

The new 3D Energy Transition : towards a new #DigitalGrid

Laurent Schmitt

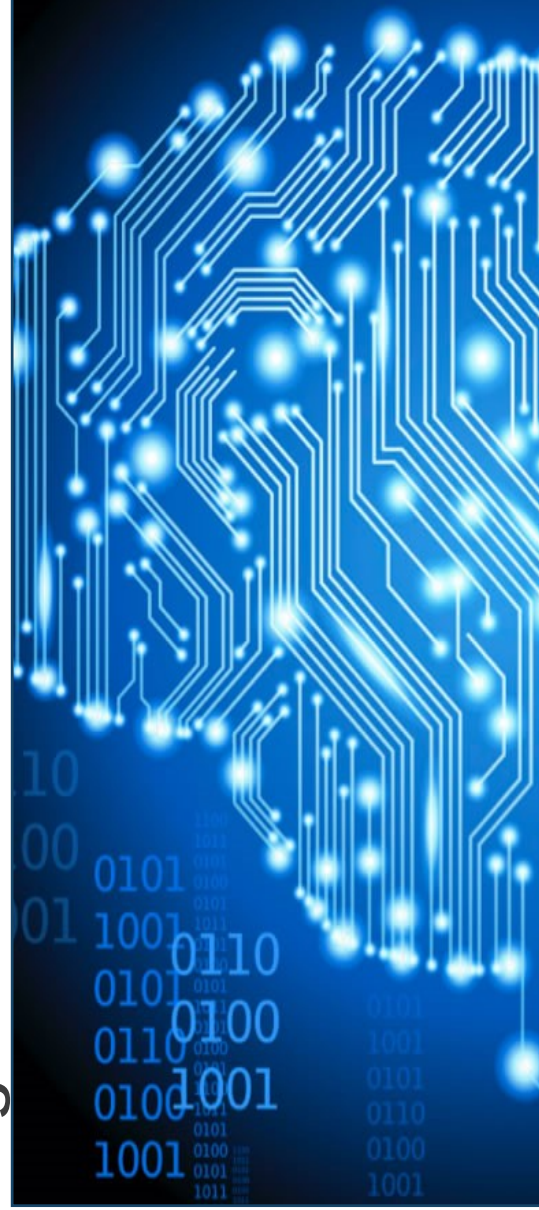
26 August 2019
16th IAEE European Conference

3 or 4D ?

Decarbonisation



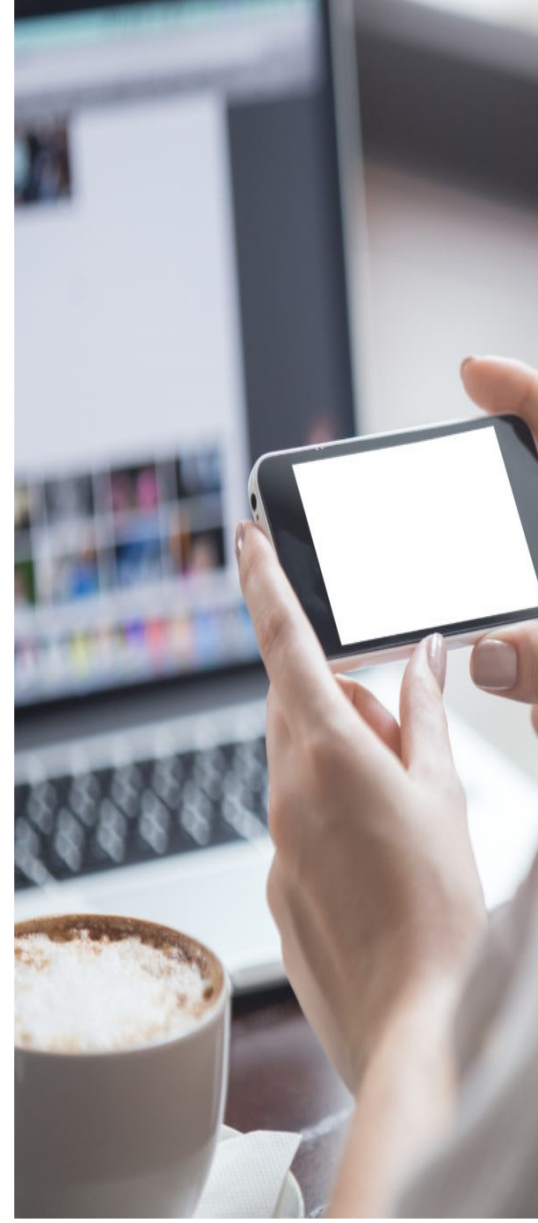
Digitisation



Decentralisation



Democratisation





"Enabling the energy transition"



Setting the #Energytransition scene



Keep global warming well below 2 C and target 1.5 C

= Halve the power sector emissions by 2030

COP25 – Implement the Paris Agreement

2020 Climate & Energy Package

20% reduction in GHGs
20% improvement in energy efficiency
20% of energy from renewables
10% electricity interconnection target

Clean Energy Package (2030) Targets

32.5 improvement in energy efficiency
32% of energy from renewables
15% interconnection target
Expected to deliver a 45% reduction in GHGs

2050 Energy Strategy

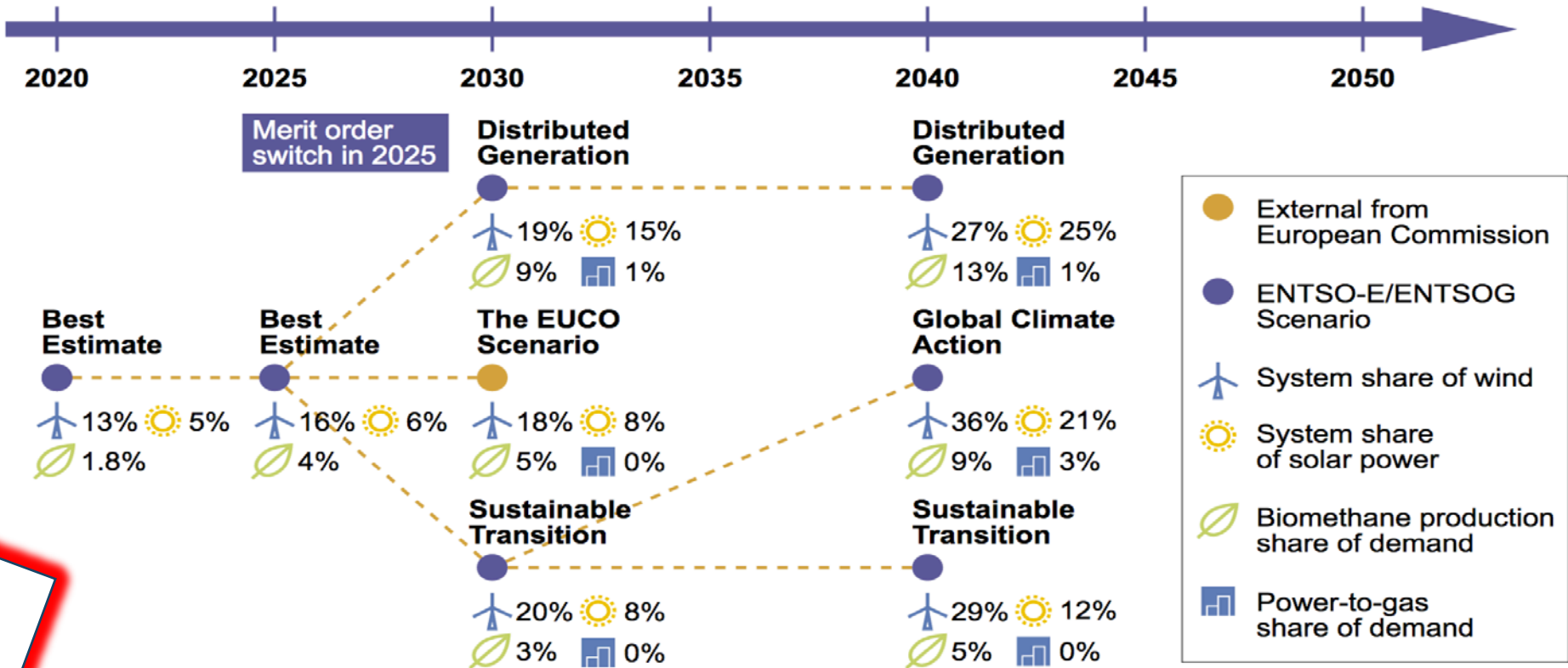
80 - 90% reduction in GHGs by decarbonising the entire energy system.

The 2050 Energy Roadmap explores the scope of available opportunities e.g. energy efficiency, nuclear energy, renewable energy and carbon capture and storage.

Up to 50RE ?

Up to full carbon neutrality ?

Need to identify best sound and realistic pathways for society at large



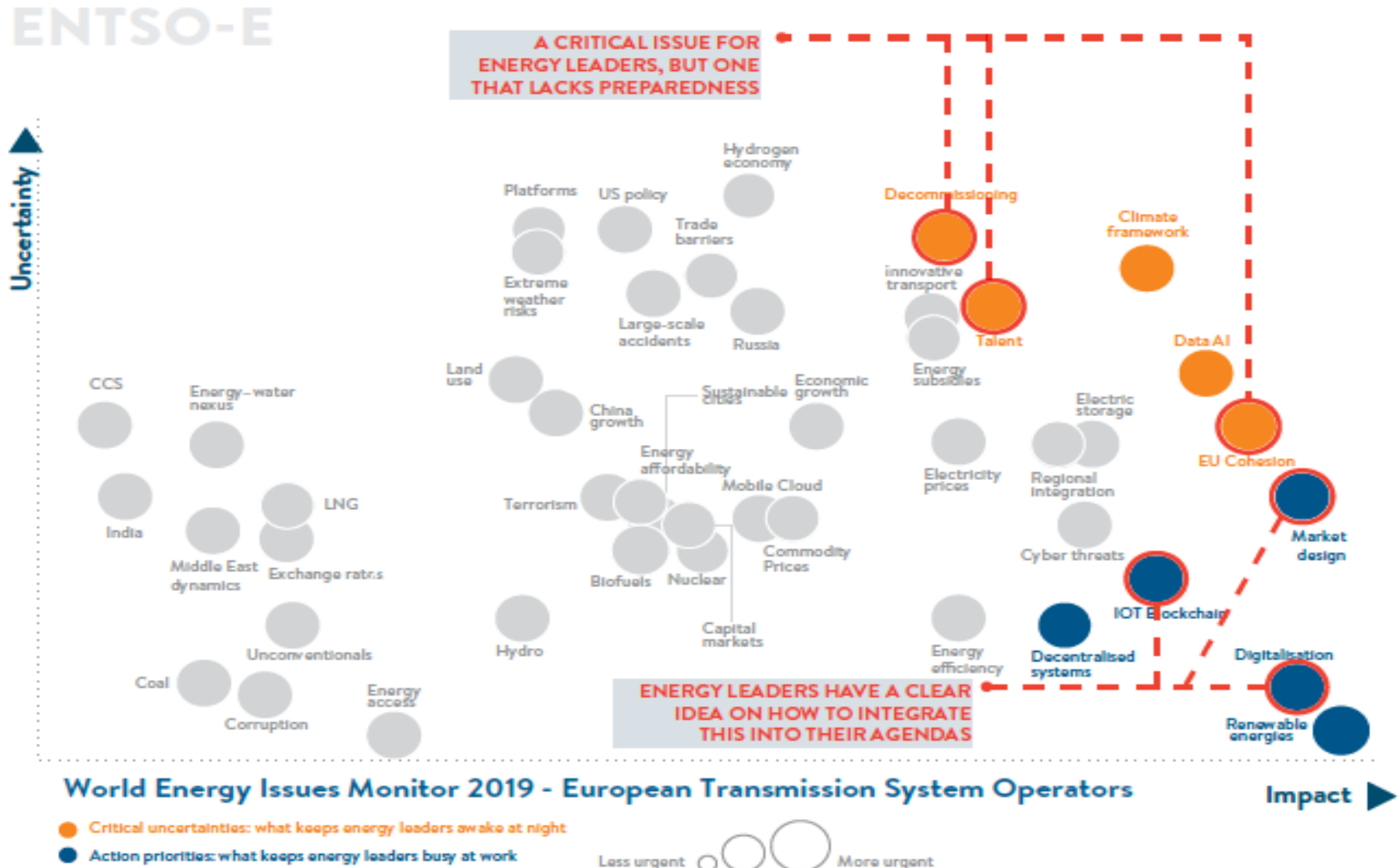
entsoe
POWERFACTS
EUROPE 2019

Currently Updated

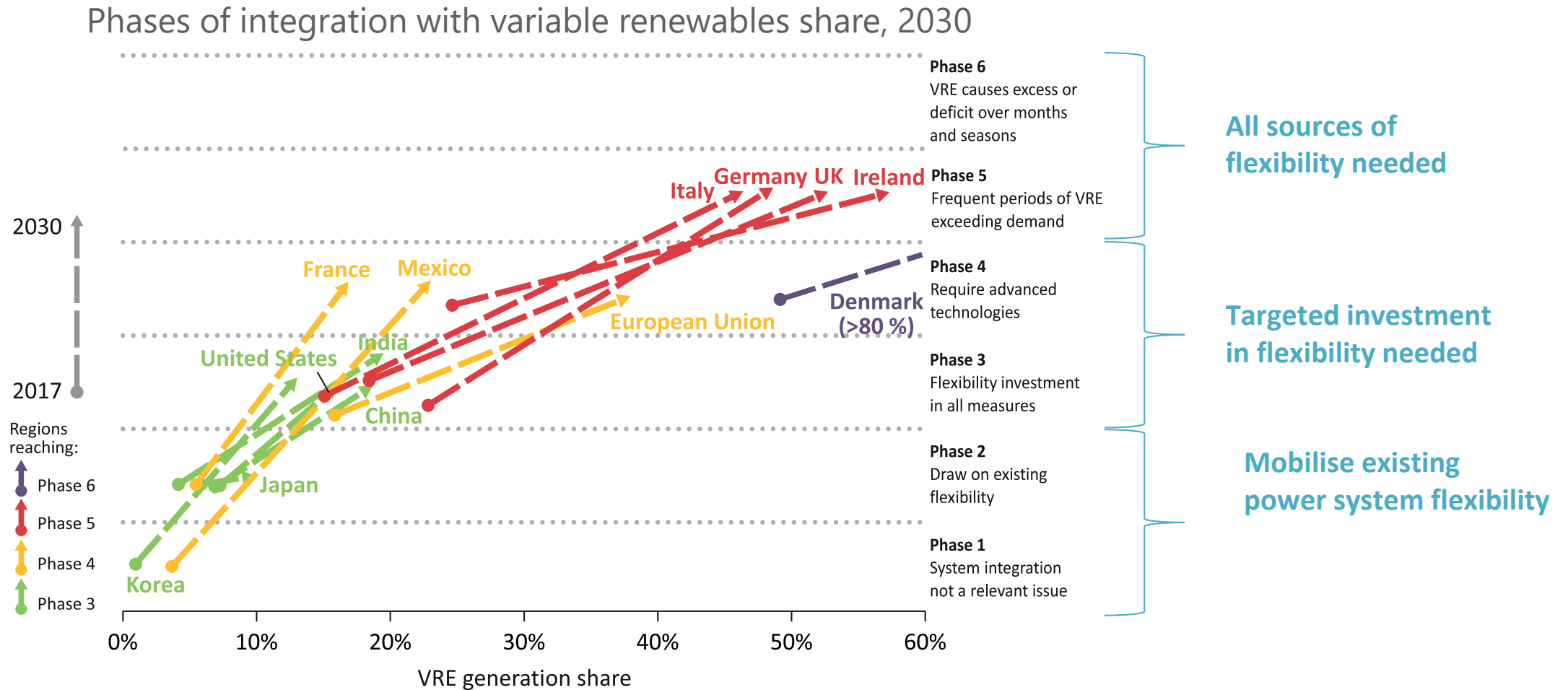
TYND 2018 Scenario Summary

Ten Year Network Development Plan and Mid Term adequacy are essential calculations to clarifies these European Pathway

Main issues that keep ENTSO-E Member TSOs C-level 'awake at night/ busy in the day'

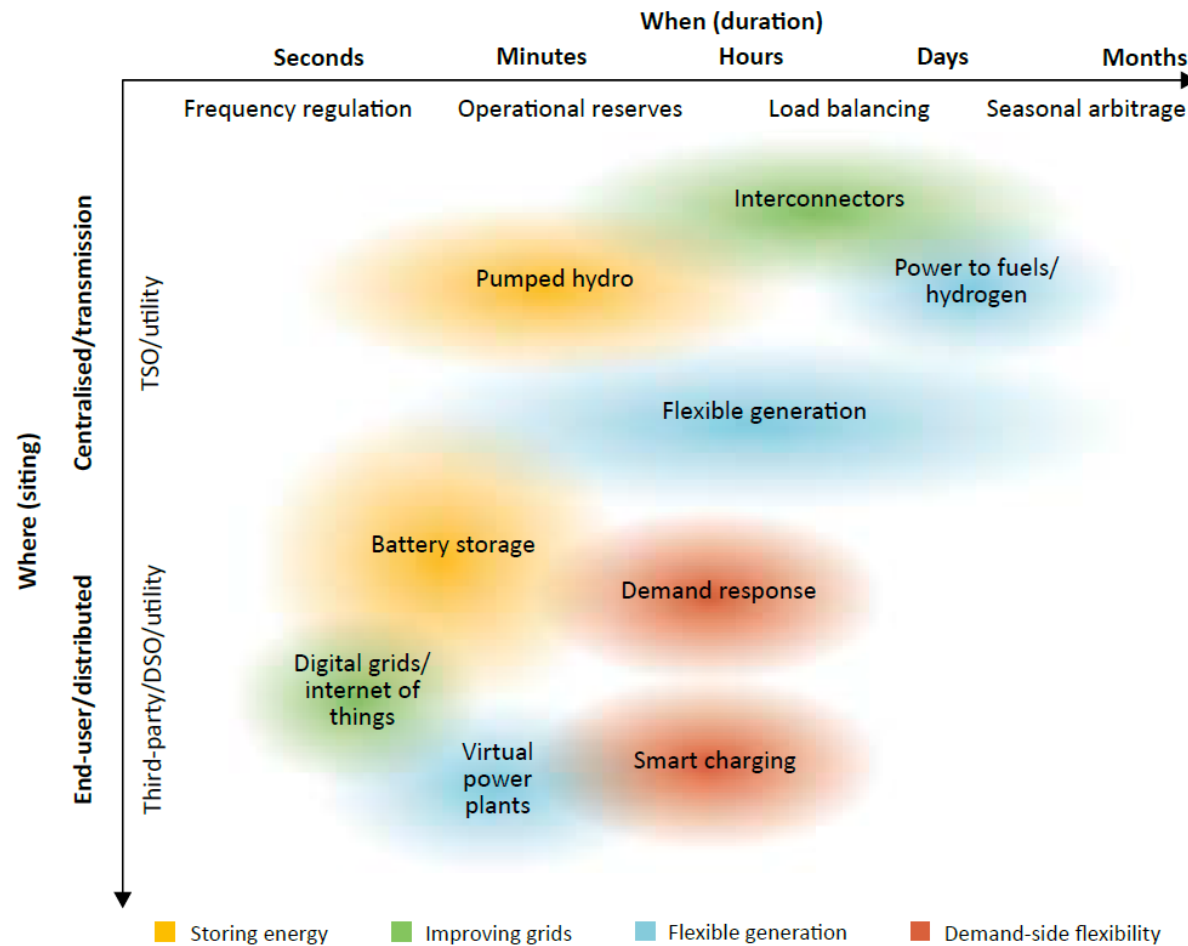


The new transition requires new forms of flexibility



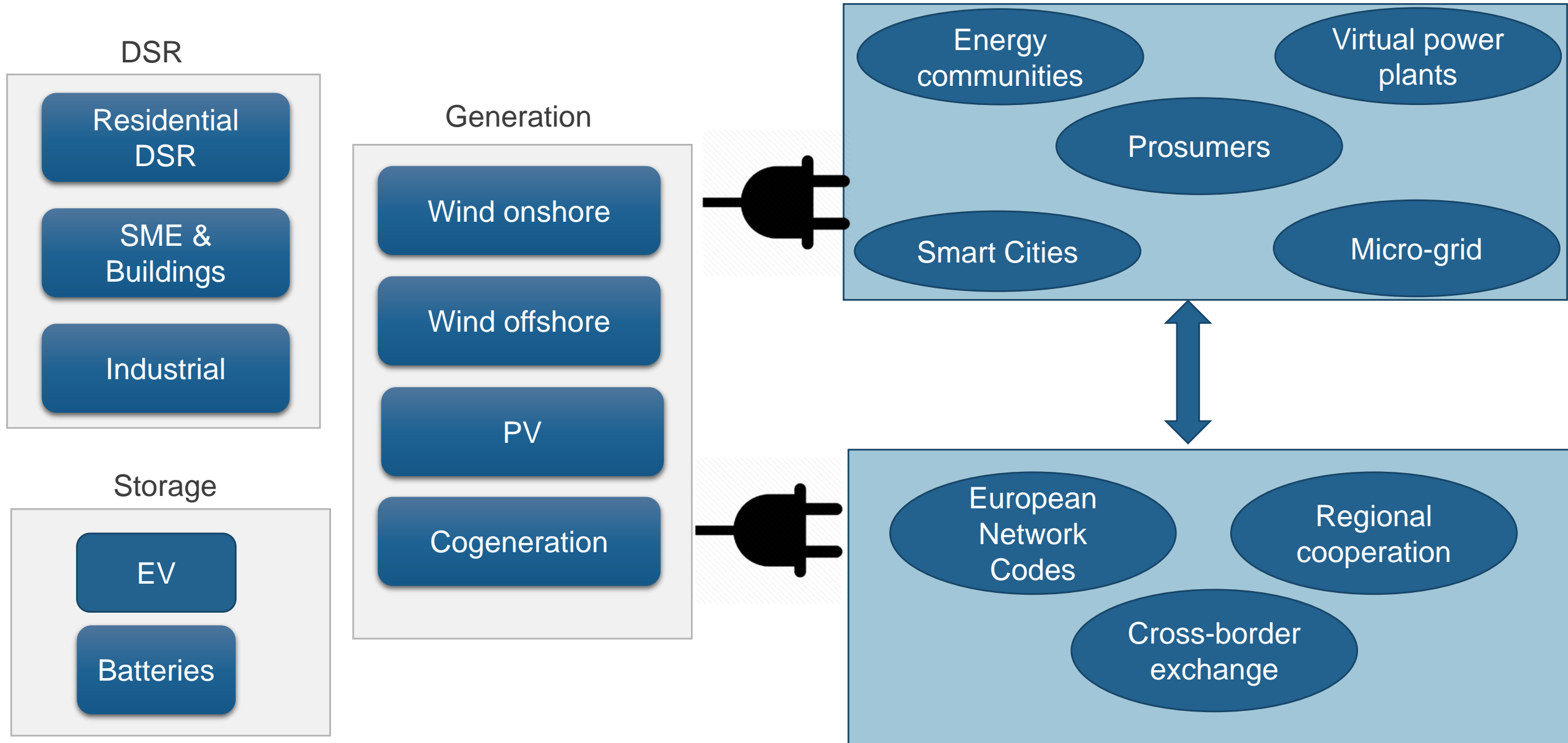
The size of the power system, flexibility of thermal generation, shape of demand profile, imply different needs for additional flexibility even at the same levels of VRE

New flexibility options emerge at the edge of the System



Expansion of electrification, distributed generation and variable renewables will broaden the need and range of flexibility options

New emerging actors and European governance



One System coordinated through regions

PLANNING

Regional planning used in the EU 10-year network development process (TYNDP)

TYNDP used as basis for the EU Projects of Common Interest



MARKETS

Internal Energy Market developed voluntarily & regionally

EU guideline on capacity allocation & congestion management



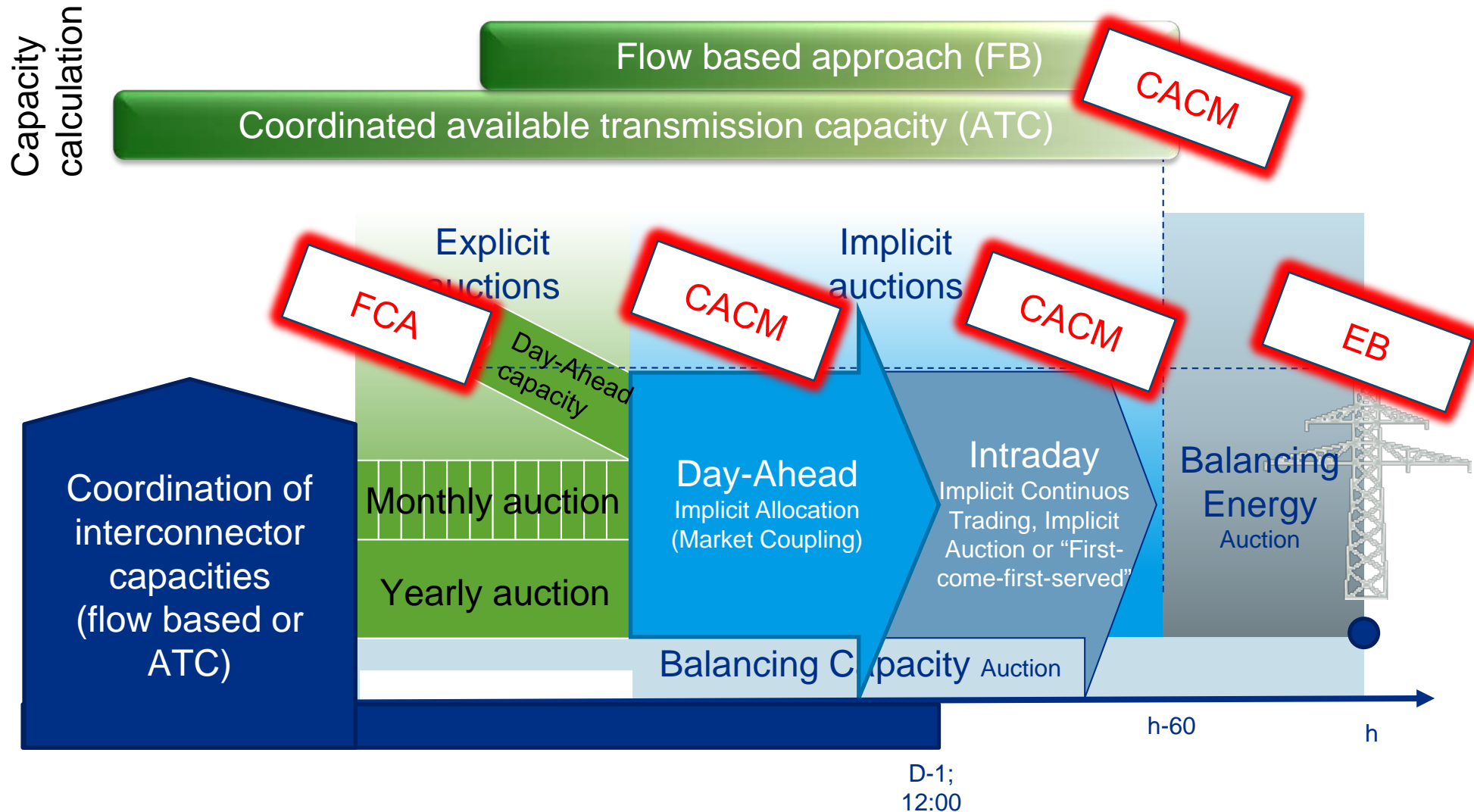
OPERATIONS

Regional security coordinators created on a voluntary basis

Registered in the EU system operation guideline



An evolving Electricity market model



Digital is mandatory today

Facilitate the EU code deployment



Enabling more RES & demand response connections

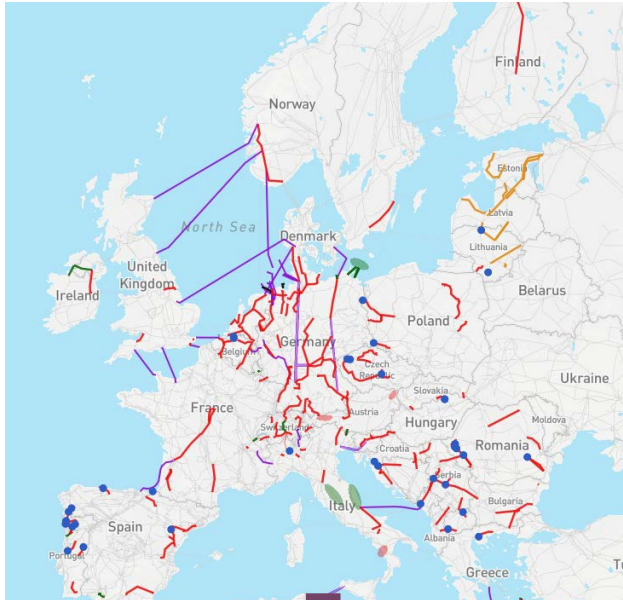
Flow based Bidding zones review
Real-time Markets

TSO-DSO Flexibility Platforms

Enhanced Regional security coordinators
Capacity Calculations

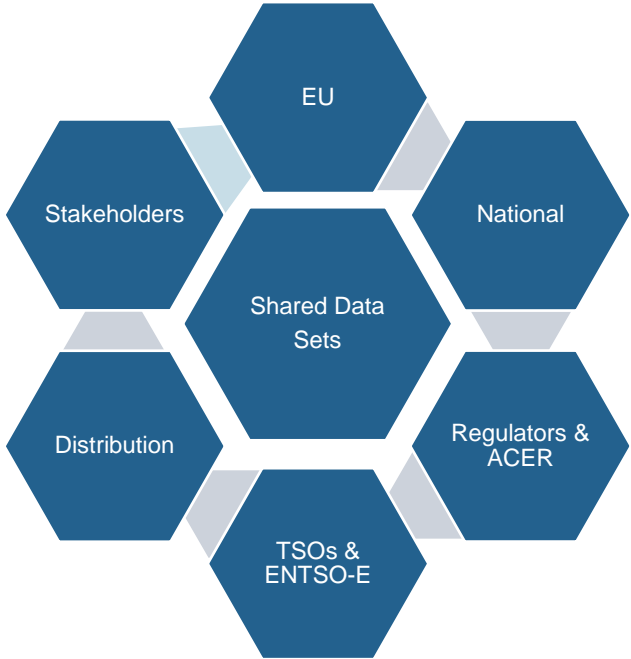
New Emergency Restorations

Increase Grid Transparency



Including links inside countries

Foster cooperation at all levels



High Level TSO Usecases for Grid Operators



RESILIENCY

- Real-time Asset conditions & limits assessment
- Low inertia Grid Stability, Wide Area Defense Plan & Natural Disaster Recovery
- New Regional Security coordination role



EFFICIENCY

- TSO Flow Based markets & DSO Market facilitation
- Digital Substation
- Integrated Grid Edge/OT & IT/cloud architectures
- New Energy Data Play



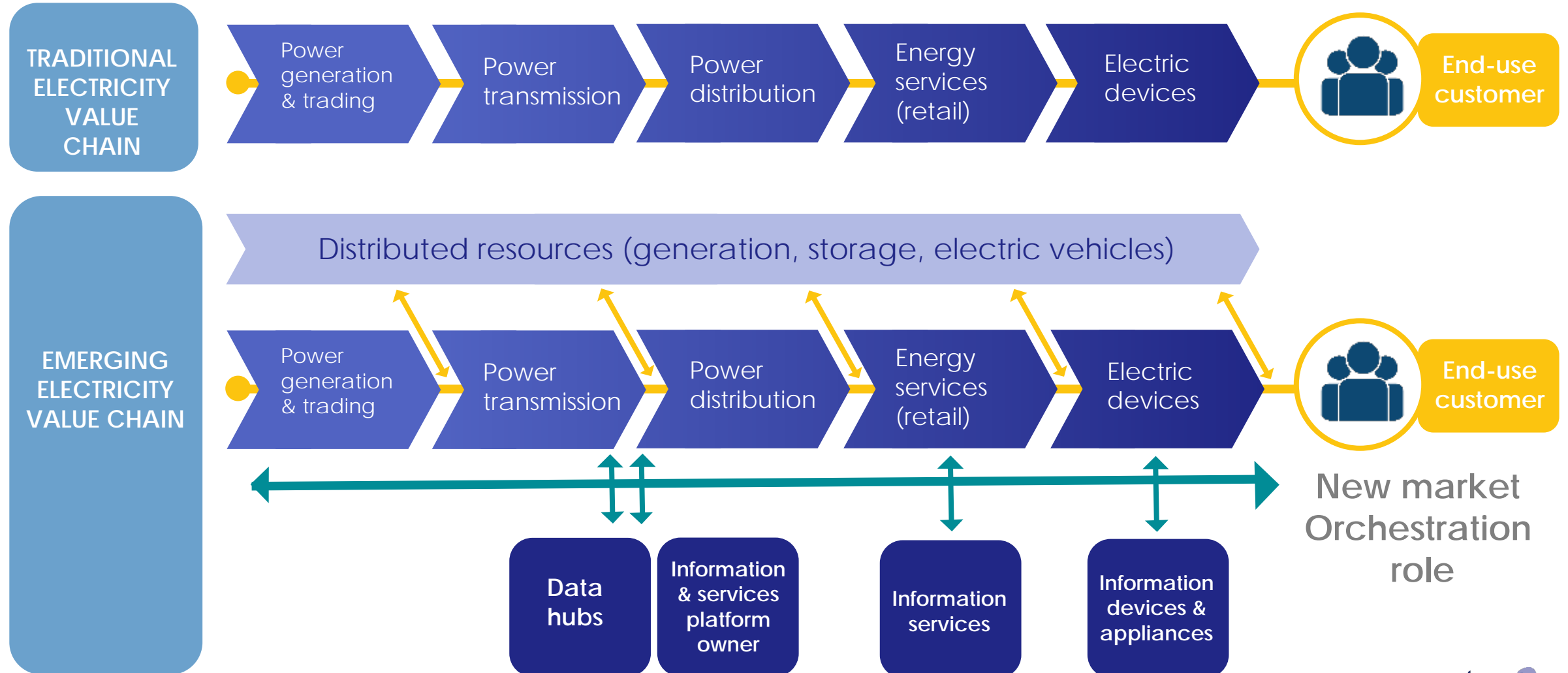
DER INTEGRATION

- Enable DER (renewable, storage, demand) Virtual Power Plant Aggregation
- Real-time DER integration into Grid Economic Dispatch & reserves
- New Smart Connection planning with renewable & community Microgrids

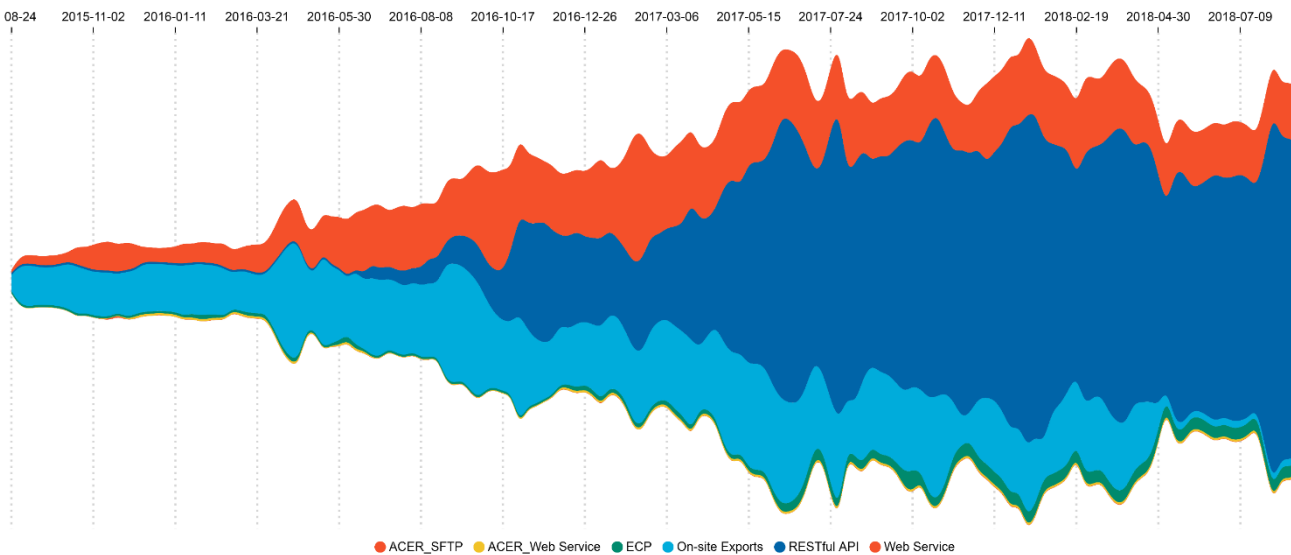
New Multi sided orchestration is required for market facilitation

— Power flow

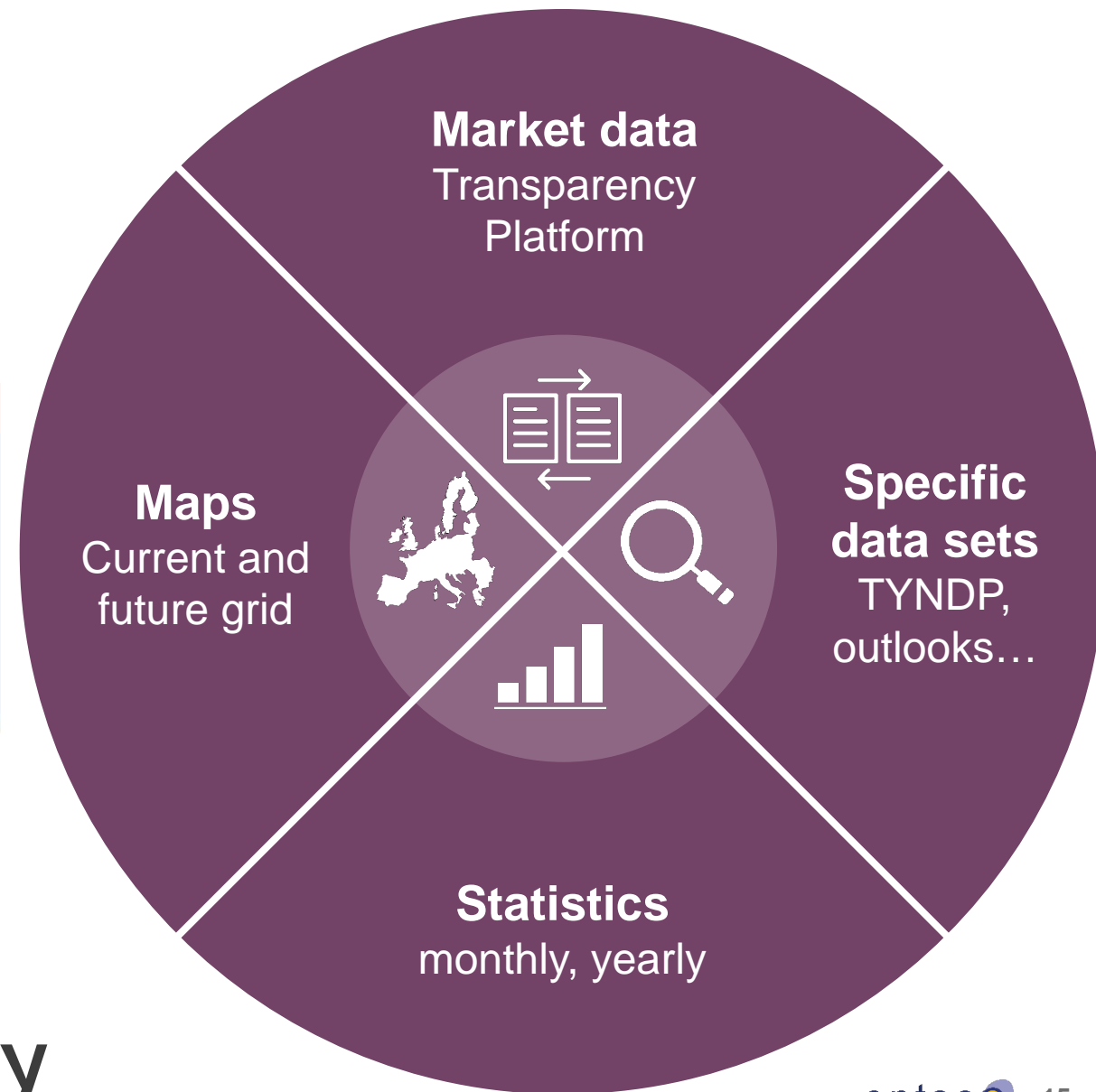
— Information flow



Grid Operators evolving towards data orchestrators...



46 Million files exchanged each week



...requiring new data policy

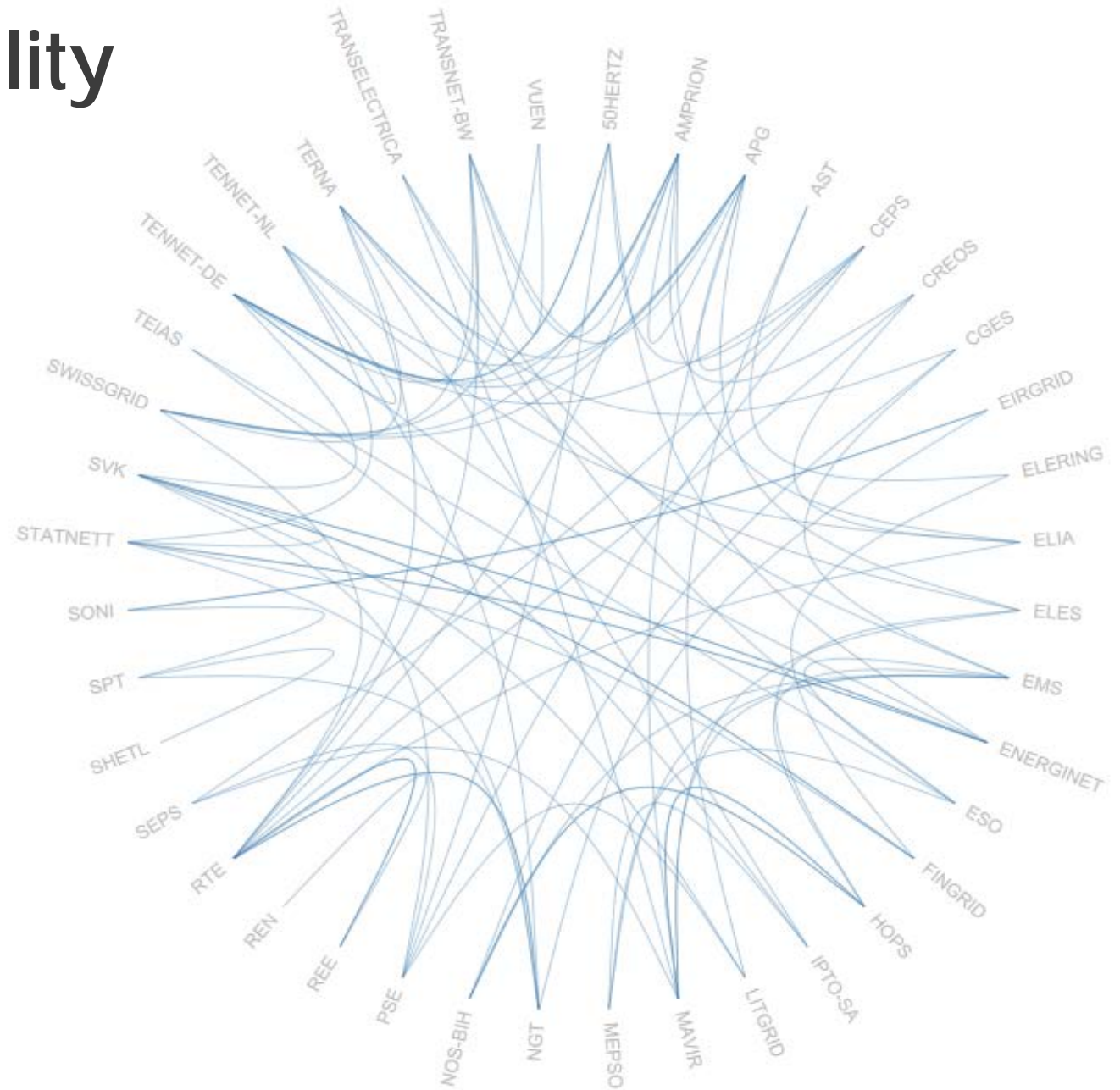
New Data Interoperability

The Common Grid Model

Smarter data sharing among TSOs for both market and security of supply

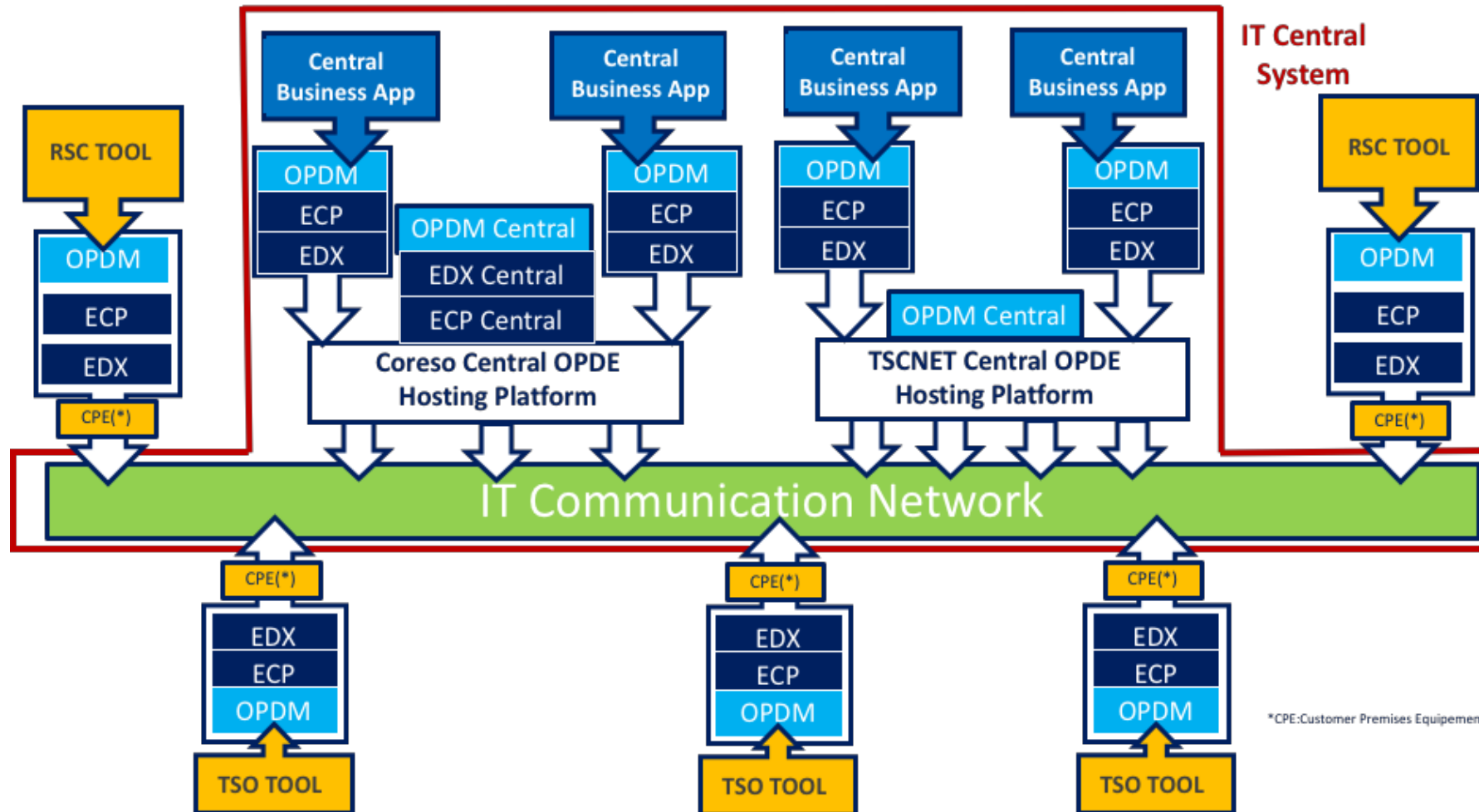
[How the CGM works:](https://www.youtube.com/watch?v=0bm4hqINTyI)

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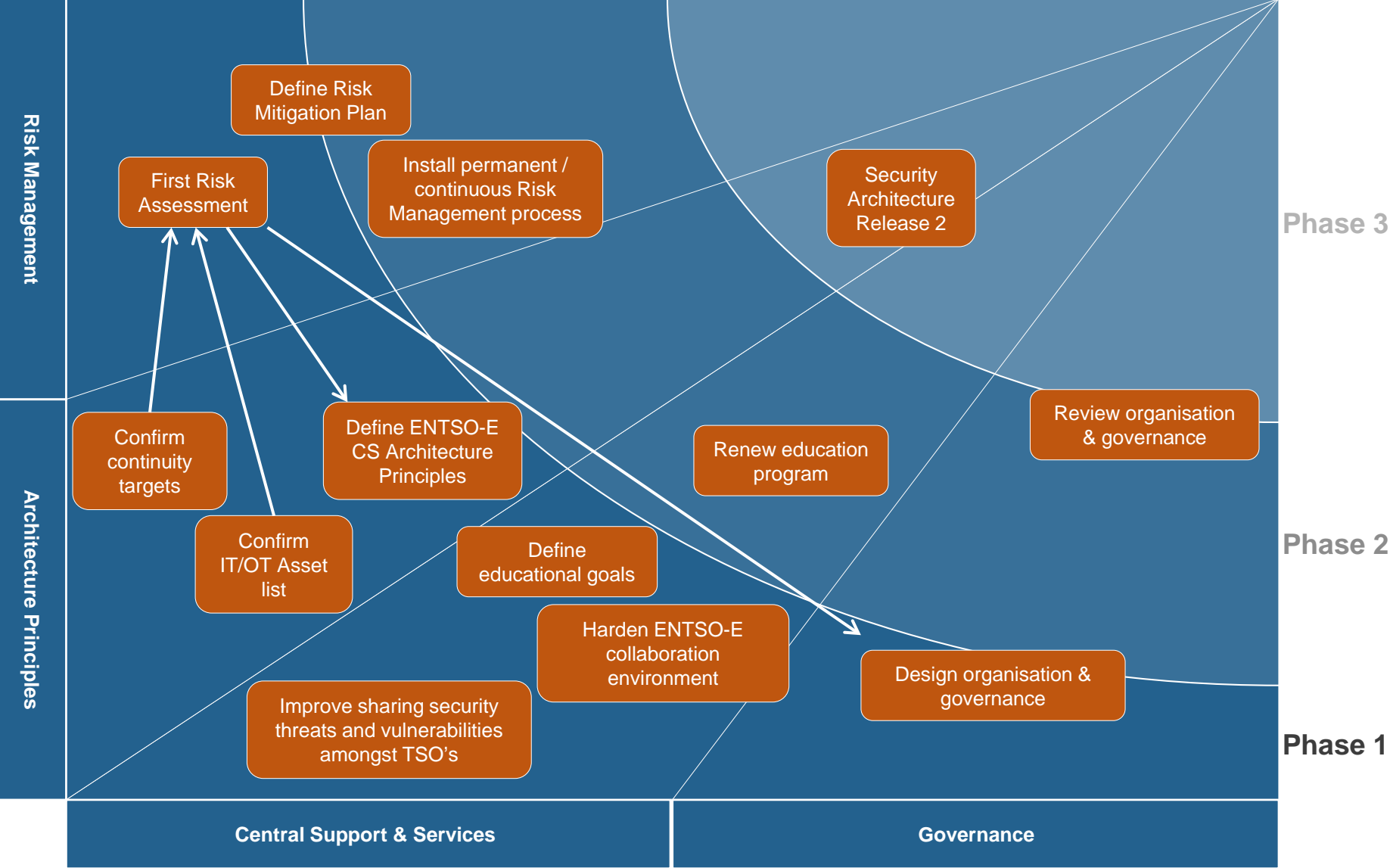


New reference platform architecture

ENTSO-E's OPDE environment: High level technical concept



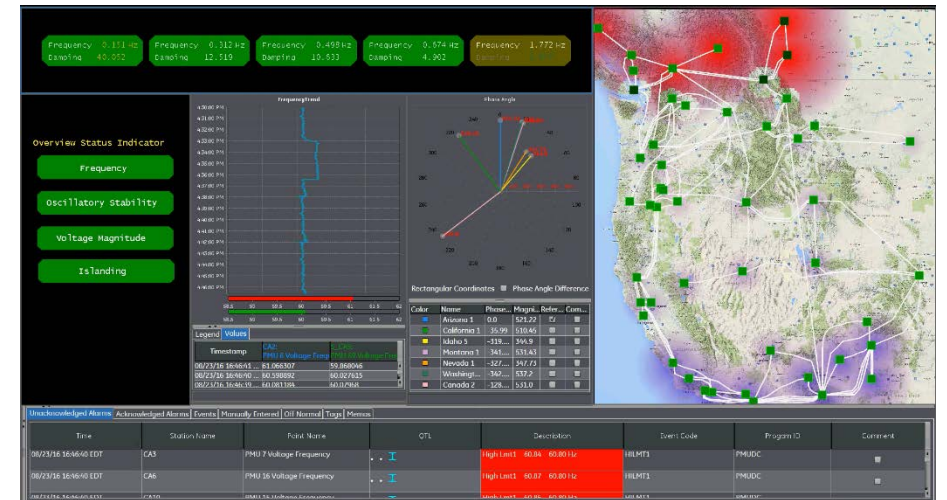
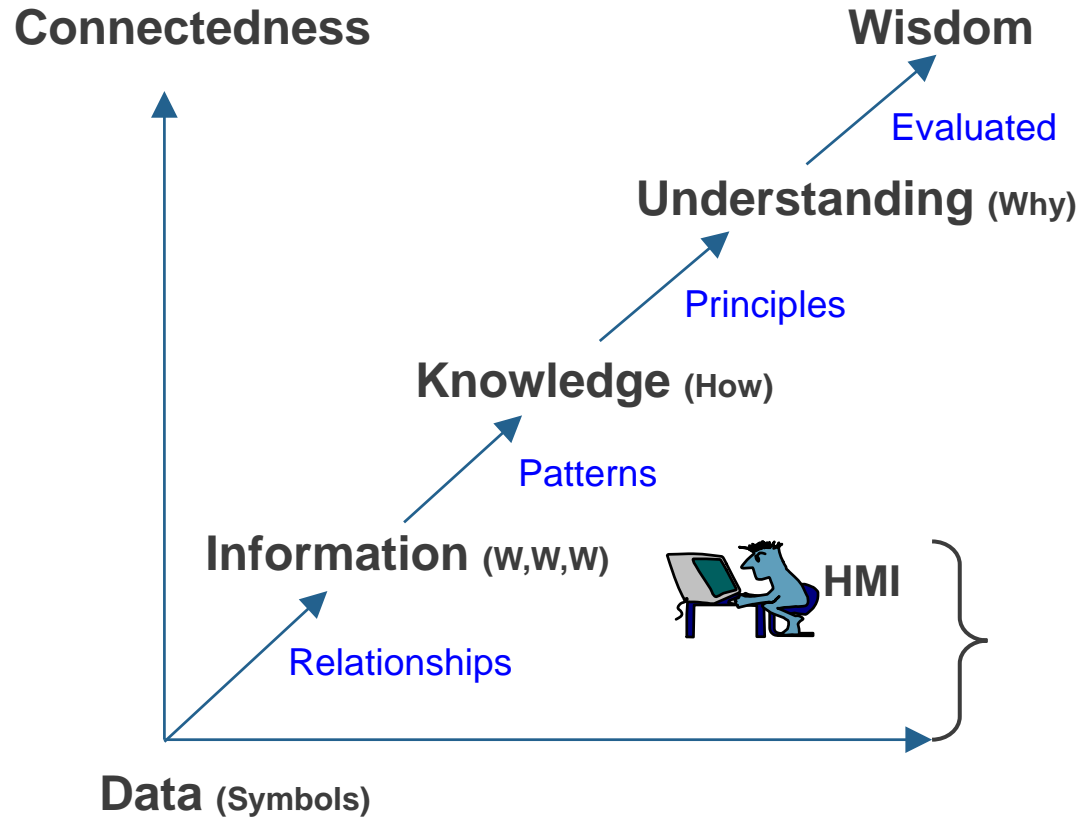
New Cyber Security strategy



- Key features
- Cyber security by design for solutions and infrastructures
 - Secure physical network and “middleware” layer
 - Shared awareness for all TSOs and RSCs
 - Pan-European attack pattern anticipation

New needs for Risk Situational Awareness analytics

From Dispatchers to Modelers & Machine Trainers



"From Data to Wisdom", Journal of Applied Systems Analysis, Volume 16, 1989 p 3-9
 Graphic Original Illustration: Courtesy of Dr. Richard Candy, Eskom South Africa

New TSO –DSO partnerships



Develop the TSO-DSO partnership

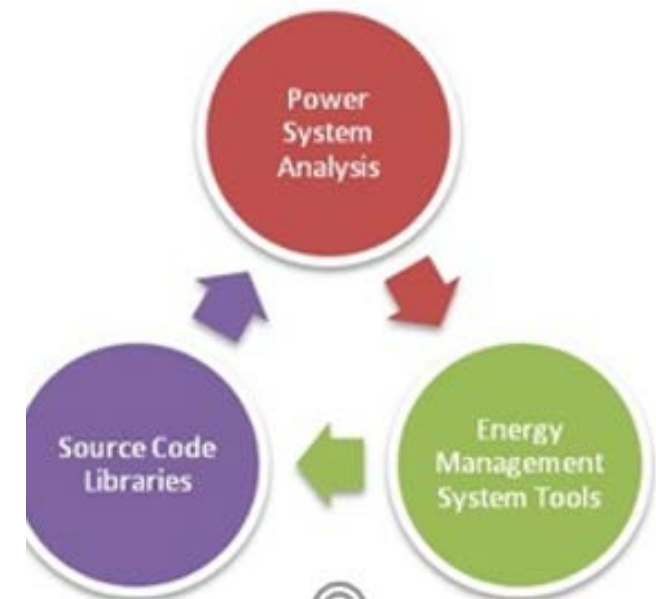
Define strategy on TSO-DSO partnership and coordination with EUDSO entity

Materialise partnership

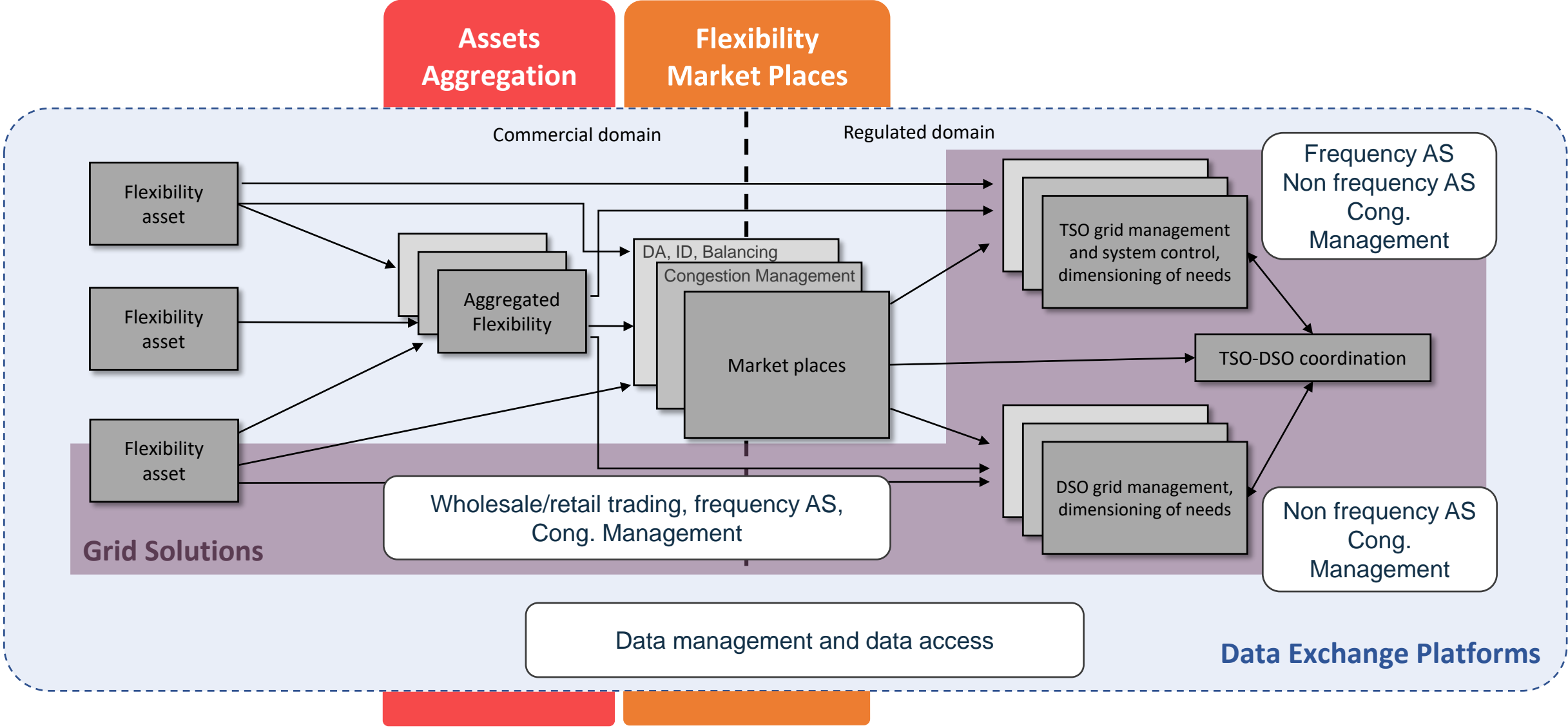
Shape regulatory framework to allow customer participation in all markets (top-down approach)

Share knowledge/experience from TSO-DSO projects (bottom-up approach)

Active System Management (ASM)



Redistribution of Grid Operator Market facilitation roles



New flexibility toolbox to unleash flexibility potential, beyond grid reinforcements

Technical solutions using network assets

Market-based solutions to activate explicit flexibilities

Connection agreement solutions

Tariff solutions to trigger implicit flexibility

Rule-based solutions like curtailments, in last resort or emergency situations



Small Scale Pilot have already developed...



Categories of the pilots:



Flexibility Market Places



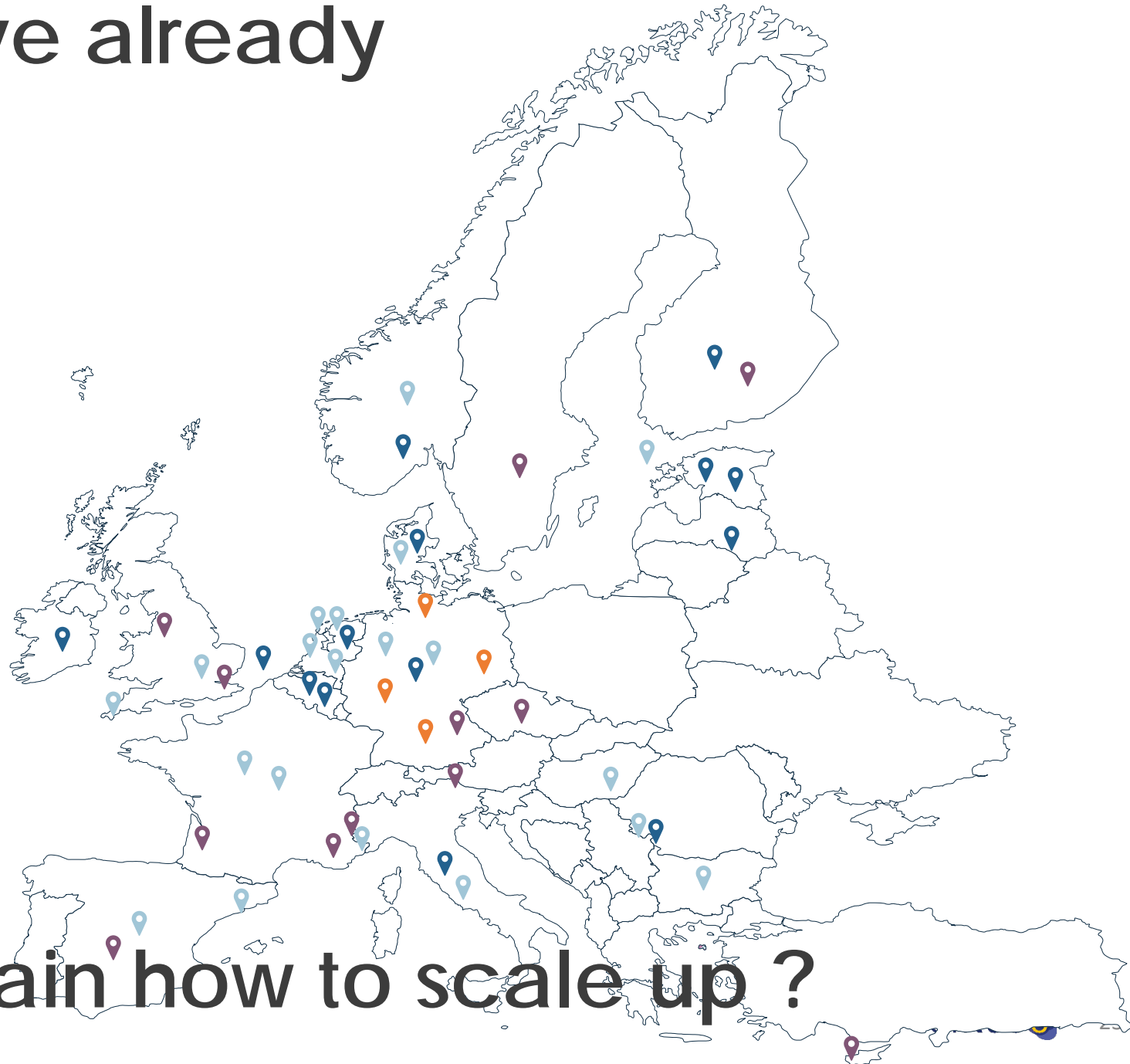
Data Exchange



Technical Solutions



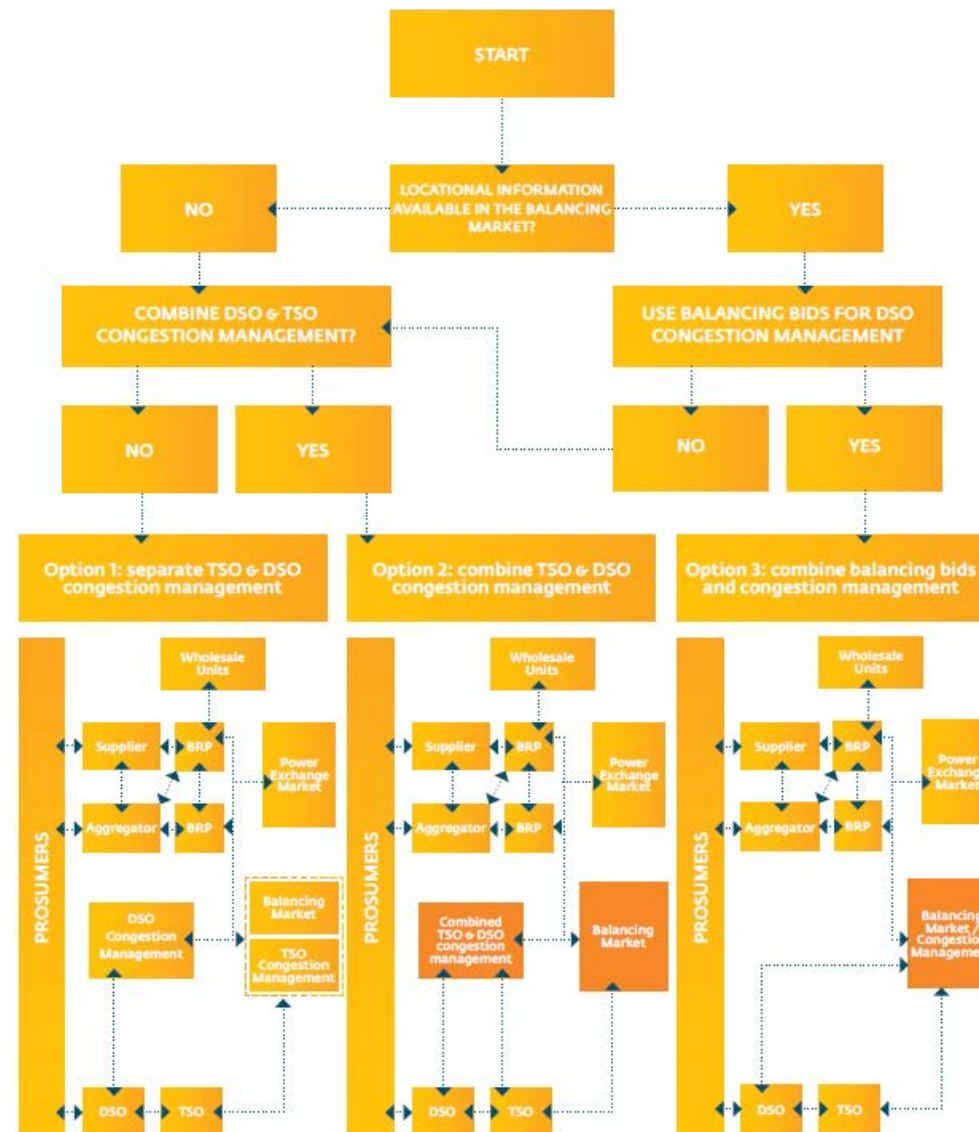
Aggregators (not in the map as covering all European countries)



... but question remain how to scale up ?

Target to establish a reference European Framework with best practises

The different options for market models, coordination and platforms give a European framework, which is recommended to be the basis for the Member States to discuss and implement the best solution.



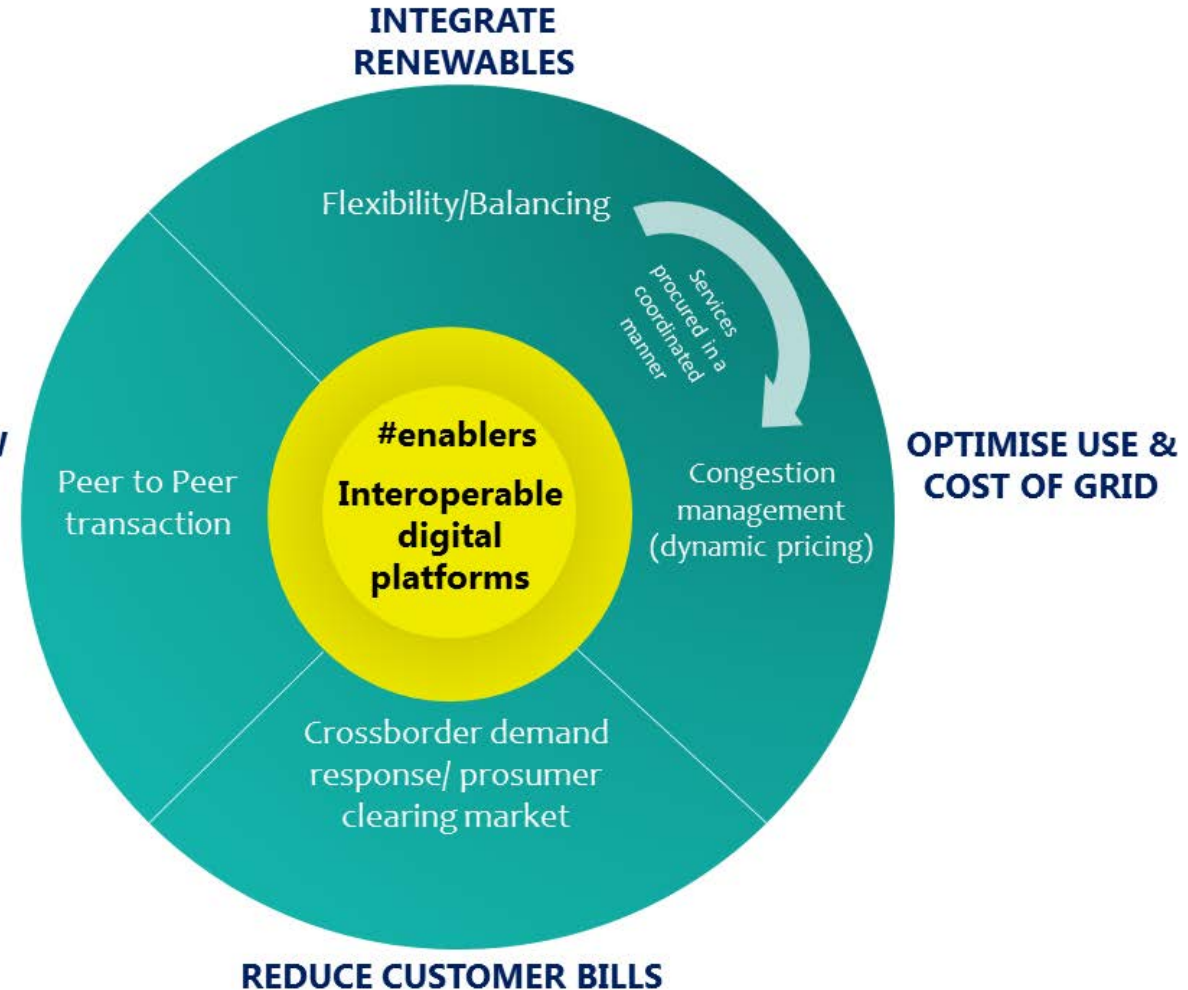


TSO-DSO-Consumer INTERFACE
aRchitecture to provide innovative grid
services for an efficient power system

We create
the common
platform!

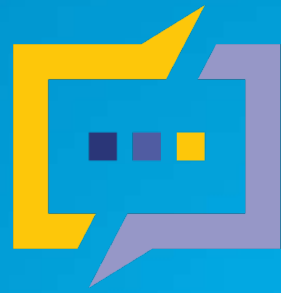
INTERFACE PROJECT LAUNCHED

DEVELOP NEW
SERVICES



Working on a new Grid vision for 2040





BUSINESS NETWORK INNOVATION



Ecosystem
of **energy
transition**
players driven by
**business
perspective**



Bridge between
ENTSO-E and
start-ups, citizen
initiatives, opinion
leaders, institutions,
energy businesses

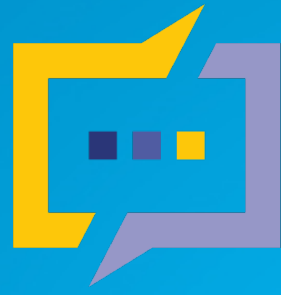


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listening
