Preparing Europe's Power System for 2030

Konstantin Staschus, ENTSO-E Secretary-General

3 December 2014

Energy Transition: A Multifaceted Challenge for Europe

High Level Conference

The 2030 Energy & Climate Package for the EU: the challenges that lie ahead

entsoe

Reliable Sustainable Connected

The 2030 challenge for Europe's power system

- **Europe's electricity system will be at the forefront of delivering the EU's 2030 energy and climate objectives**
- **Decarbonising Europe's power system will require integrating unprecedented levels of renewable energy into the system**

THIS WILL REQUIRE NEW…

HARDWARE

Upgrading existing transmission lines and building new ones

&

SOFTWARE

Harmonised rules and regulations through Network Codes and a fit-for-purpose market design

entsoe

TRANSMISSION INFRASTRUCTURE

INTERCONNECTIONS AND UPGRADED POWER LINES FOR A PAN-EUROPEAN LOW-CARBON ELECTRICITY SYSTEM

entsoe

The importance of transmission infrastructure

Primary forms of RES-E such as wind and solar power are often **variable and less predictable** in their output than conventional power plants

RES-E will be increasingly be **generated far from consumption** centres

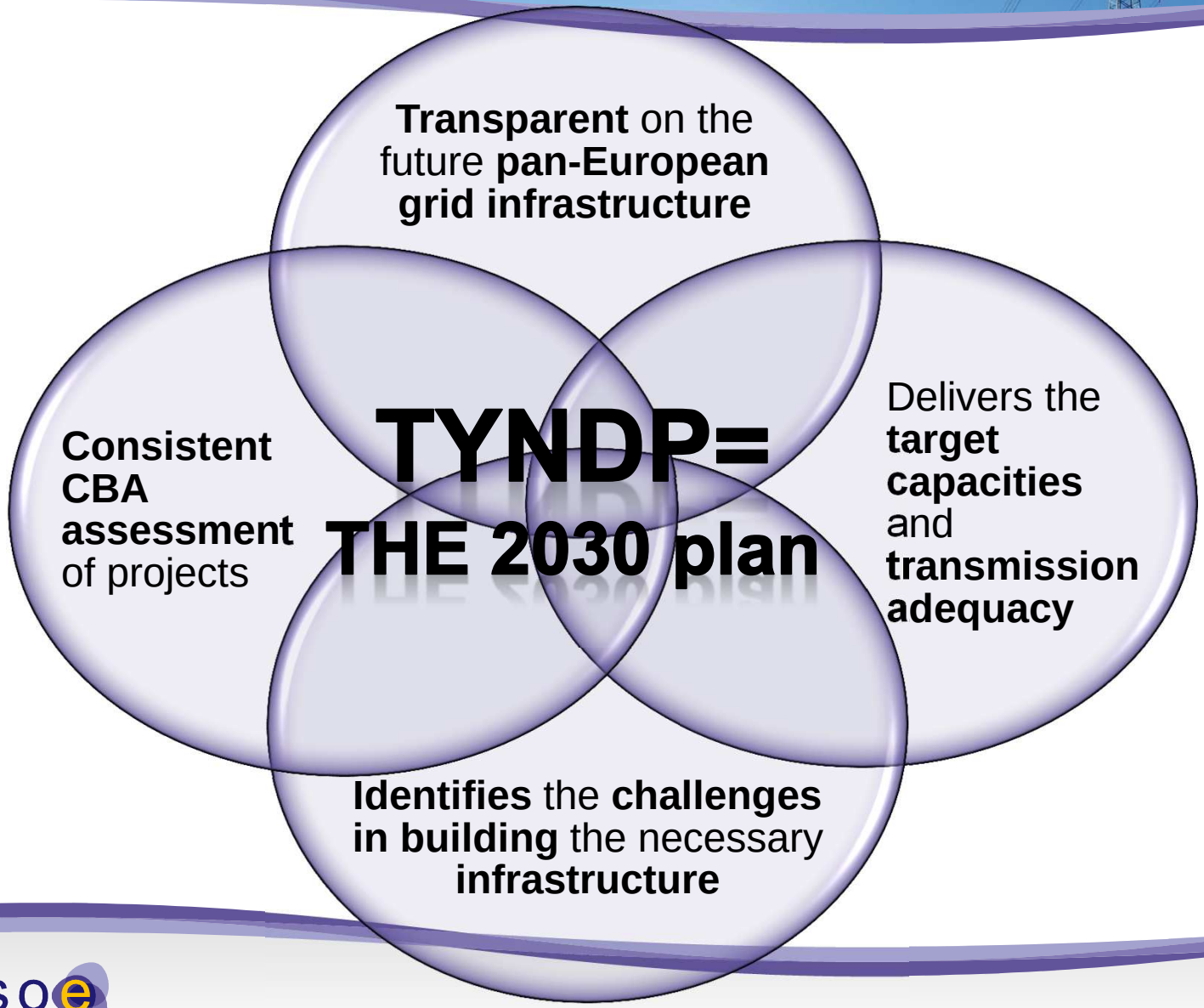
Need to balance the grid and optimise resources by connecting areas with surplus energy to those with a deficit

Need to bring energy to final consumers across greater distances

Requires building new interconnectors and upgrading and reinforcing existing transmission infrastructure

entsoe

The Ten Year Network Development Plan – a key tool to deliver the necessary infrastructure

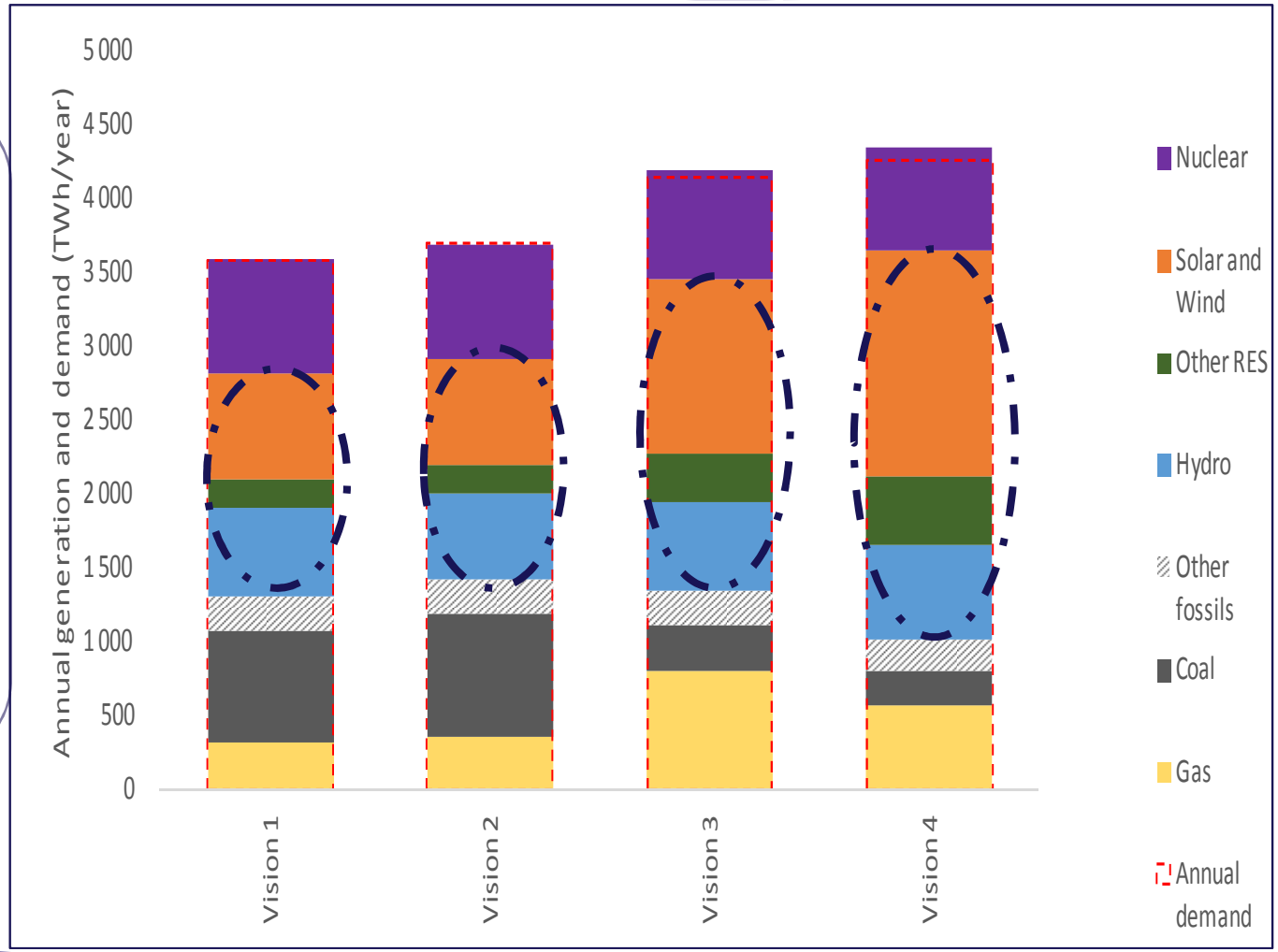


Renewable energy goals driving European grid development

From 197 GW up to 876 GW of installed renewable capacity in 2030

Up to 60% of total energy consumption in 2030 covered by renewables

80% of the pan-EU projects contribute to renewables integration



entsoe

TYNDP 2014 main findings

Up to €150 billion for projects of pan-EU significance by 2030

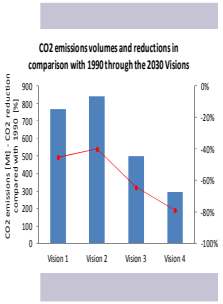
(1-1.5 €/MWh, about 1% of bill)

Reduction of 2 to 5 €/MWh for bulk power prices by 2030

Up to 50,000 km of new or refurbished grid investments

(23.000km new overhead lines)

Optimised land use: the crossed urbanised areas account for less than 4% of the total km of lines

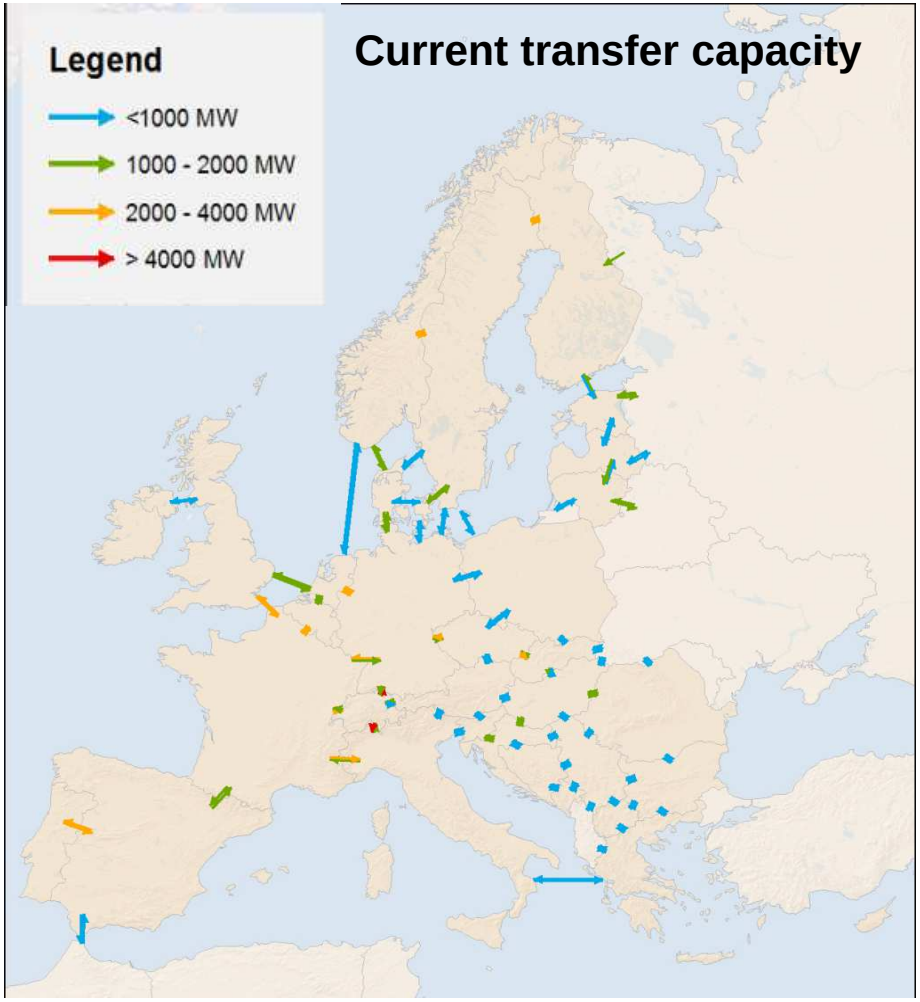


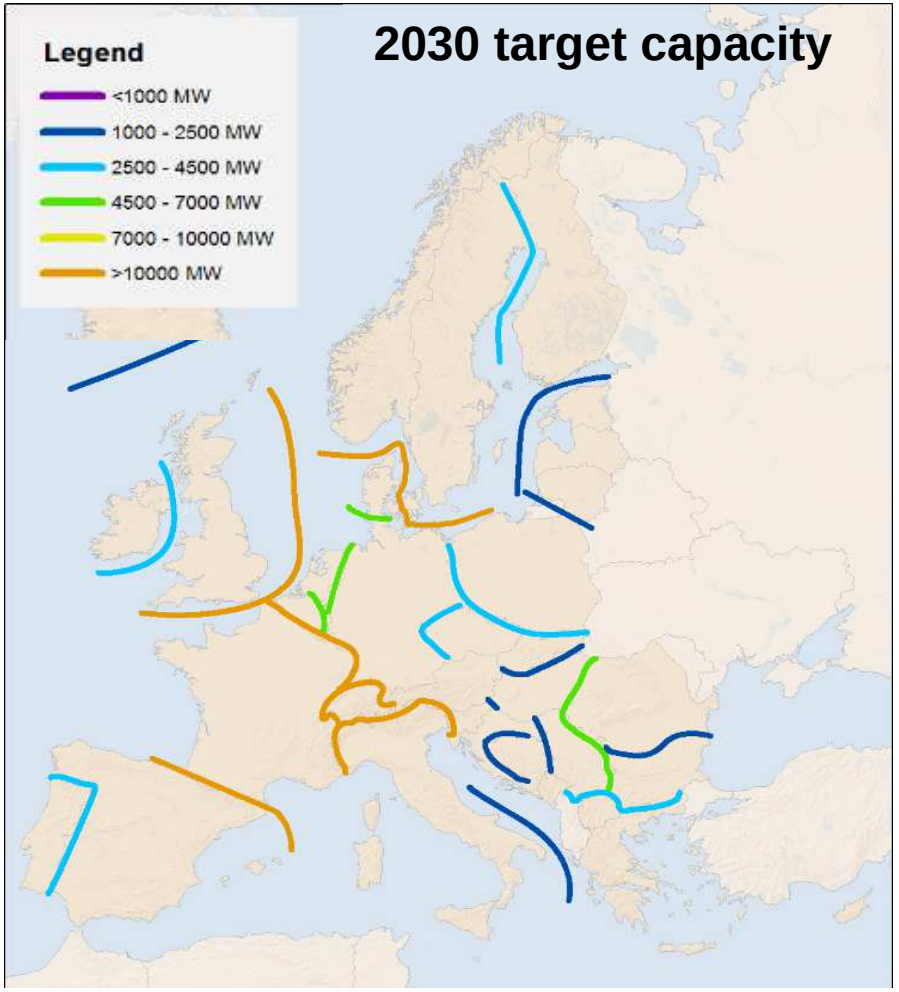
Mitigation of 20% of CO2 emissions for the European power sector

Accommodating up to 60% RES of total consumption in 2030

entsoe

Doubling the interconnection capacity by 2030





entsoe

NETWORK CODES

HARMONISED TECHNICAL RULES AND MARKET ARRANGEMENTS ENABLING THE TRANSITION TO A LOW-CARBON ELECTRICITY SYSTEM

entsoe

What is a network code?

A set of rules addressing one aspect of the electricity system

Which are developed by ACER, ENTSO-E & market participants

And become legally binding after the Comitology process

Hence they will have the same status as any other Regulation

Three sets of codes to deliver the IEM and low-carbon future electricity system

Grid Connection Related Codes

- Requirements for Generators (RfG)
- Demand Connection Code (DCC)
- HVDC Connection Code (HVDC)

System Operation Related Codes

- Operational Security (OS)
- Operational Planning & Scheduling (OPS)
- Load Frequency Control & Reserves (LFCR)
- Emergency & Restoration (ER)

Market Related Codes

- Capacity Allocation & Congestion Management (CACM)
- Forward Capacity Allocation (FCA)
- Balancing Network Code (EB)

entsoe

All Network Codes to help integrate RES-E

In addition to helping complete the IEM, all Network Codes are intended to play a role in facilitating the integration of RES-E.

Requirements for Generators

Defines what ancillary services generators should be capable of delivering

Demand Connection

Facilitate uptake of Demand Side Response

HVDC

Paves the way for a European 'supergrid'

Capacity Allocation & Congestion Management

Forward Capacity Allocation

Harmonised rules to establish the IEM and enable market entry of new RES-E producers of all sizes

Operational Security

Ensure secure integration of RES-E by enhancing coordination between all network operators

Load Frequency Control & Reserves

Emergency & Restoration

Frequency control management for high RES-E penetration

Operational Planning & Scheduling

Higher RES-E penetration through enhanced forecasting arrangements

Electricity Balancing

Optimised balancing markets for high-RES-E penetration

entsoe

MARKET DESIGN

DESIGNING MARKETS FOR AN INTEGRATED PAN EUROPEAN LOW-CARBON ELECTRICITY SYSTEM

entsoe

Good progress on moving towards the Target Model through successful market coupling and Network Codes

Day-ahead Multi-Regional Coupling Project (MRC)

- NWE went live on February 4, 2014. SWE coupled with NWE on May 13th, 2014 (NWE-SWE now called MRC).
- Electricity can thus be exchanged from Portugal to Finland or Great Britain to Germany under a common day-ahead price calculation
- MRC has proven to be operationally robust

EXPANSION OF MRC	
NWE, Baltic	Feb 2014
Austria, Poland	Partial solution Feb 2014
SWE	May 2014
Italian Borders	Feb 2015
4M	Nov 2014

Nearing adoption of CACM Regulation

- Will help achieve the IEM through a harmonised approach to cross-border electricity trading
- Also sets out rules for congestion management – optimising the use of transmission capacity

Good progress on Electricity Balancing and Forward Capacity Allocation NCs

entsoe

Enhancing the Target Model with additional features to enable RES-E integration

1. **Target Model fully implemented ASAP**

2. **Current market design to be improved**

3. **Technical system scarcities** to be objectively **assessed by ENTSO-E's adequacy assessment**

- **Balancing prices should be reflective of full system costs**
- **All RES should be fully integrated into the market**
- **Demand Side should participate as much as possible in all markets**

entsoe

Thank you for your attention

Konstantin Staschus, Secretary-General ENTSO-E

3 December 2014

Energy Transition: A Multifaceted Challenge for Europe

High Level Conference

The 2030 Energy & Climate Package for the EU: the challenges that lie ahead

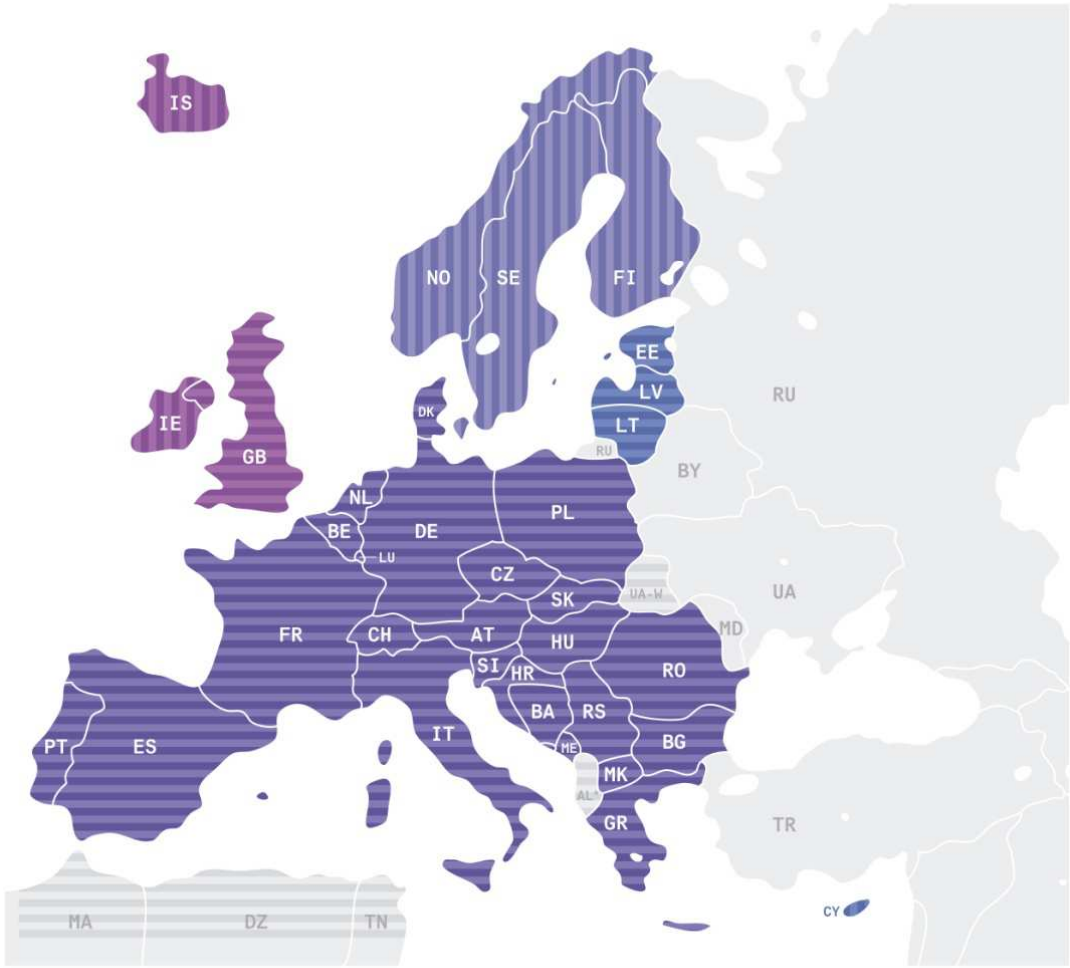
entsoe

Reliable Sustainable Connected

Backup: Introducing ENTSO-E

European Network for Transmission System Operators for Electricity

- 41 TSOs from 34 countries
- A trans-European network
- 532 million citizens served
- 1,004,062 MW net generation capacity
- 307,503 Km of transmission lines
- 3,307 TWh/year consumption
- 387,251 GWh of electricity exchanges between member TSOs
- Legal mandate Reg. (EC)714/2009



entsoe

Backup: ENTSO-E in Regulation (EC) 714/2009

Article 4: ENTSO-E

- Completion of Integrated Energy Market

Article 6: Establishment of network codes

- In line with Framework Guidelines (by ERGEG/ACER)
- Legally binding through Comitology
- Effective & transparent access to the transmission network
- Transparent extensive consultation process

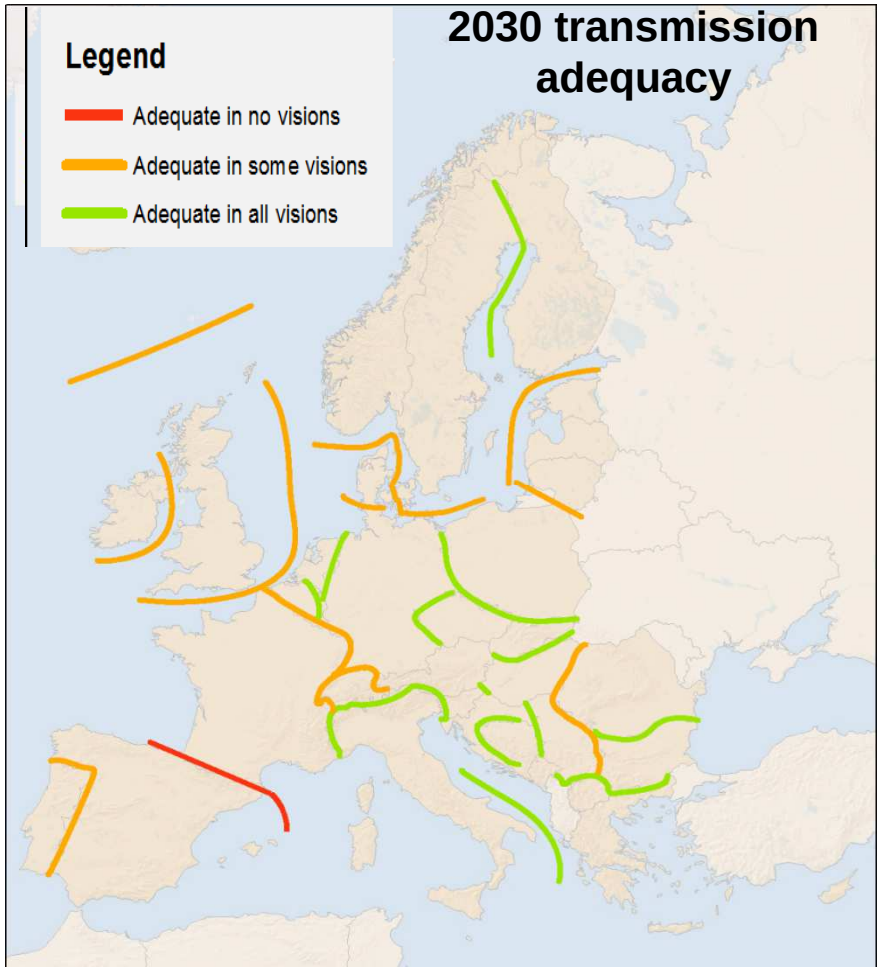
Article 7: Issues addressed by network codes

- Cross border network issues and market integration issues without prejudice to the Member States' right to establish national network codes

Article 8: Tasks of ENTSO-E

- Network codes; TYNDP, incl. a European generation adequacy outlook
- Work programme, annual report, summer/winter outlooks, monitoring

Backup: Integrating the four “electric peninsulas’



entsoe

Backup: Challenges to implementing infrastructure on time

Permit granting	• Procedures are lengthy and often cause commissioning delay • 30% of investments delayed after 2 years
Public acceptance	• More effort to bring citizens and interest groups on-board and increase understanding of Europe's energy needs
Financing	• A stable regulation for long-term investments • Tariffs must adapt to energy transition goals

Backup: Why Demand Side Response (DSR)?

1. **DSR is a key component in the successful evolution of the power system**, enables EU 2030 and 2050 energy policy and decarbonisation targets.
2. **DSR creates value** for consumers and society at large.
3. **DSR provides TSOs with flexibility** to maintain security of supply, optimise utilisation of the infrastructure and grid investments, and it supports system adequacy.
4. **DSR enhances competition and improves the target market model** by providing a strong additional alternative to a system where each new demand needs new generation.

ENTSO-E to play a leading role in the transition to 2030

To help achieve the EU's 2030 energy and climate policy objectives ENTSO-E will continue working closely with all stakeholders to deliver:

- **The infrastructure – through the TYNDP**
- **Implement Network Codes and continue developing them in the long-term**
- **Fit-for-purpose market design – by advising stakeholders and decision-makers**