From National to Regional and pan-European: digital transformation

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ENTSO-E
ENTSO-E in figures

43 TSOs, 36 countries

3 673 TWh generated

3 631 TWh consumed

1,14 TW of generation capacity

500+ million citizens served

+/- 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

Common Grid Model
Network code strategic objectives

**MARKET CODES**
Wider market integration
Allow more competition, new entrants, and enhance resources optimisation

**CONNECTION CODES**
Greener power, smarter consumption
Connect new actors to the grid and enable them to play an efficient role

**OPERATIONAL CODES**
Reinforced security of supply
Plan, operate & monitor a grid with new challenges and new technologies
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

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

- Emergency and Restoration
- System Operation

- HDVC
- Demand connection
- Requirements for generators

All approved by Member States
2017

5 years

FULL implementation
2022
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

FUTURE

- Digital, data-centric system
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ENTSO-E Innovation roadmap around 5 topics

**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 4: Future of Energy System**
- Optimal grid design
- Stakeholders, end users and environmental effects
- System of systems
- Scenarios
- Integration with non electrical network

**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