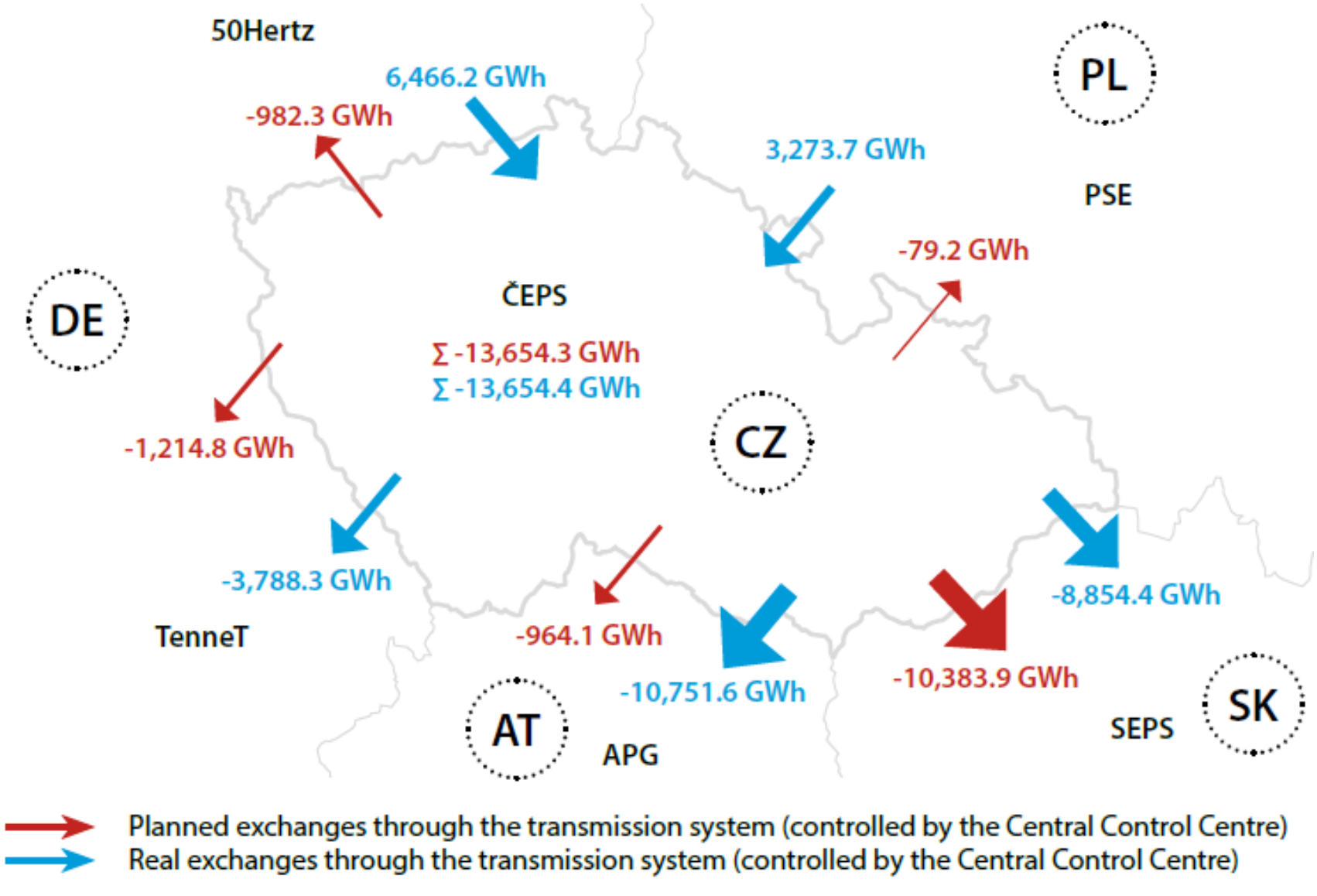
Miroslav Vrba

Interconnected European meshed grid an advantage or threat?

Transmission network operators ENTSO-E today (43/36)



Physical vs commercial world

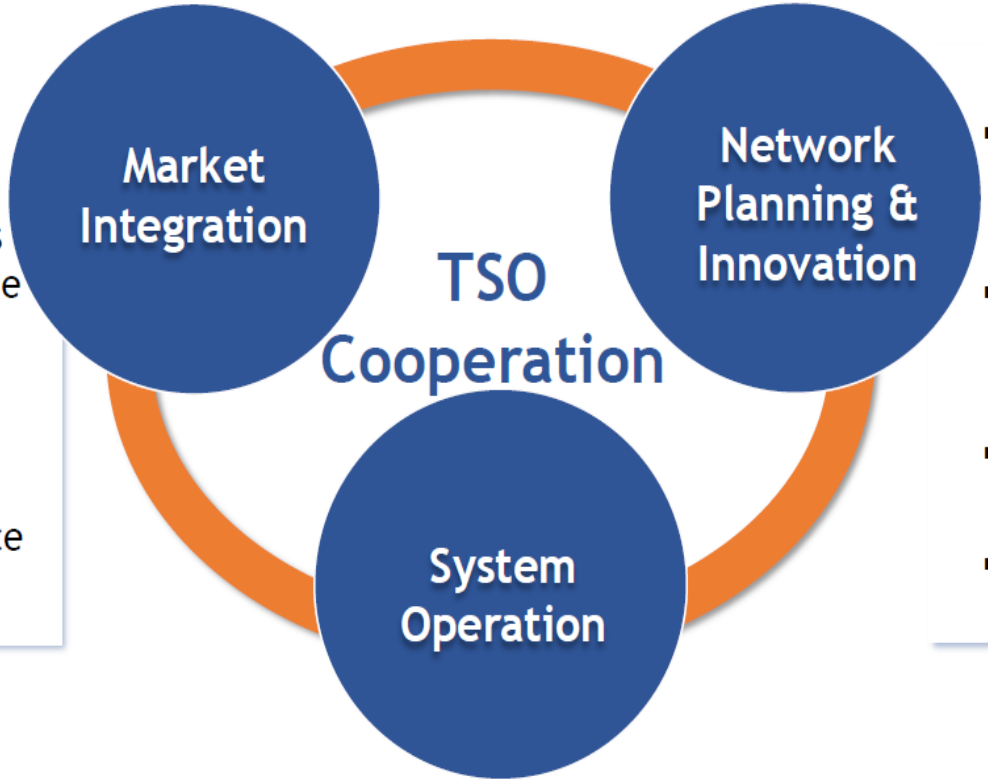


Role of TSO's: balance between security of supply and efficient markets

- Develop and maintain **adequate** and reliable transmission capacity
- Allow the market to use the **available** transmission capacity – taking into account security limits
- Do final **balancing** of supply and demand using „near-real time markets" and ancillary services (reserve activation)
- Develop **market rules** to make markets more efficient
- Increase **transparency**

What TSOs do for Europe?

- TSOs drive Market Integration
- TSOs engage in numerous Initiatives to integrate the Market
- TSO initiatives foster Increased Cross-Border Trade
- TSO initiatives foster Price Convergence



- TSO Coordinated Planning generates Welfare Gains
- TSOs actively engage in Innovation/New technologies
- TSOs couple Distant Markets
- TSO Measures to foster Acceptance

- TSOs anticipated need for cooperation
- TSOs efficiently responded to new challenges
- TSO Regional Cooperation is a Success Story
- Despite of new challenges Maintenance of high level of security of supply

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EVOLUTION IN POWER SYSTEM OPERATION

Where we were in the past

- Large, steerable, and centralised generation
- One-way flow to consumers with predictable demand pattern

Where we are now

- Increasing proportion of small, intermittent and decentralised generation
- bidirectional flows at all voltage levels
- Reduced thermal generation
- Increasing smart technologies

Where we might go in the future

- Mixed generation portfolio of distributed, CCGTs and low carbon technologies
- Suite of new technology assets & services
- Engaged, active, prosumers
- Further electrification of transport
- Smart, data-centric system

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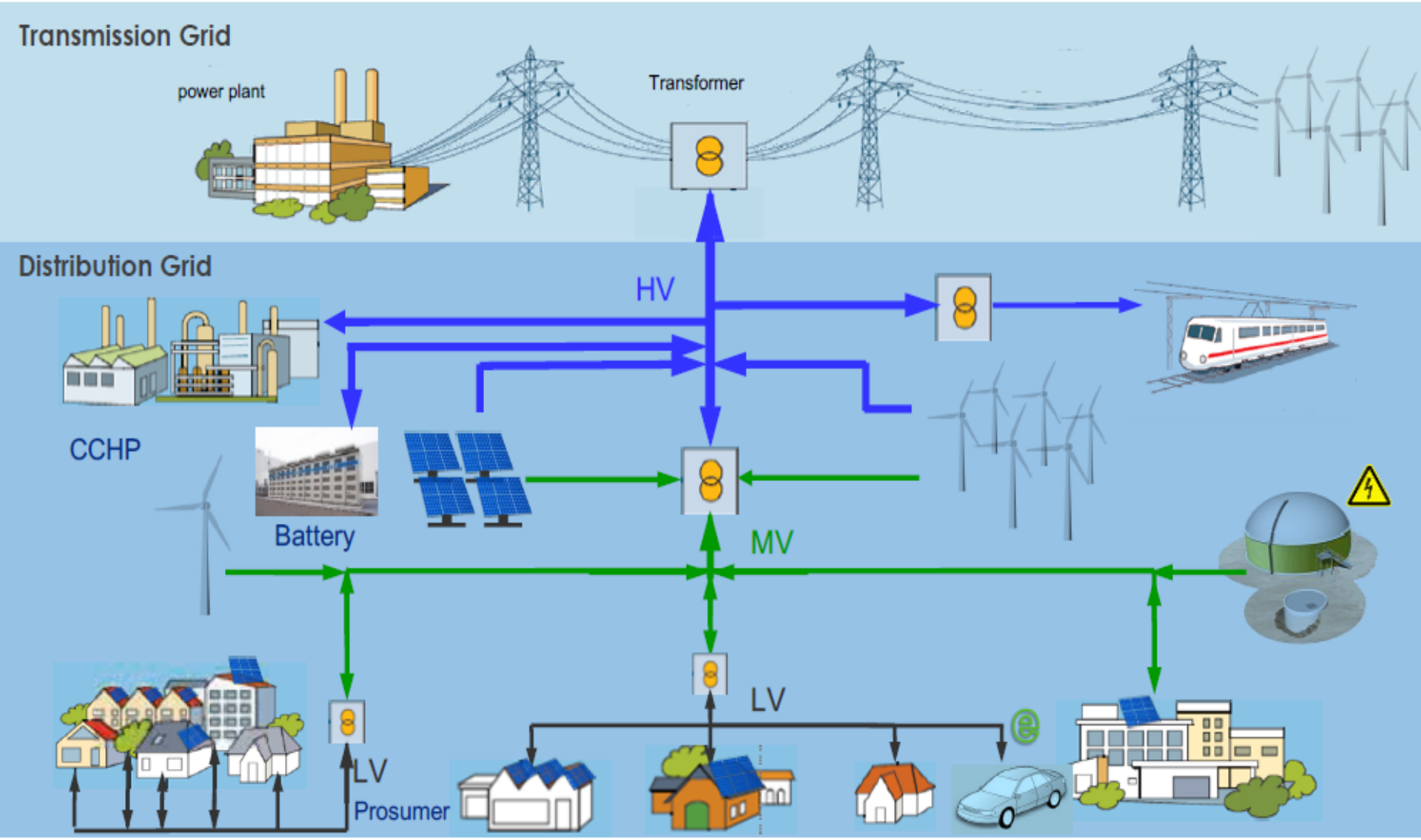
COMPLEXITY INCREASES WITH ENERGY TRANSITION



How to tackle compexity ?

Rules

Implement the EU codes

Enabling more RES & demand response connections

flow based

bidding zones review

Regional security coordinators

Physical capacity

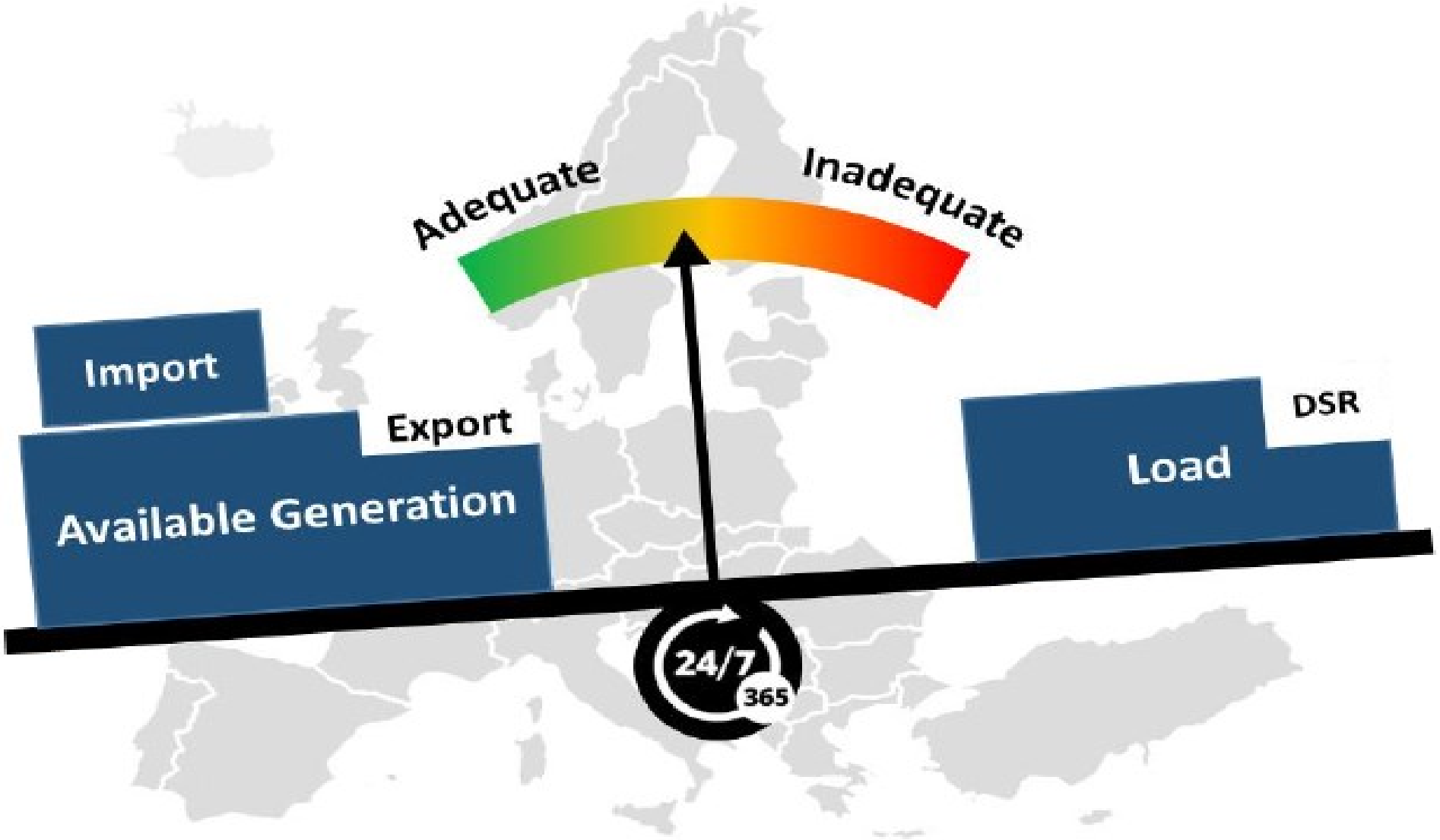
Strengthen the grid

Including links inside countries

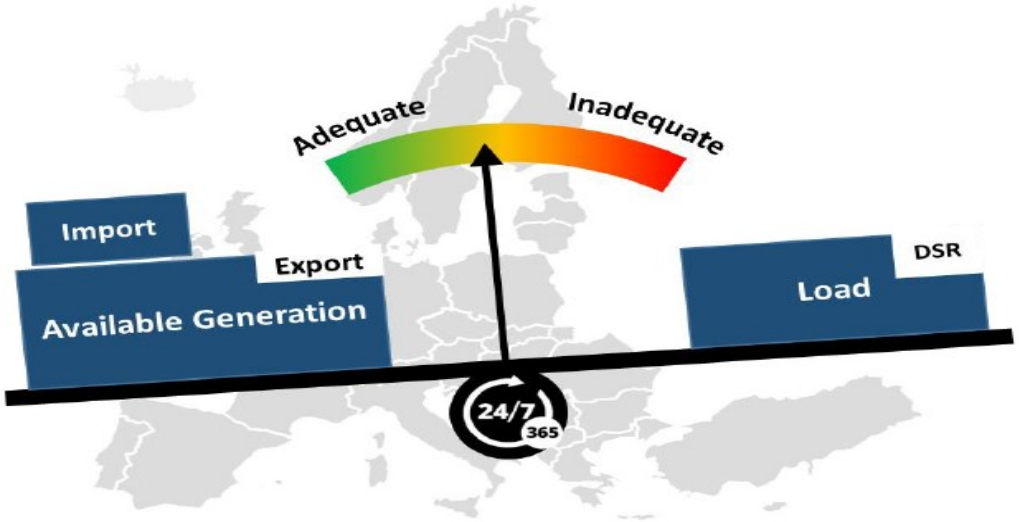
Cooperation

Enhance existing cooperation at all levels

How to keep lights on



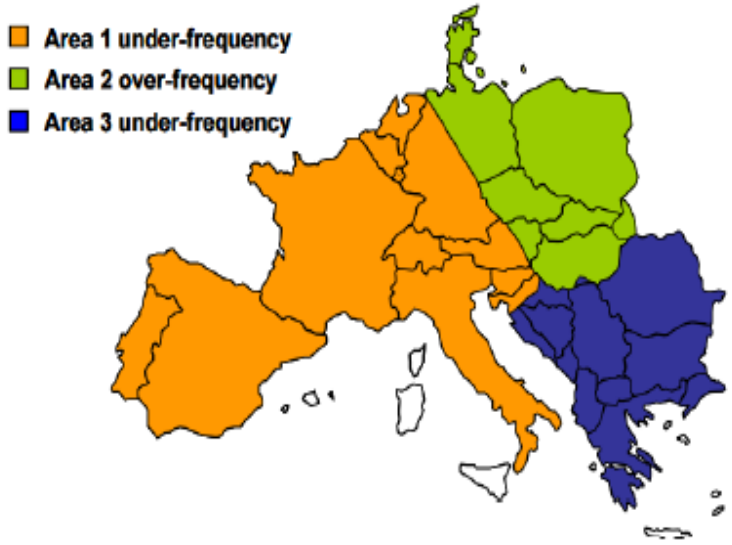
Short-term adequacy



Generation	Storage	Load
=	=	=
Known Information: •Capacities •Planned Outages	**Known Information:** • Network availability • Planned Outages	**Known Information:** • Demand profiles • Demand side response
+	+	+
Uncertainties: • Wind generation • Solar generation • Forced outages	**Uncertainty:** • Forced Outages	**Uncertainty:** • Weather conditions

Driving forces of changes: stressed situations

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



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

European Awareness System, RSC Coordination, and Network Code Implementation mitigate risks of Critical Grid Situations

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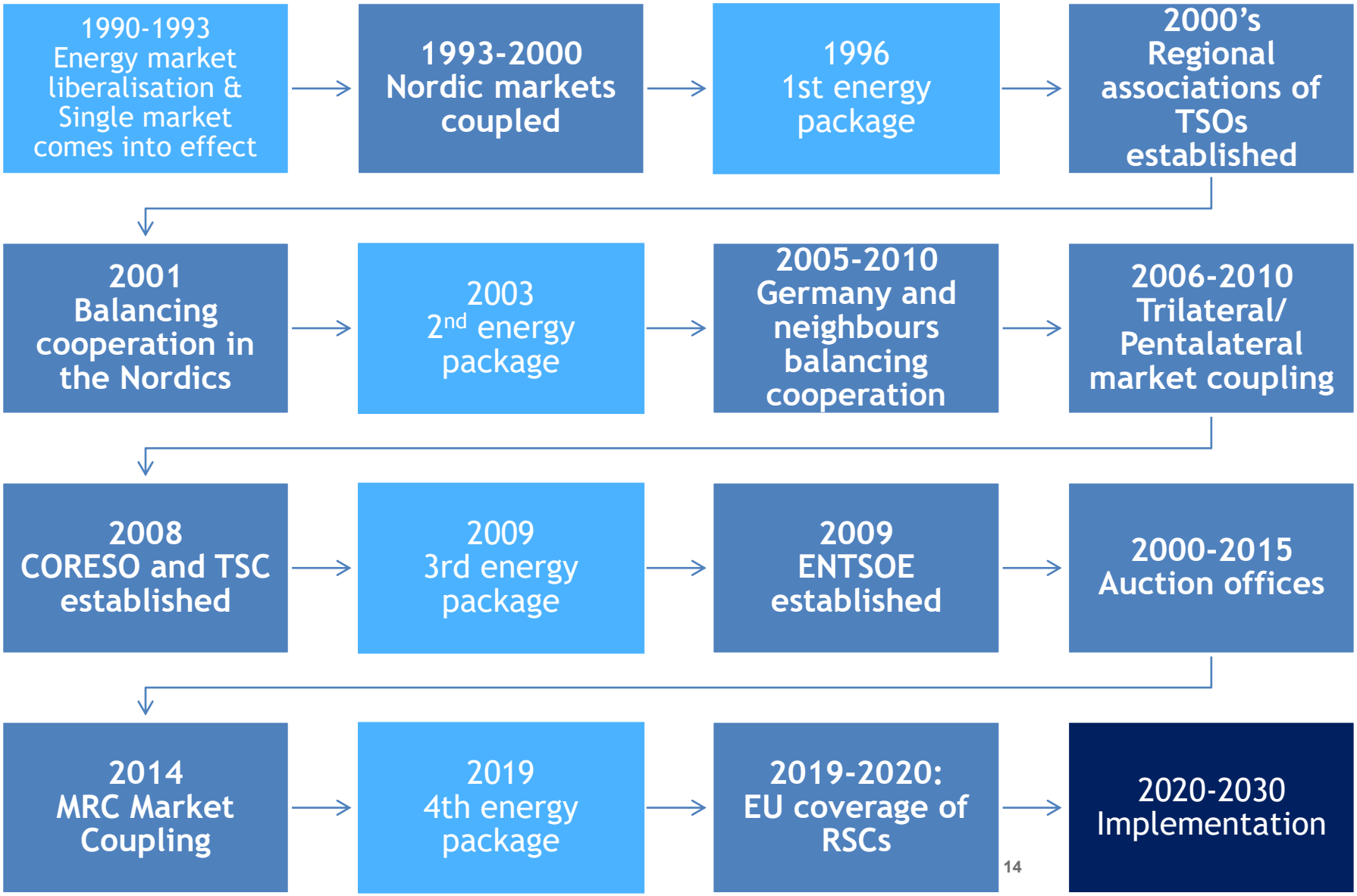
Driving forces for changes: market development

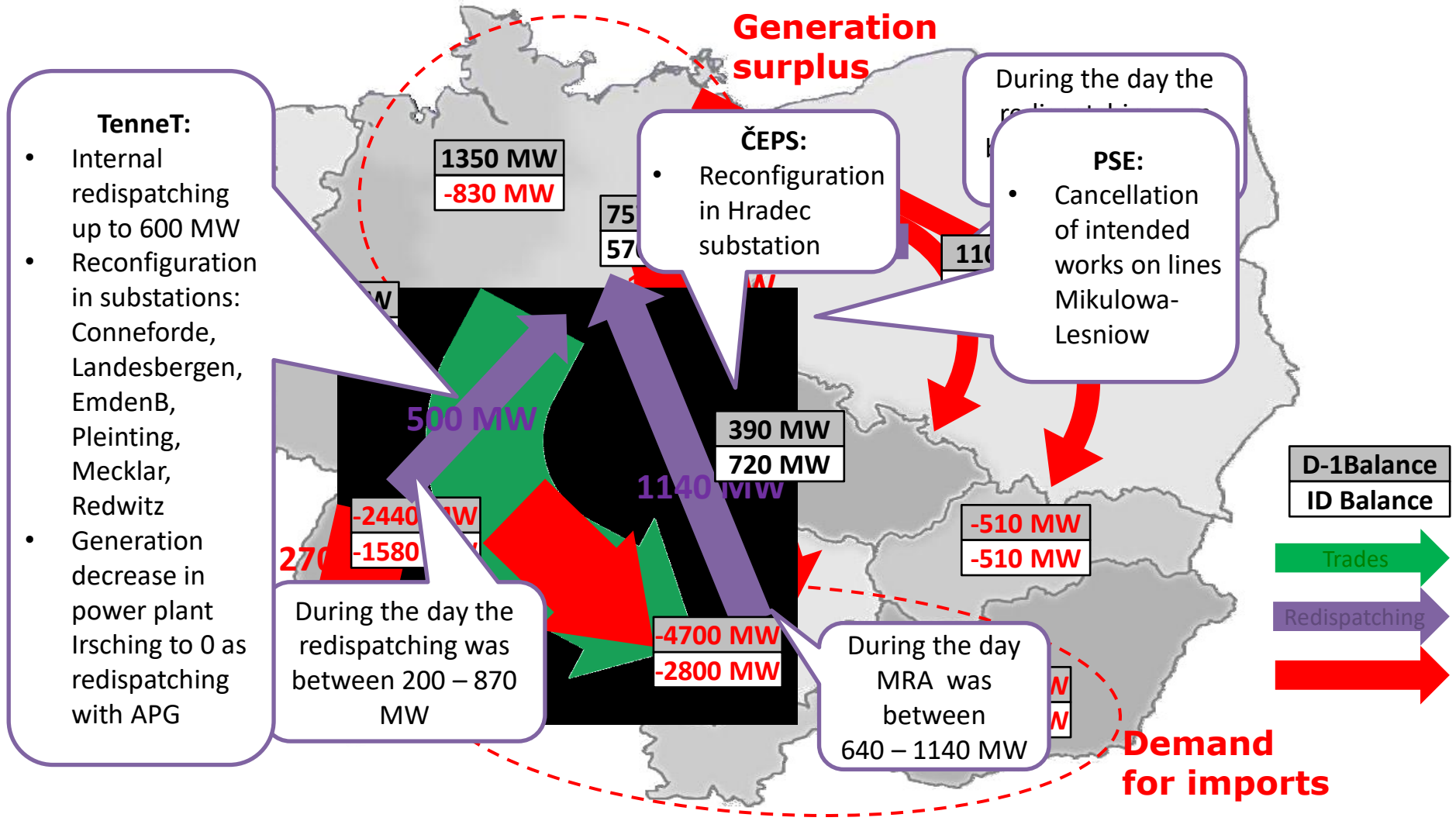
REGIONAL DAY AHEAD IMPLICIT AUCTIONS		
	North West Europe (NWE)	Price coupling
	Poland	PL coupled with NWE through SwePol (and LitPol Dec. 2017)
	Ireland and Northern Ireland	All Island market, single price zone
	Czech – Slovak – Hungary-Romania	Price coupling

Source: APX, updated by Matti Supponen in October 2017

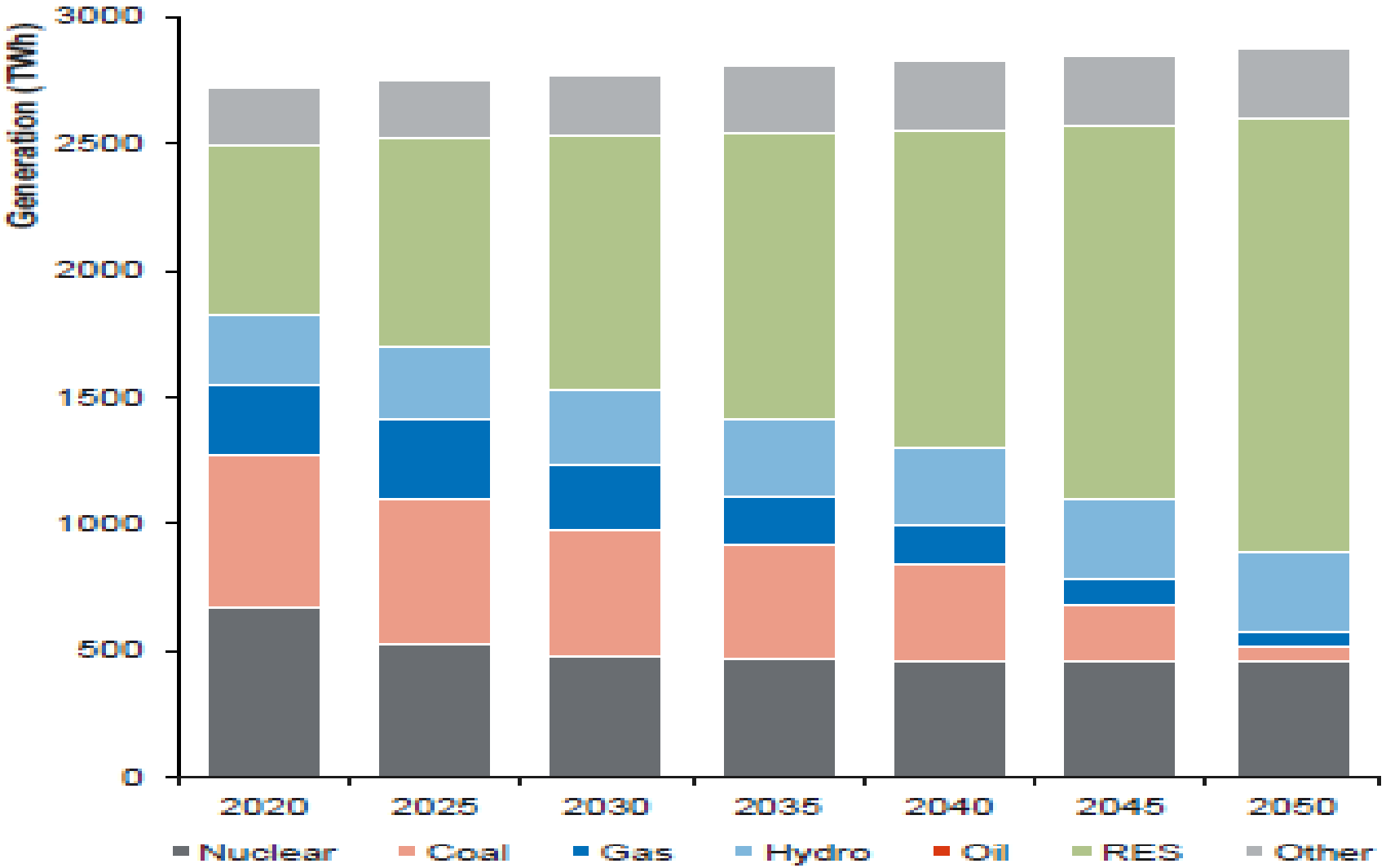
Evolution of electricity market in Europe



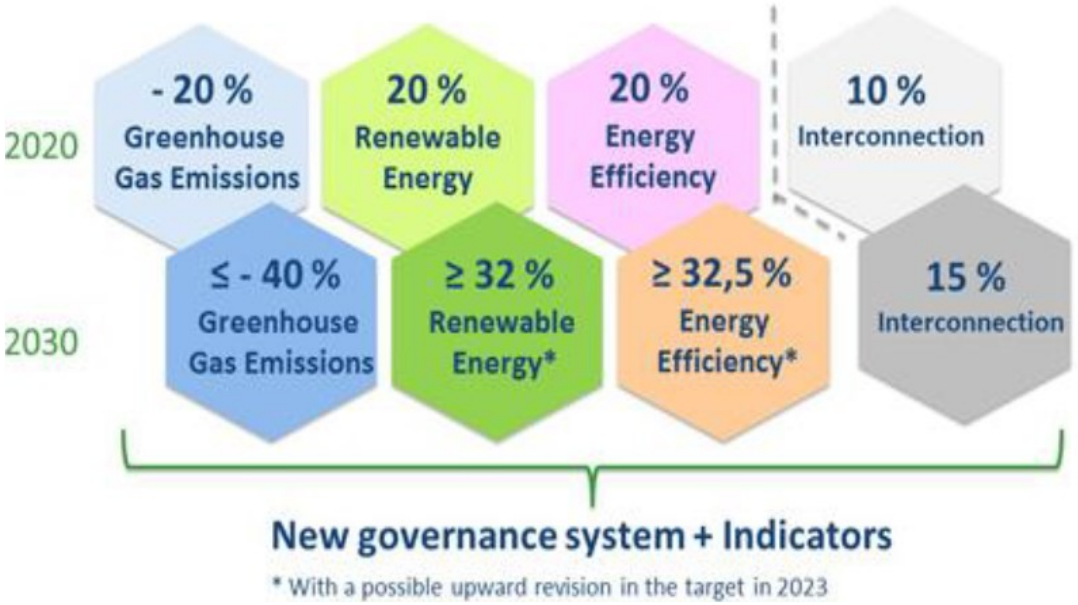
Driving forces for changes: congestion management



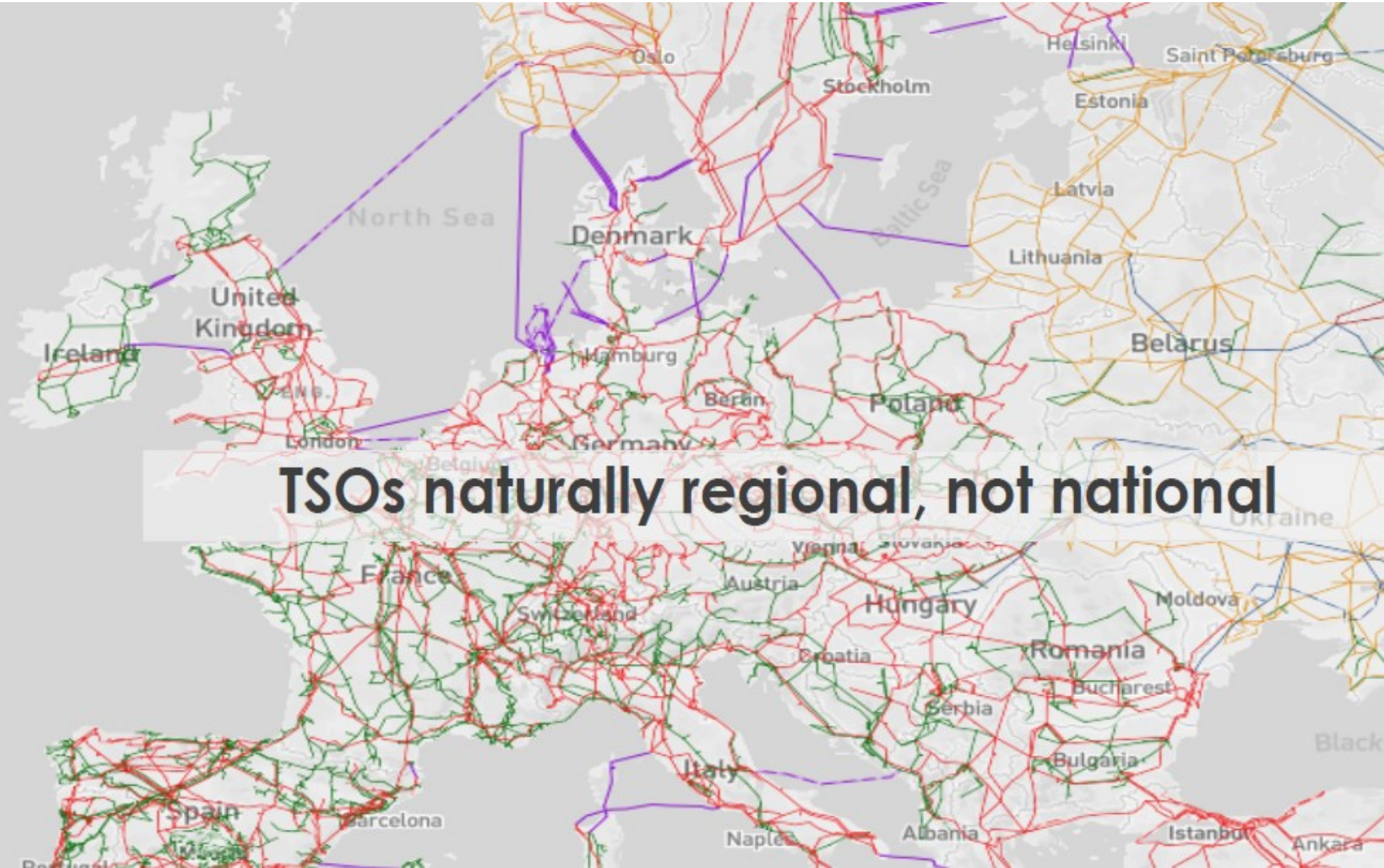
Driving forces for changes: decarbonisation of power generation



2020, 2030 & beyond

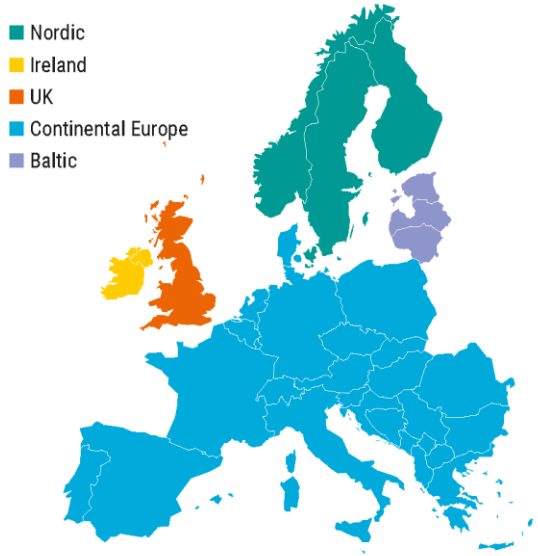


Right TSO's response ?

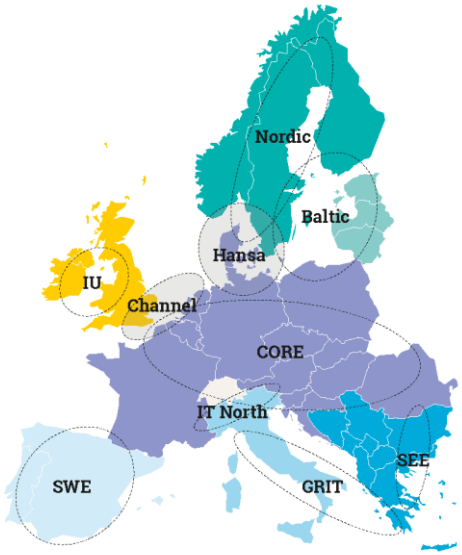


State of play of regional coordination in Europe

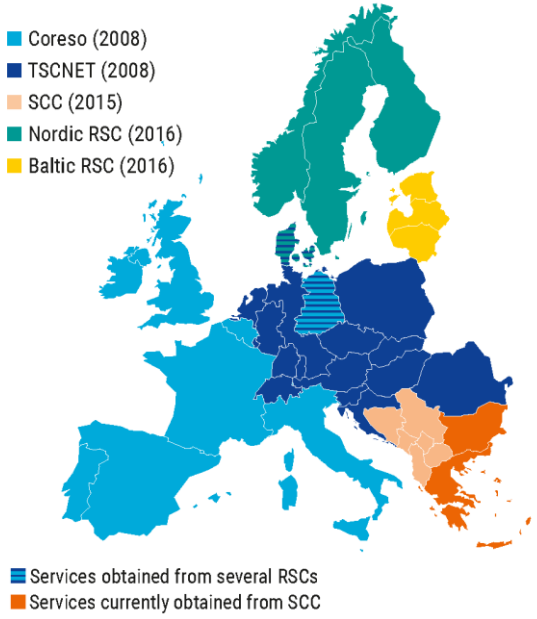
5 Synchronous Areas



10 Cap. Cal. Regs

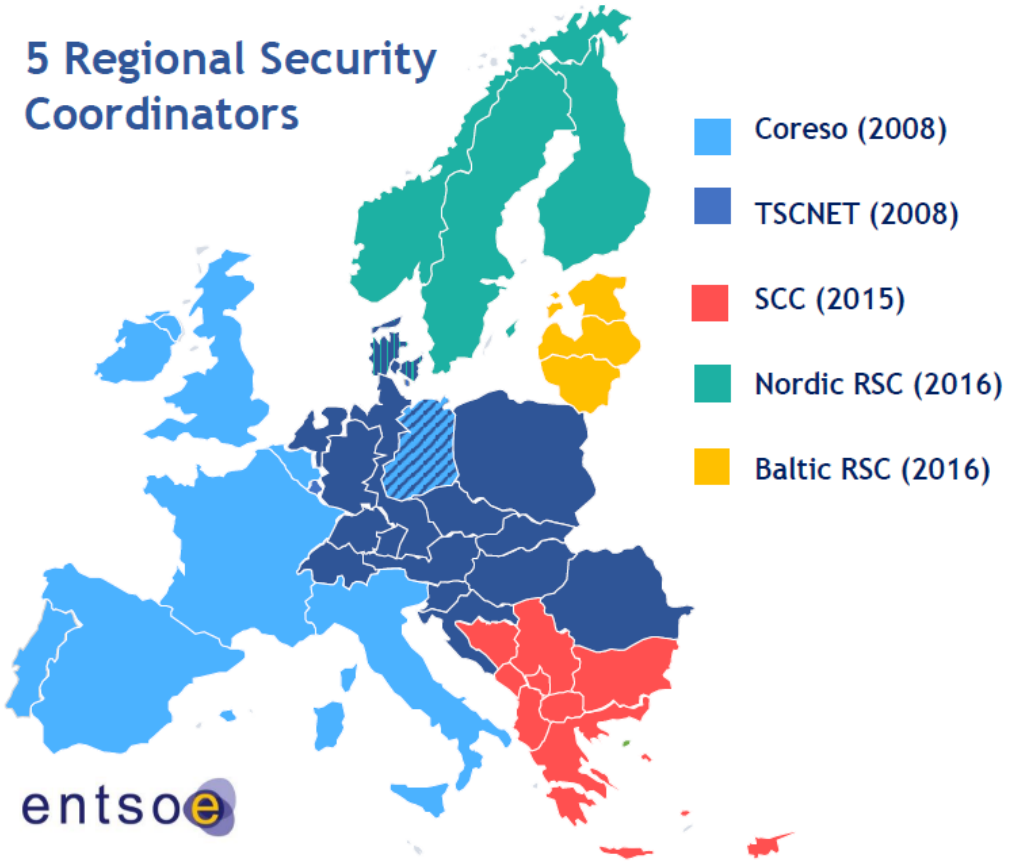


5 RSCs



Regional Security Coordinators in operation

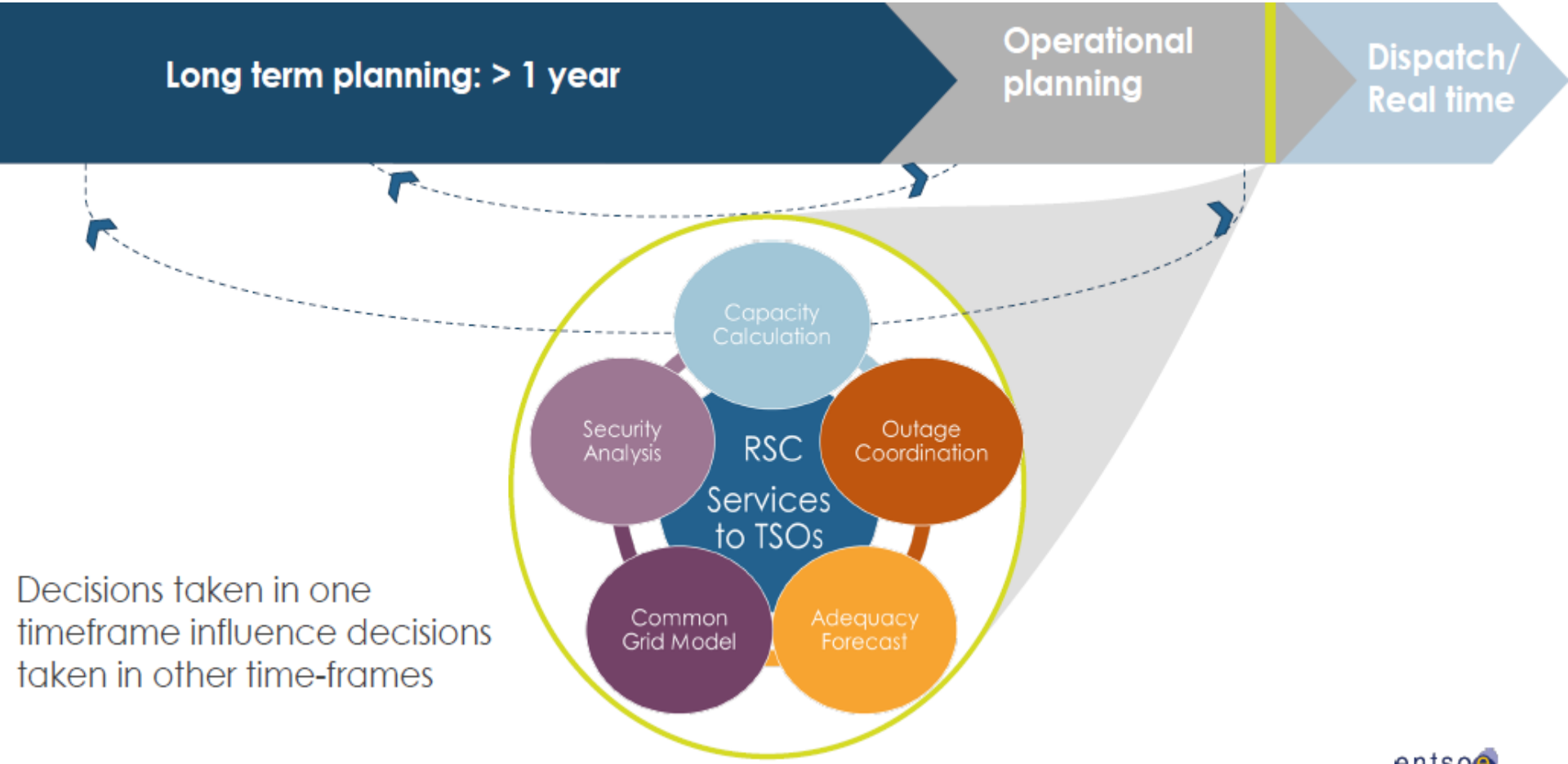
5 Regional Security Coordinators



5 coordinated services

- Security analysis
- Capacity Calculation
- Common Grid Model
- Outage planning
- Adequacy forecast

RSC support TSOs in operational planning



Decisions taken in one timeframe influence decisions taken in other time-frames

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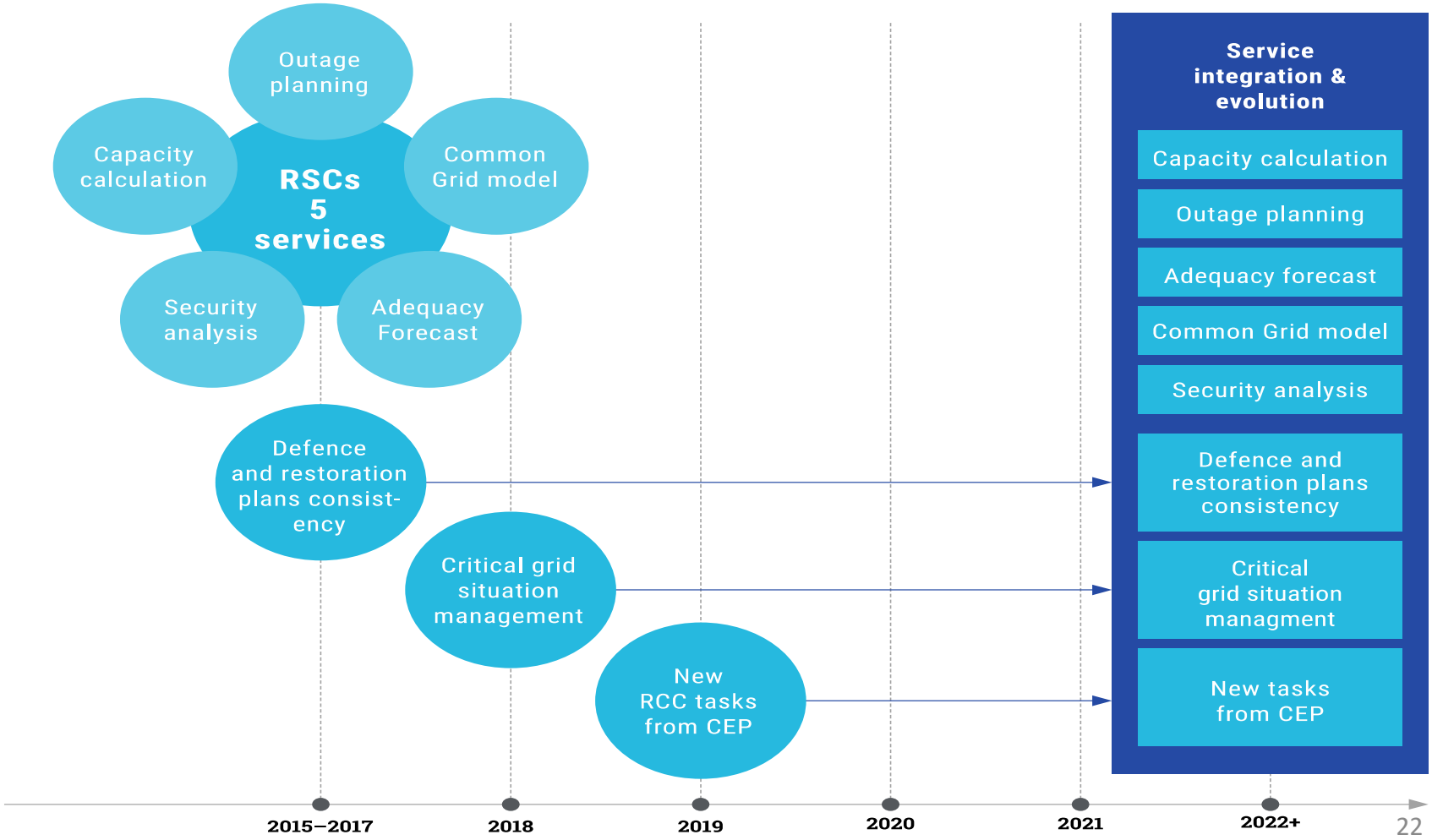
Evolution of regional coordinated services



Current roadmap for TSO regional coordination in markets & operations

	2018–2019	2020–2024	2025–2030
Expected realisation	• Design and implementation of NC methodologies • Design of balancing market, first NC platform projects go-live • Start of CEP implementation, including RCC tasks	**Network codes fully implemented** e.g. flow-based, EU balancing platforms, ISP/MTU=15 min, RSCs **CEP implementation (continued):** • Pan-EU adequacy assessment • RCC establishment • 70 % capacity target • CRMs • Risk Preparedness methodologies • TSO – DSO cooperation on EU level, DSR	• CCR evolution according to CACM provisions and efficiency considerations • 70 % capacity target achieved
Prerequisites to evolve to next phase of realisations	• Approval of relevant NC methodologies by NRAs/ACER, start of implementation of those • RSCs fully established and operational • Balancing market design is approved	• CCM, flow-based fully operational • NCs and methodologies alignment with CEP as relevant, removal of regulatory gaps • Coordination tasks are designed and developed • RCCs fully established and operational	

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Thank you for attention

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