

From National to Regional and pan-European: digital transformation

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ENTSO-E

ENTSO-E in figures



43 TSOs, **36** countries



500+ million
citizens served

3 673 TWh generated

3 631 TWh consumed

1,14 TW of generation capacity

+/- 435 TWh of electricity
exchanged

+/- 480 000 km
of interconnections



WHAT TRANSMISSION SYSTEM OPERATORS DO FOR YOU

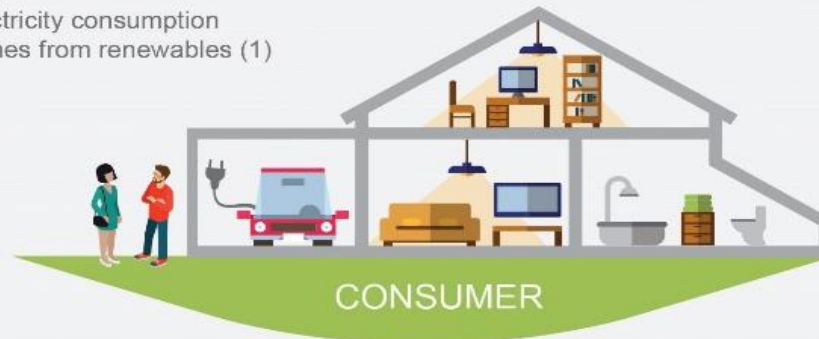
TSOs BUILD INFRASTRUCTURE TO
INTEGRATE RENEWABLES



20% decrease in CO2 emissions
by 2030 (2)



24% electricity consumption
comes from renewables (1)



TSOs KEEP THE LIGHTS ON

24/24 7/7



TSOs SUPPORT THE SWITCH
TO SMART GRIDS



3% energy saved on average (3)



13% reduction of household
energy costs (4)

TSOs CONTRIBUTE TO THE INTEGRATION
OF EUROPEAN ENERGY MARKETS

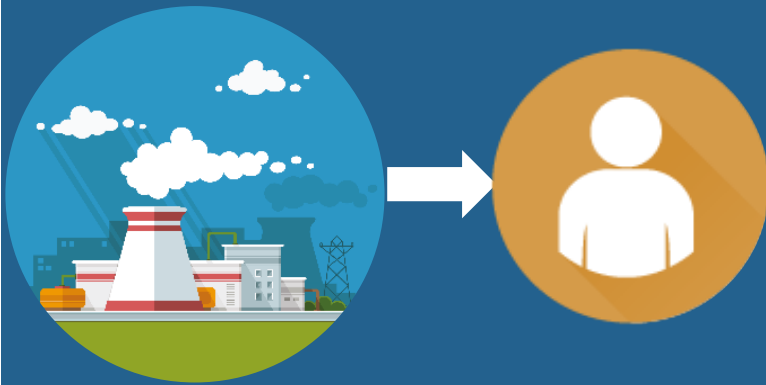
13 billion €
saved per year for consumers (5)

2 to 5 €/MWh

reduction in wholesale power prices (2)

New Grid Digitisation started, currently accelerating

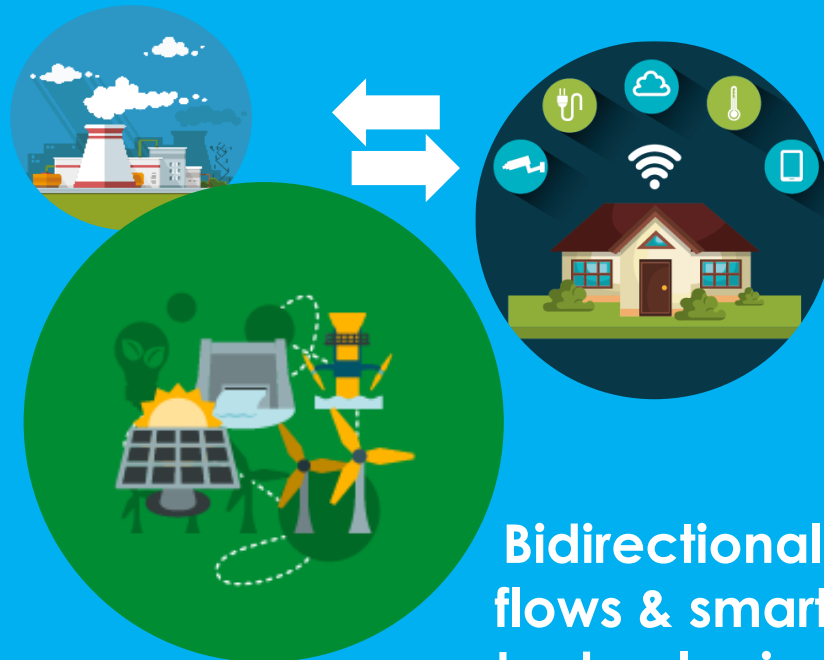
PAST



One-way power flows
Predictability

PRESENT

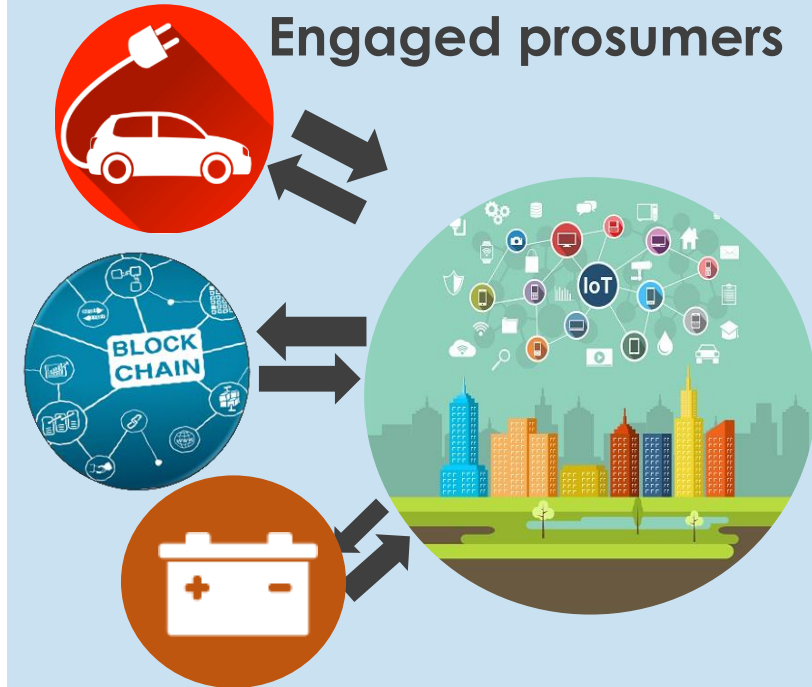
Variability & decentralisation



Bidirectional flows & smart technologies

FUTURE?

Smart, data-centric system
Electrification of transport
Engaged prosumers

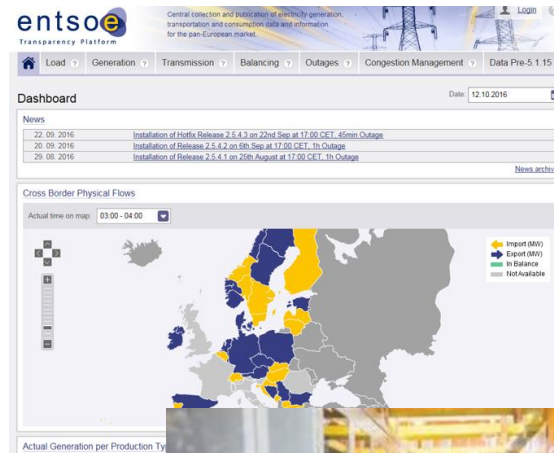


What does ENTSO-E do?

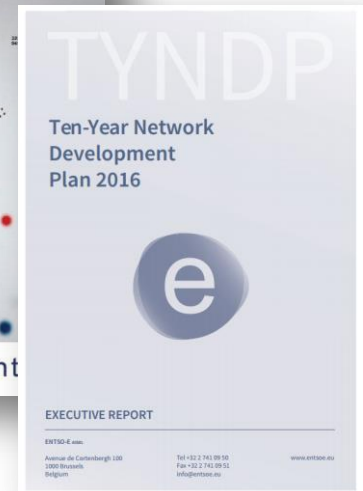
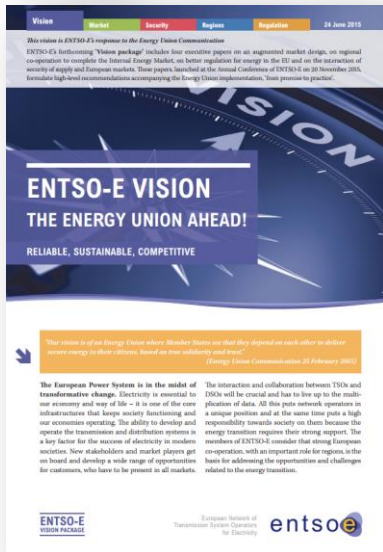
Contributes to the design and implementation of the Internal Energy Market



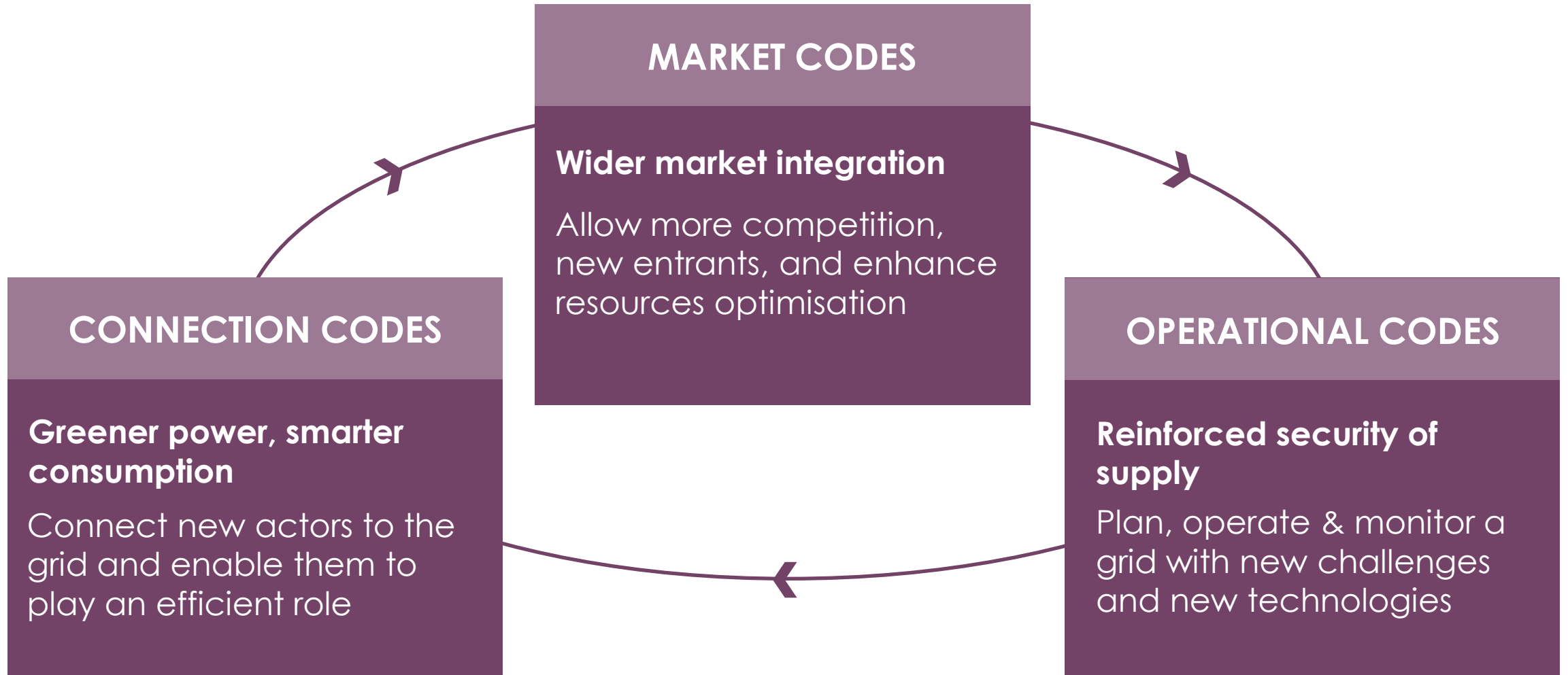
Develops the necessary IT tools for enabling the implementation



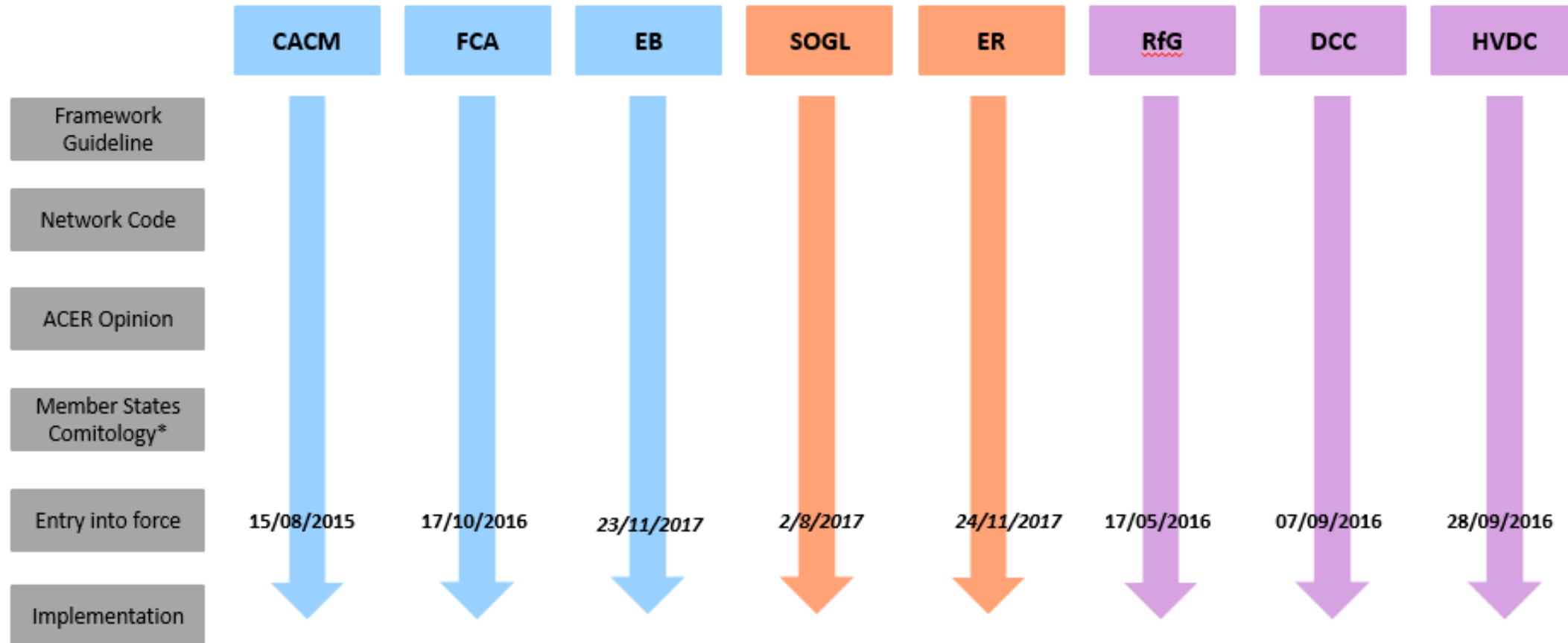
Provides regular reporting and recommendations for the development of the network



Network code strategic objectives



Now that the network codes are (almost) completed and enforced, their implementation is the next challenge



TSOs and ENTSO-E, together with ACER and all stakeholders are already in the **implementation phase**

Substantial progress has already been made thanks to early implementation process, pilot projects and voluntary coordination of TSOs.

The EU network codes: Made-in Europe rulebook for the smart system of the future

3 Market

2 Operation

3 Connection

All approved by
Member States

2017

- Capacity calculation
- Capacity Allocation and Congestion Management (CACM)
- Electricity Balancing

- Emergency and Restoration
- System Operation

- HDVC
- Demand connection
- Requirements for generators

FULL
implementation

2022

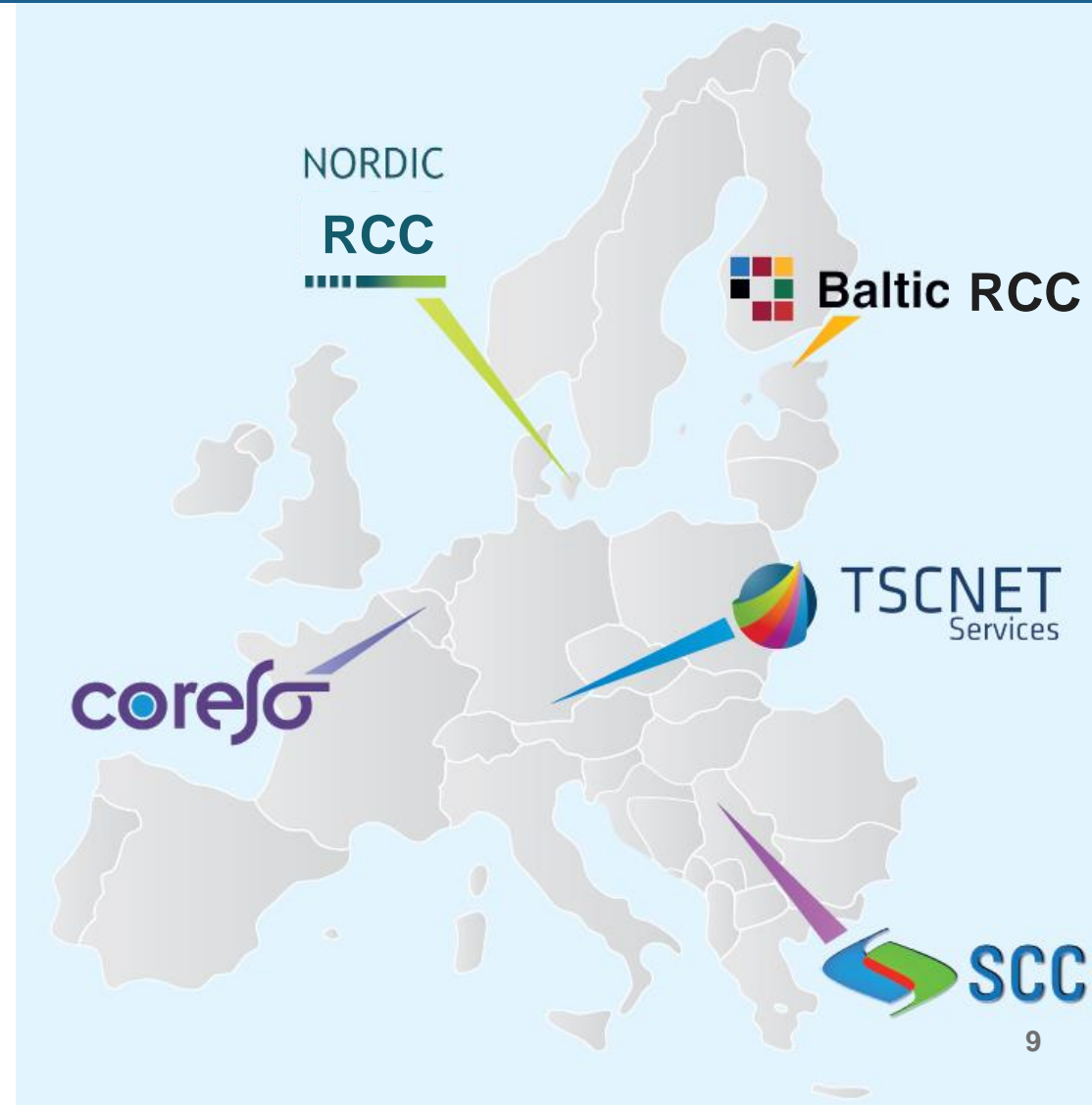
5 years

Network Codes deliver regional cooperation

Regional Coordination Centers (RCC):

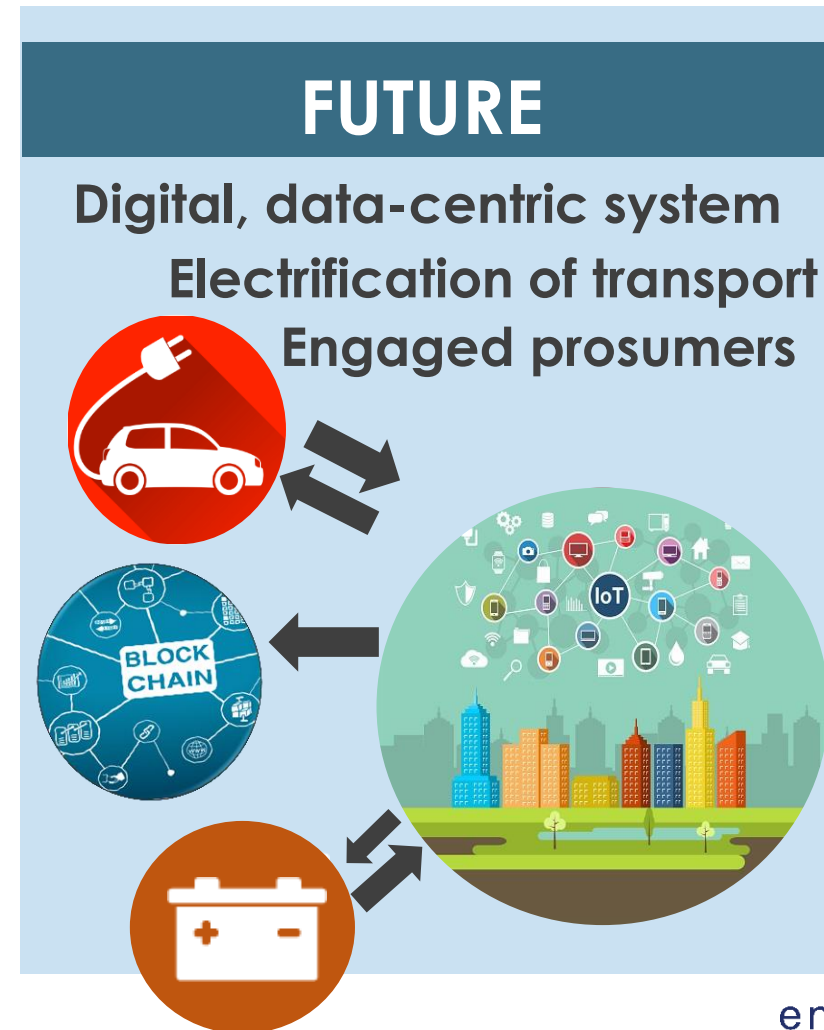
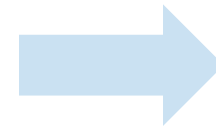
1. Capacity calculation
2. Security analysis
3. Common grid model
4. Adequacy forecast
5. Outage planning

We are prepared to take on new tasks from CEP



Next Migration Step : the Clean Energy Package 2030

- Active customer
- Scarcity pricing
- Removal of price caps
- Easier supplier switching
- Risk preparedness framework
- European resource adequacy
- Ambitious Regional Cooperation



ENTSO-E Innovation roadmap around 5 topics

Topic 4: Future of Energy System



Optimal grid design
Stakeholders, end users and environmental effects
System of systems
Scenarios
Integration with non electrical network

Topic 1: Assets and Technologies



Asset Management
New tech and materials
Ecodesign and lifecycle
Assets
Digital assets

Topic 2: Security and operations of tomorrow



Grid Observability and controllability
Expert systems and tools
Reliability and resilience
Enhanced ancillary services
for system stability

Topic 3: Flexibility and economics



Storage and flexibility
Demand side flexibility
Generation flexibility
Market design and business
models

Topic 5: Digital & Communication



Data access and acquisition, Data processing
Integration of SW & Platforms, interoperability and
standard needs, Automation,
Critical information and Infrastructure protection

In Summary...

- The Power System is facing significant transformational challenges related to the growth of Distributed Generation and tomorrow's Electrical Transportation developments (EV)
- In parallel, Digital technologies and the Innovation Roadmap offer new key development opportunities to Grid Operators to enable new solutions and value proposition
- A Transformation of the Power System is underway and the real-time Operations experience can be used for defining the future evolutions

THANK YOU FOR YOUR ATTENTION

For more information:
www.entsoe.eu
