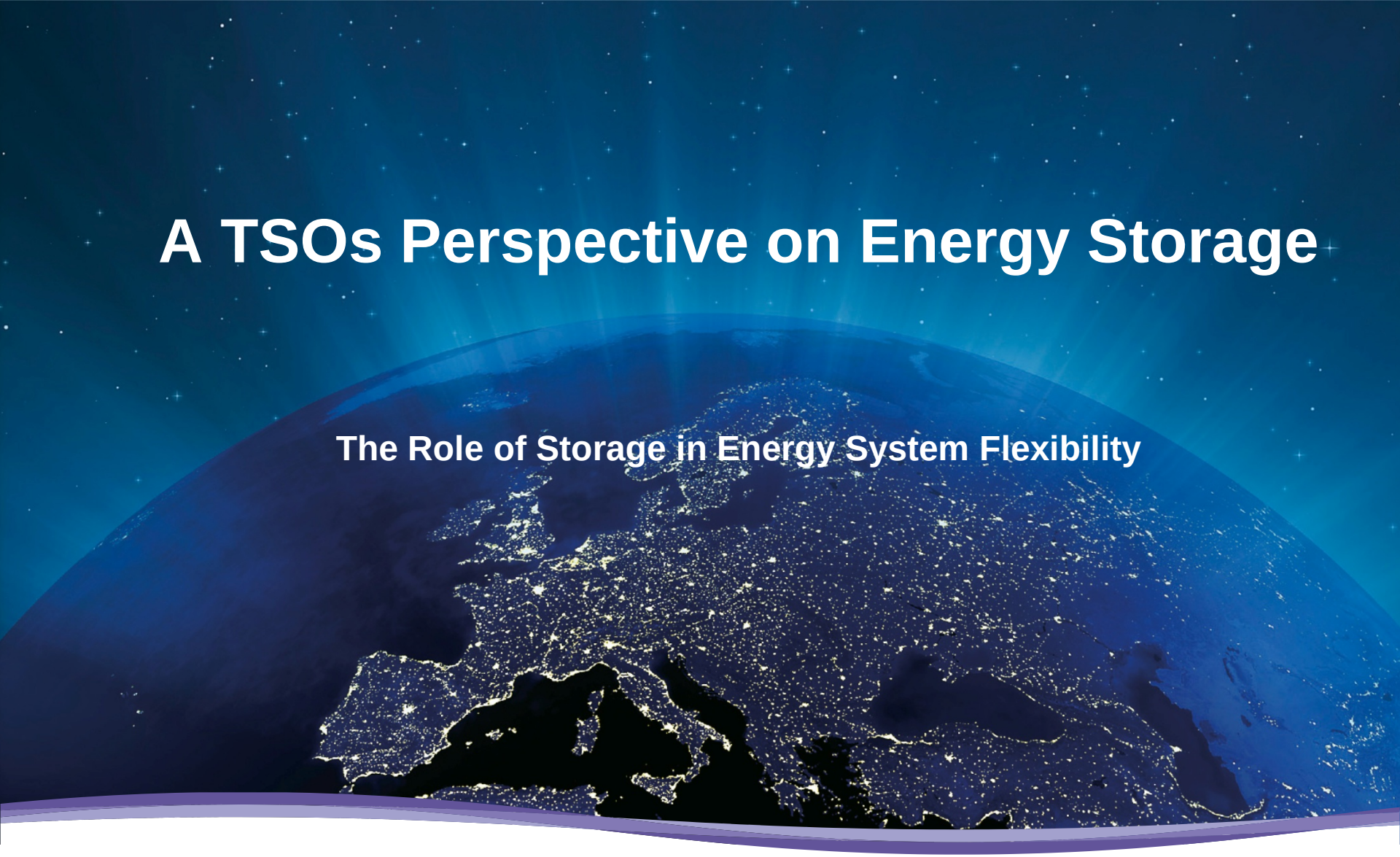
A TSOs Perspective on Energy Storage

The Role of Storage in Energy System Flexibility



IEA CERT , Expert Group on R&D priorities , Berlin 22-23 October 2014
Norela Constantinescu, R&D Advisor ENTSO-E

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Reliable Sustainable Connected

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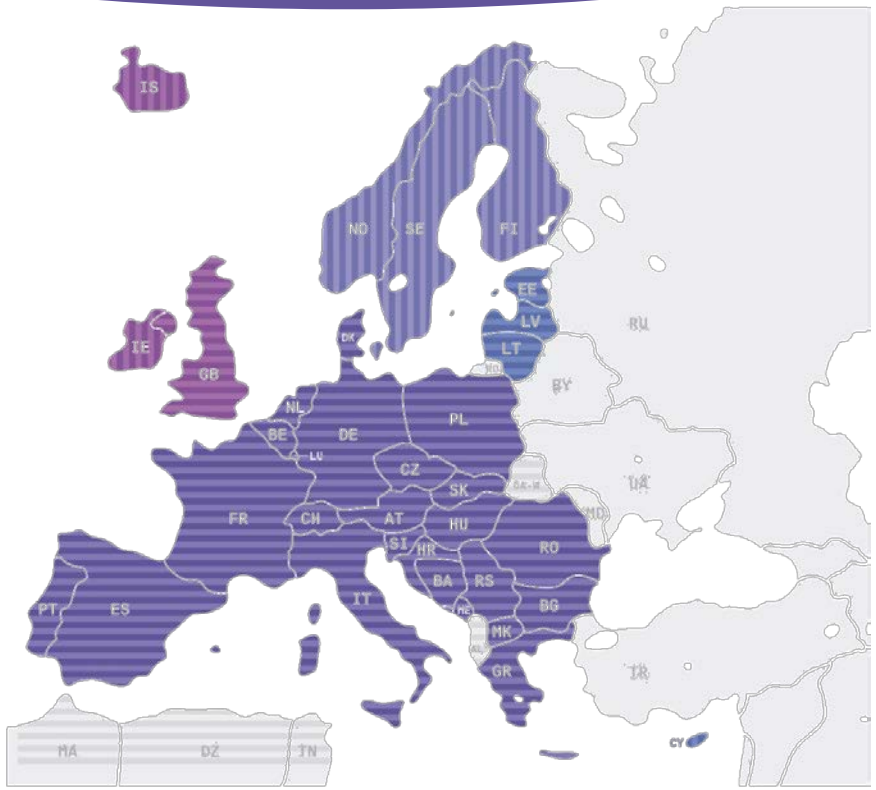
41 **TSOs**
from 34 countries

532 **million**
citizens served

828 **GW**
generation

305 **Thousand Km**
of transmission lines



Ten-Year Network Development Plans

Network Codes

R&D plans

Adequacy forecasts

Tools for Market Integration

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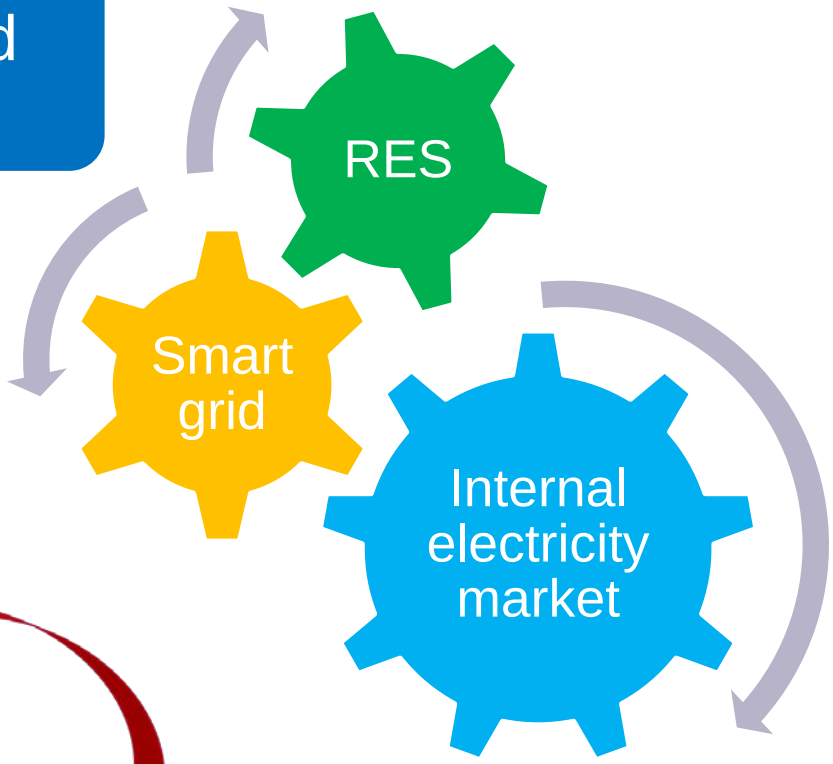
Less CO_2, more electricity, smarter grids

Energy will be more based on electricity

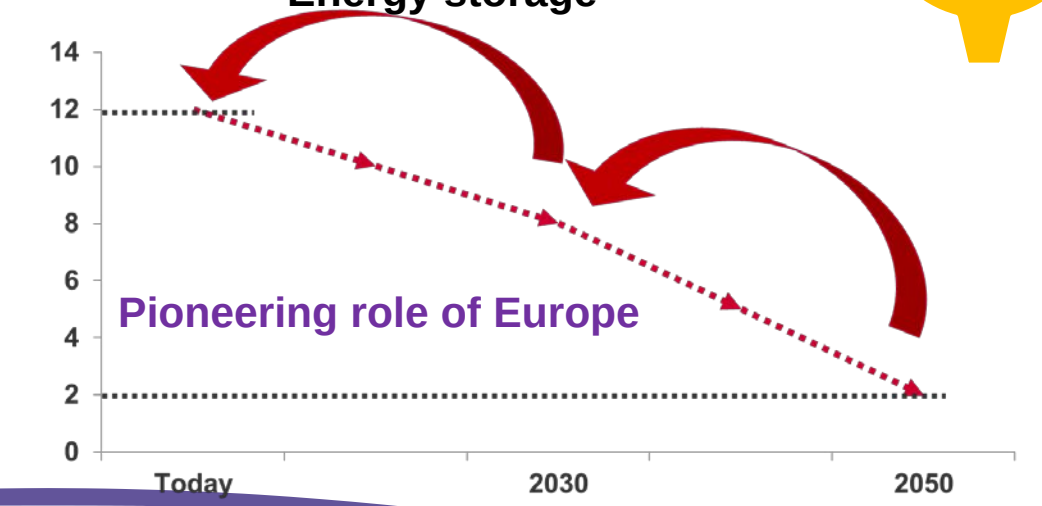


More renewables,

Stronger grid

DSR

Energy storage



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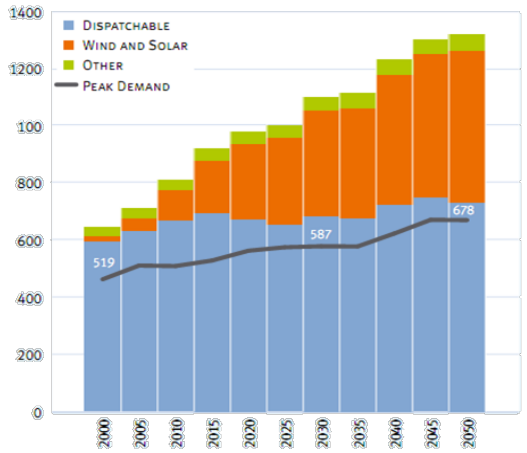
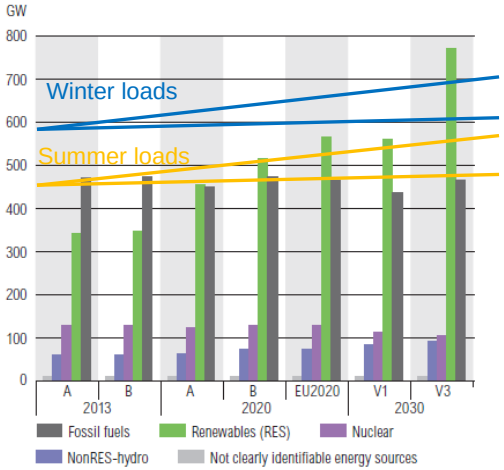
Energy policies and power system implications for TSOs

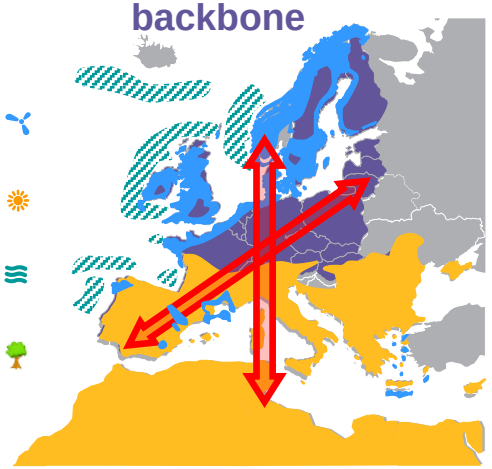
Integration of RES, new demand wave and grid users



System security and adequacy



Facilitate pan-European markets with a strong infrastructure backbone



Challenges

System Stability, Resource Variability, Uncertainty, New connections, Changed power flows

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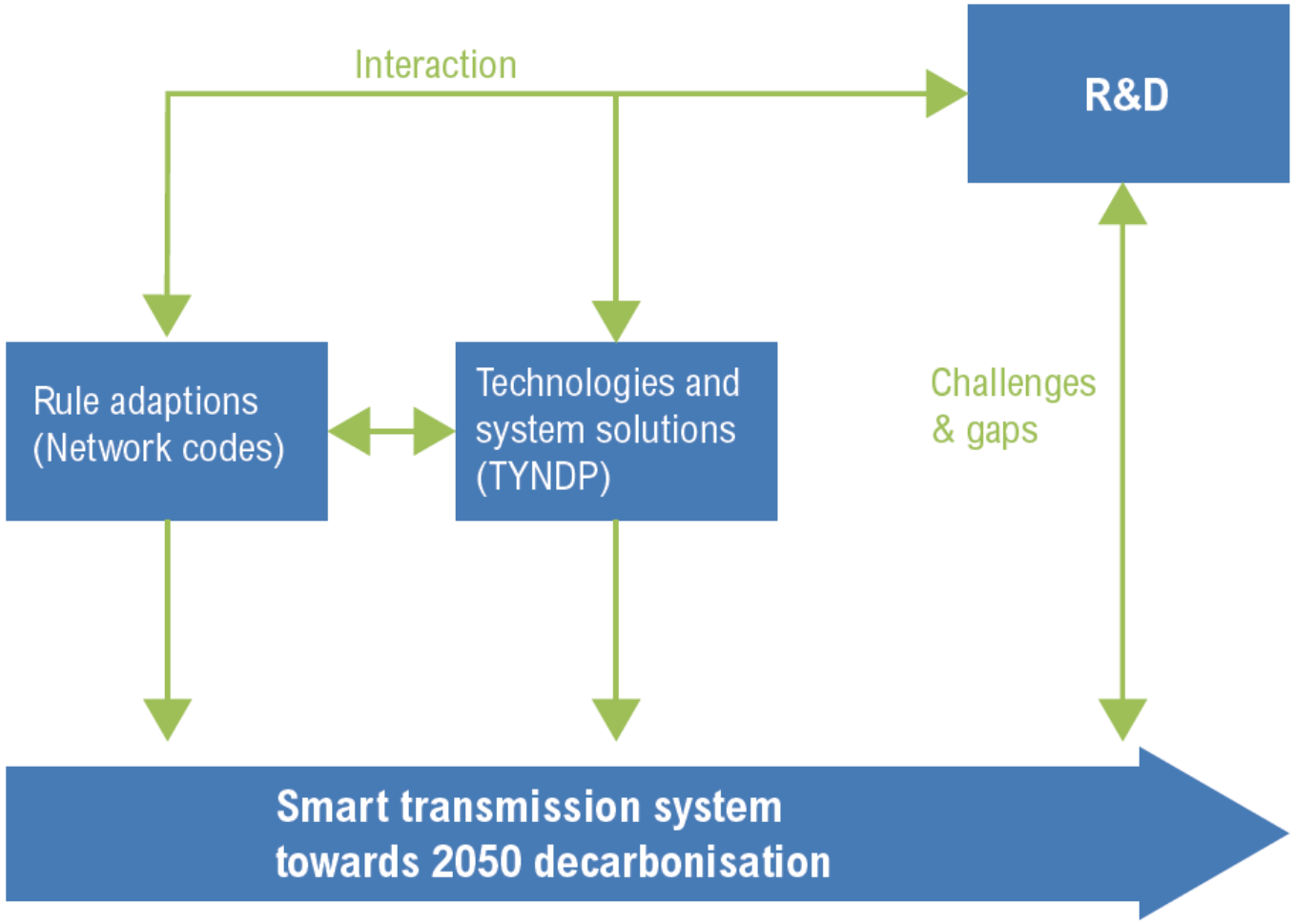
Crucial work of ENTSO-E



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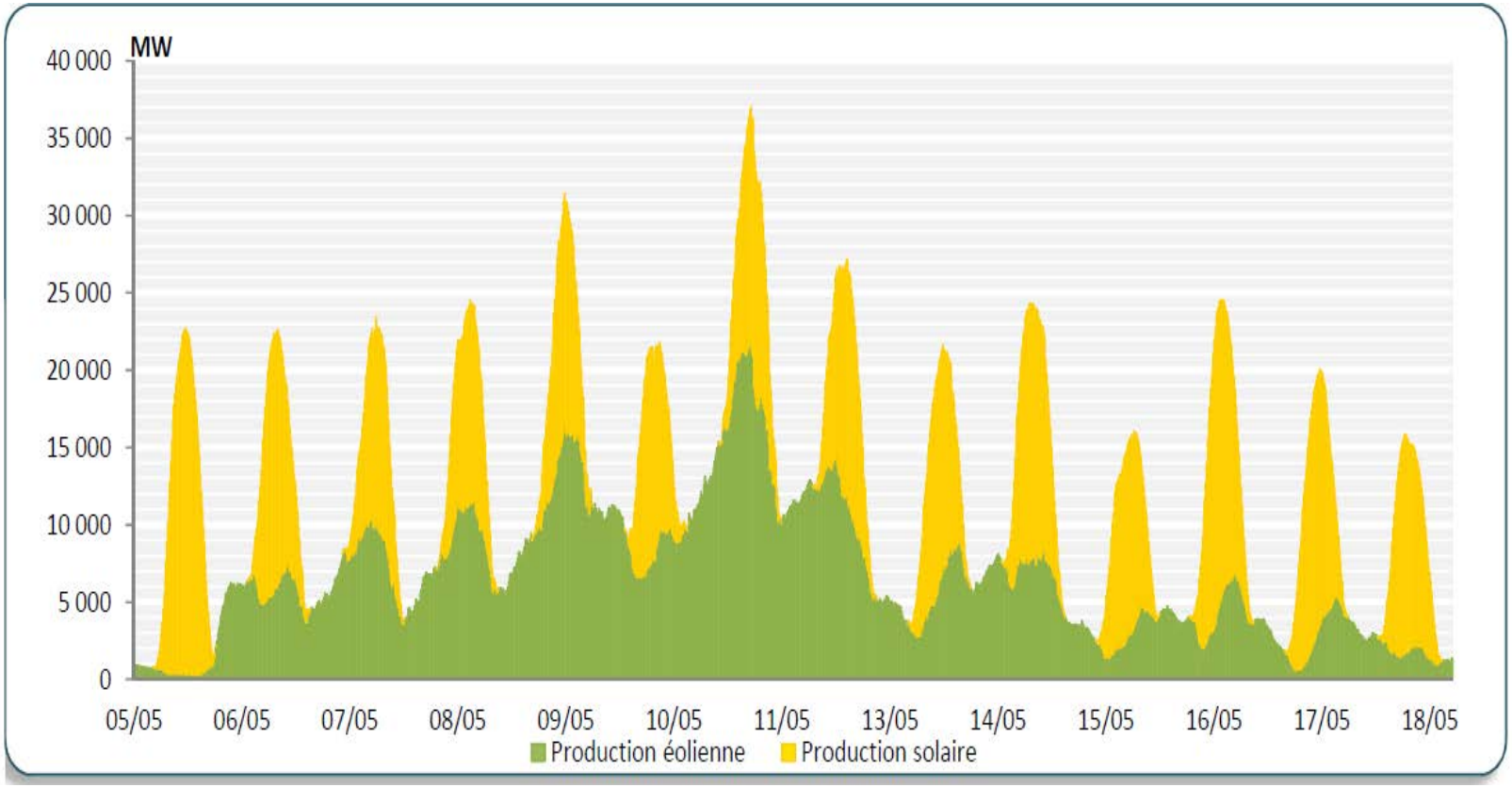
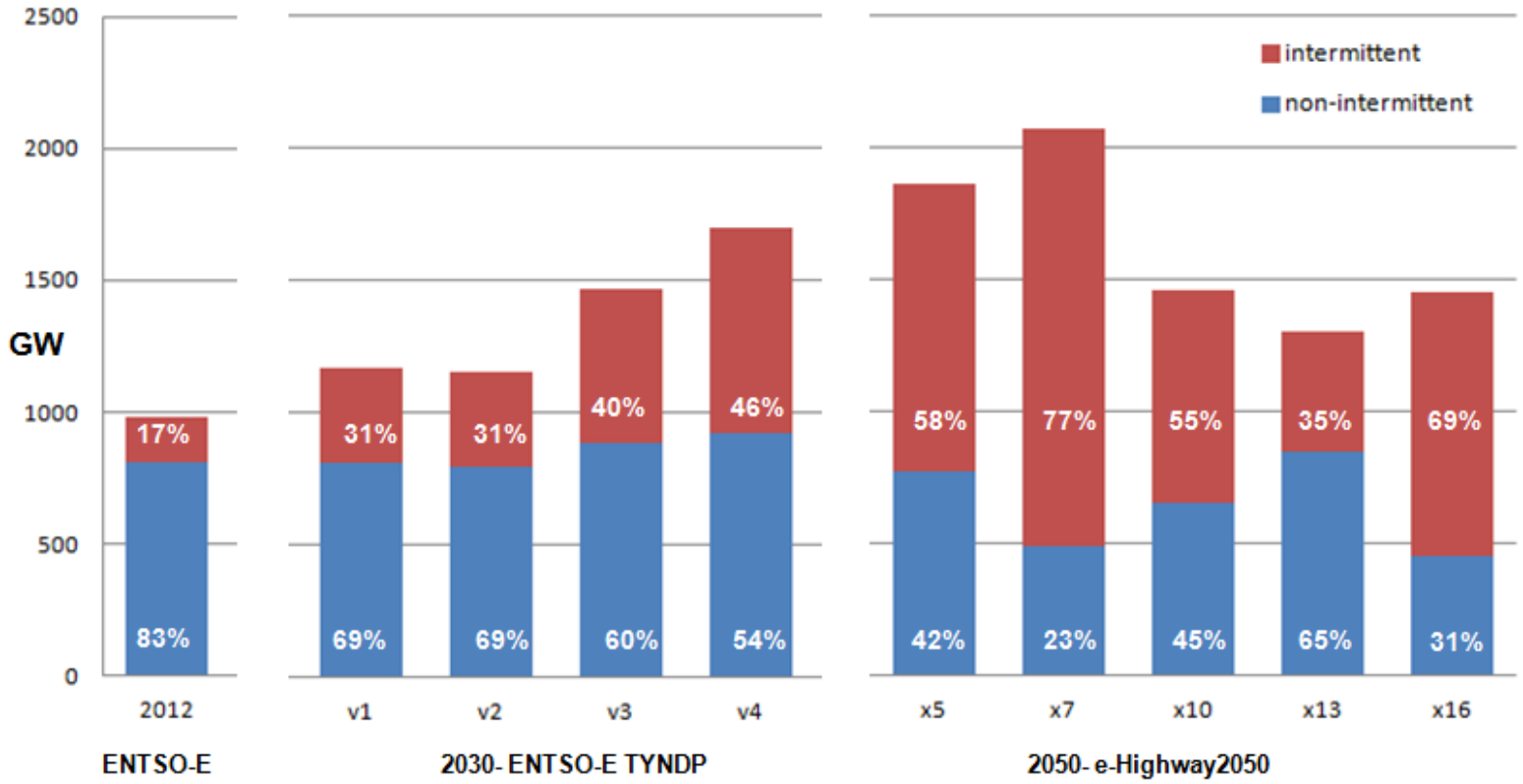
Challenges induced by generation today

Backup: Renewable generation in Germany for two weeks from 5 May 2014

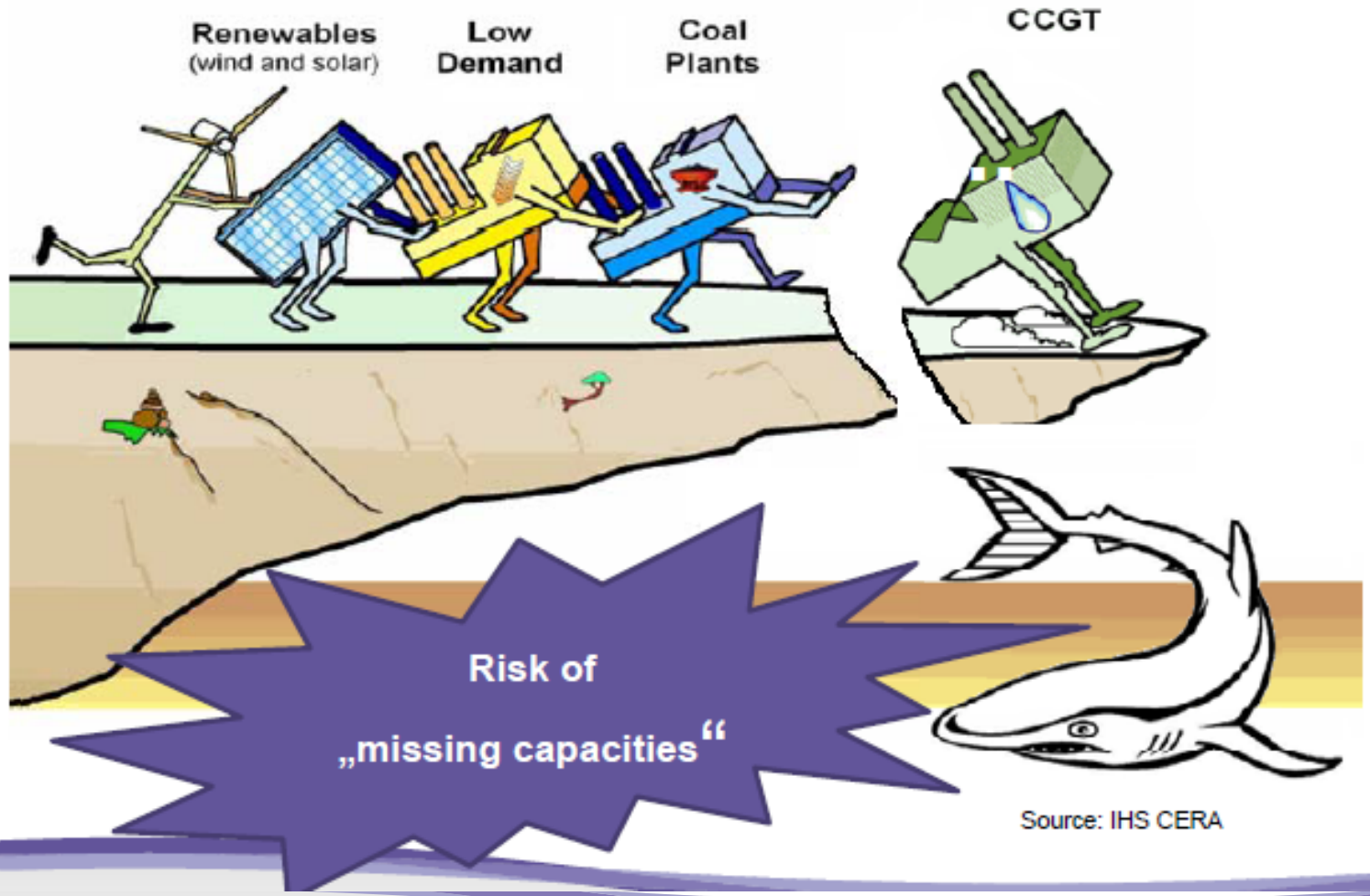


Challenges induced by generation in the future

European Energy vision requires a paradigm shift : Installed generation capacity scenarios for EU

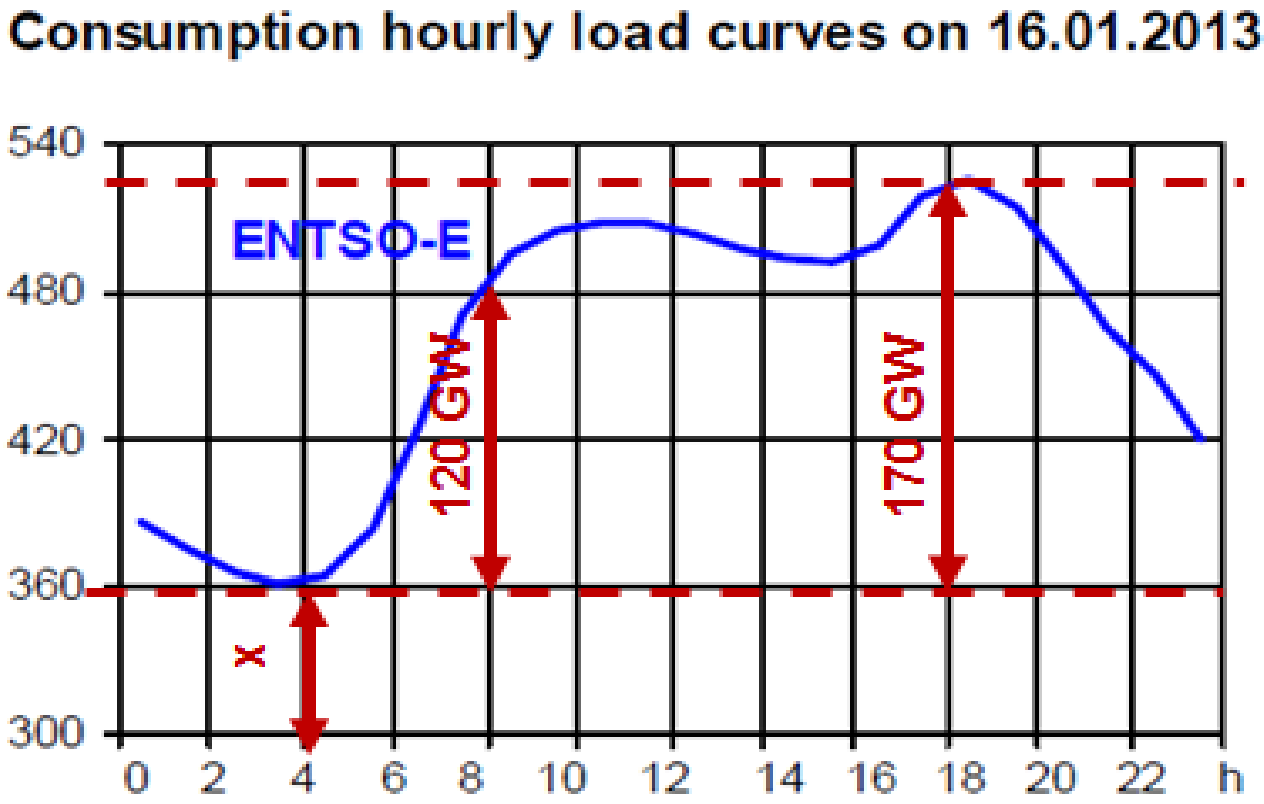


Risk of missing controllable technologies



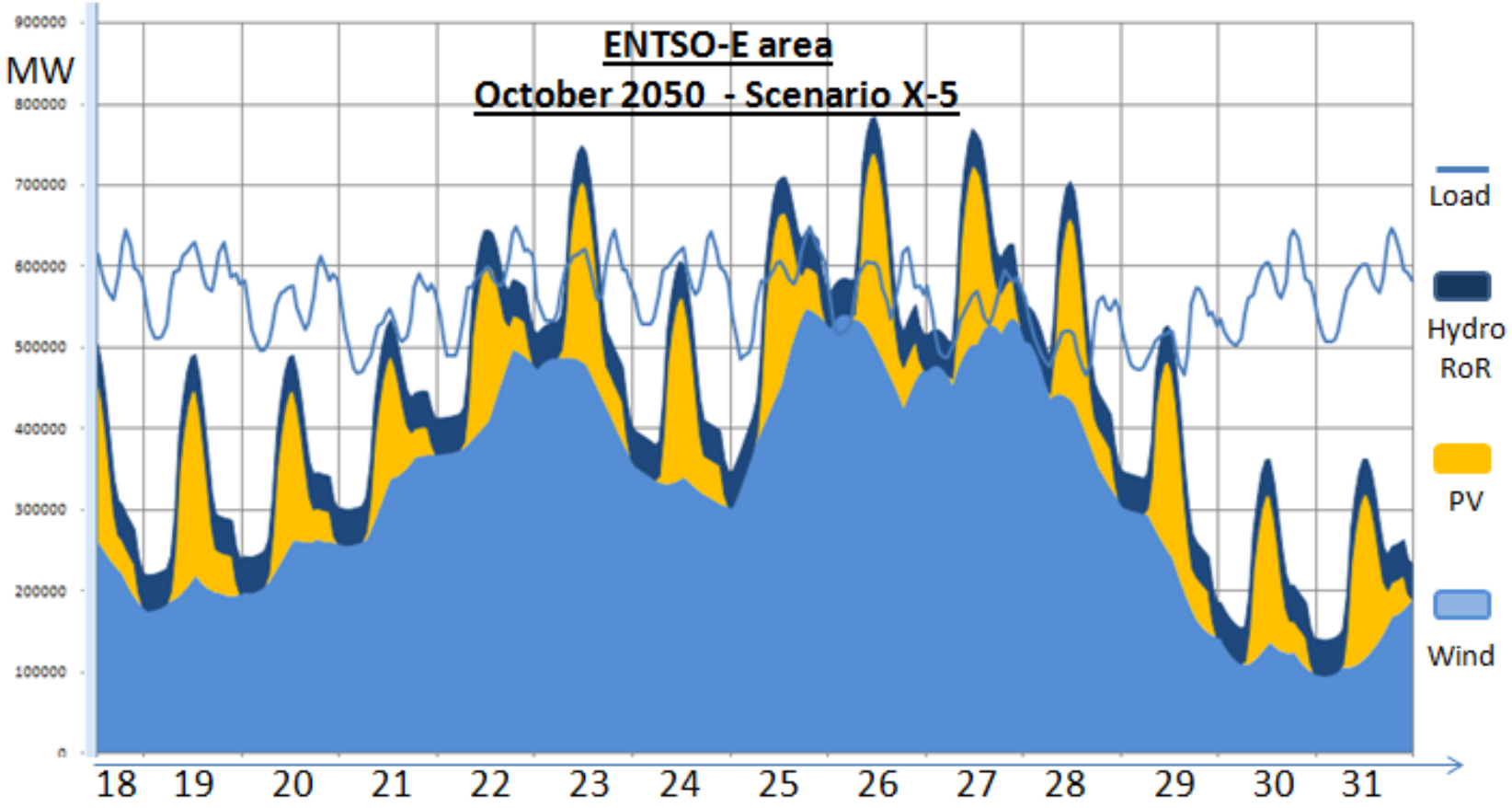
Challenges induced by demand: today

A quantitative assessment



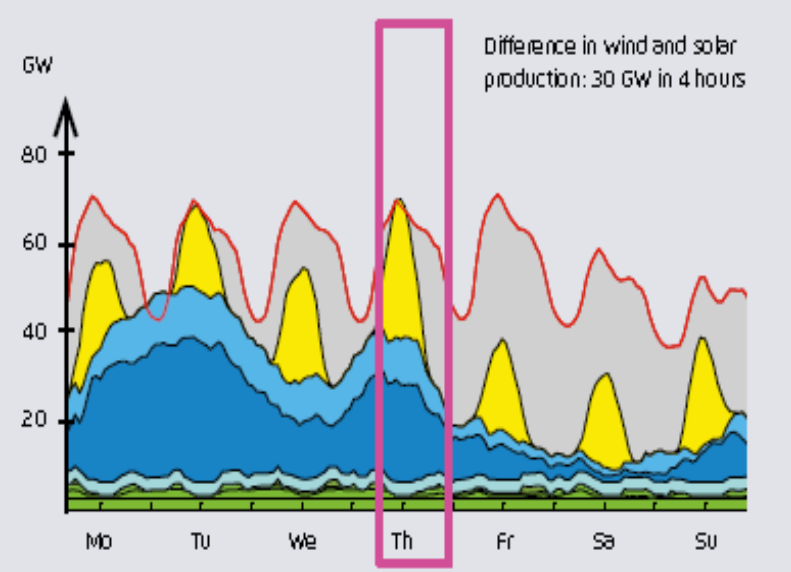
Demand patterns in the future: changes, opportunities

Flexibility and DSR are crucial parts of secure electricity supply (2050 simulations)



Flexibility Improvements – competing solutions

- Increased pan-European interconnections
- Improved transmission/distribution grid capacity in the different control zones
- Operation of CHP and biomass plants according to electricity demand
- Improved flexibility of fossil-fired power plants
- Avoiding generation peaks from wind and PV or using them for heating
- Energy storage



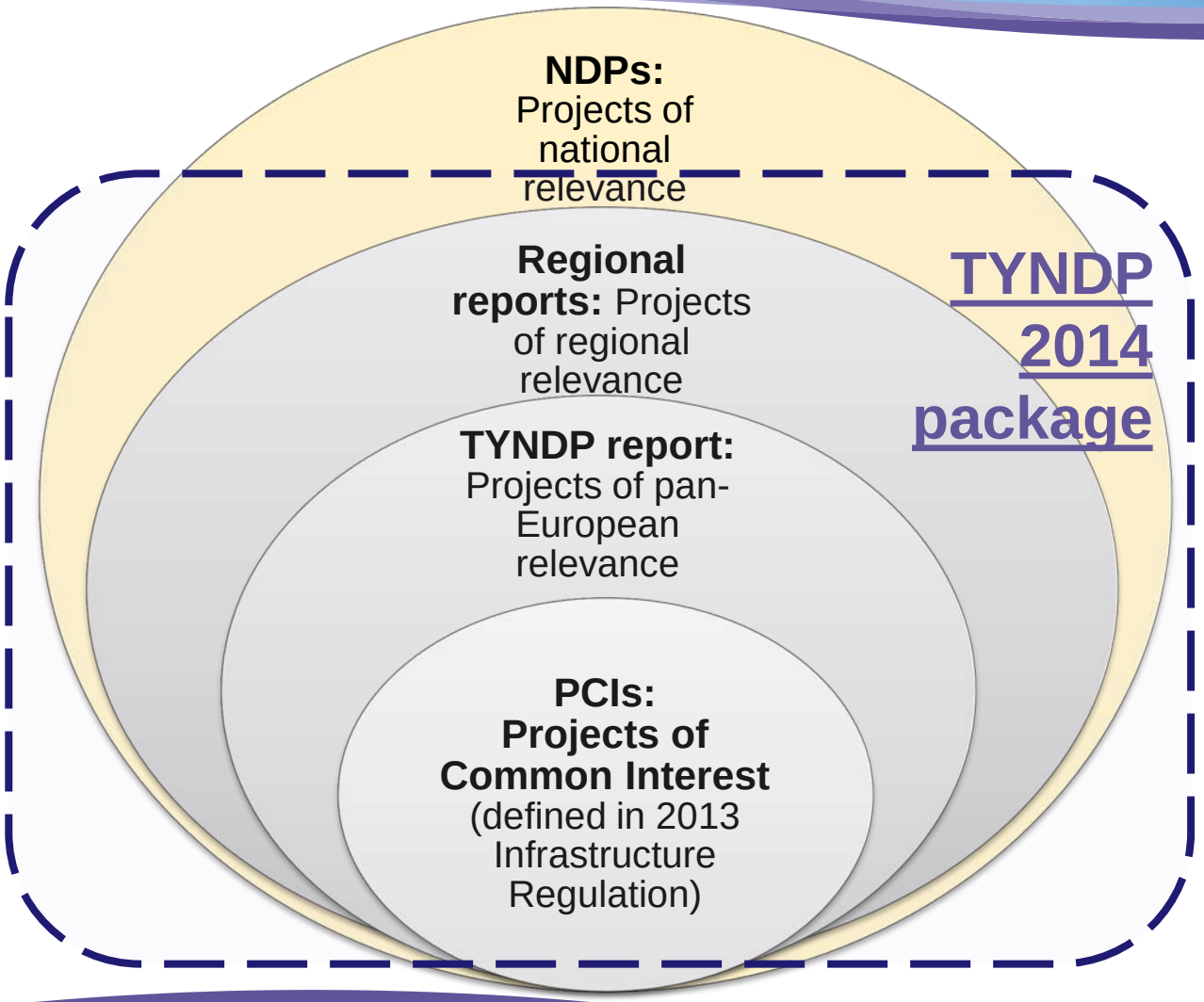
Energy storage development challenge

Maintaining or increasing the security of supply – additional storage required

TYNDP 2014 includes large scale storage facilities connected at transmission level

- Pumped Hydro Storage (PHS)
- Compressed Air Energy Storage (CAES)

TYNDP 2014 – base for the PCI 2015 list include 9 storage projects



120 projects of pan-European relevance

Incorporating 22 third party projects

17 PCI projects assessed:
- **8 transmission projects**
- **9 storage projects**

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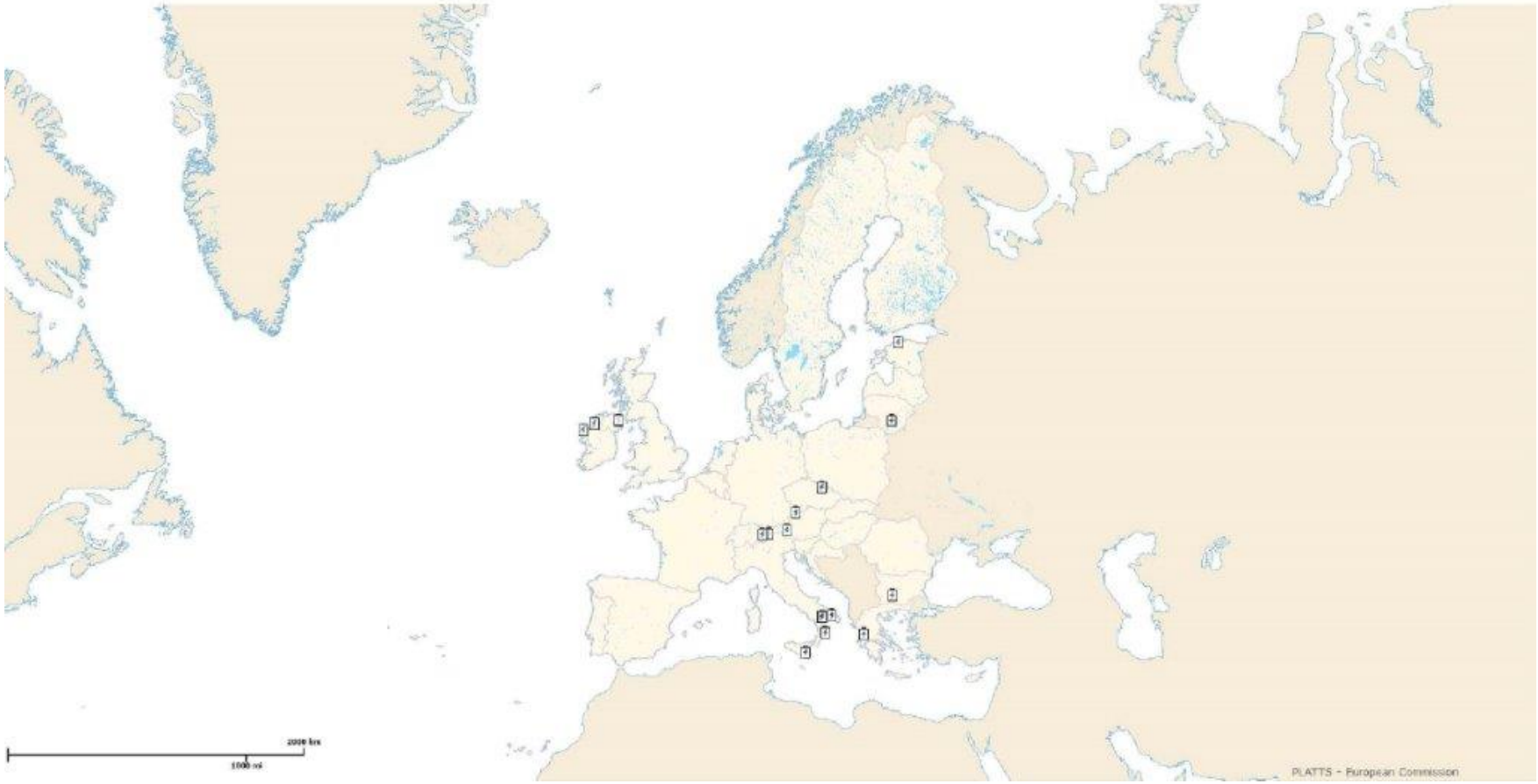
TYNDP – storage projects

PCI 2013 storage projects



Storage a needed alternative :what, how, who?

Rational for storage

- Restructuring of generation and demand side
- Slow development and difficulty in establishing interconnectors
- Balancing the power system in short time scale (few hours and even minutes)
- Spinning reserves on traditional power plants are expected to decline in the future years

Time horizons for storage for delivery back to the grid

- Yearly basis
- Daily basis – fast reacting storage (eg batteries and ancillary services)

Regulatory framework

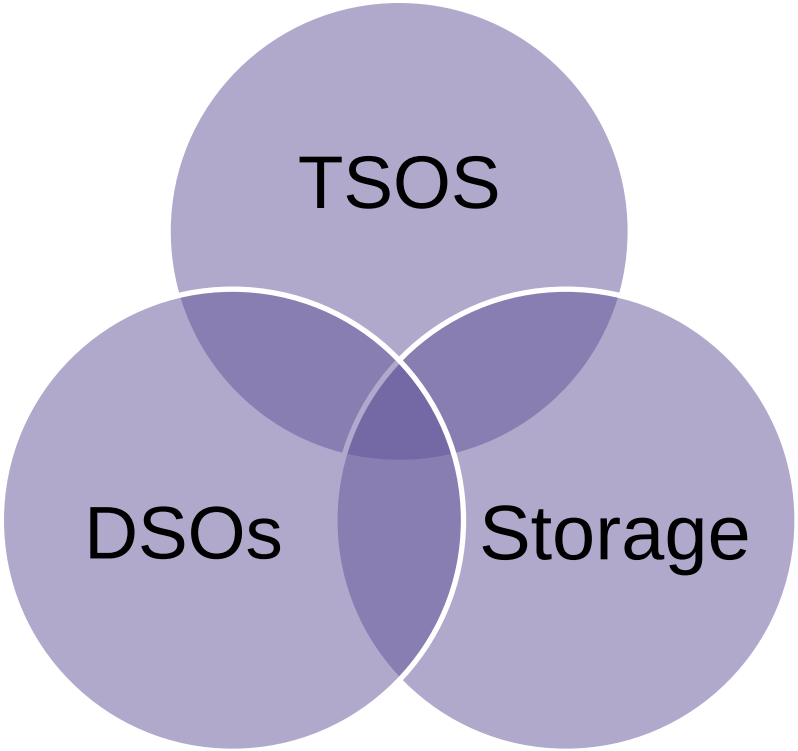
- Who should own and operate the storage facilities
- Business models

Storage a component of R&D Roadmaps and Implementation Plans

From TSOs R&D Roadmap

To TSOs and DSOs R&D Roadmap and Joint actions

To TSOs and integration DSOs and energy storage

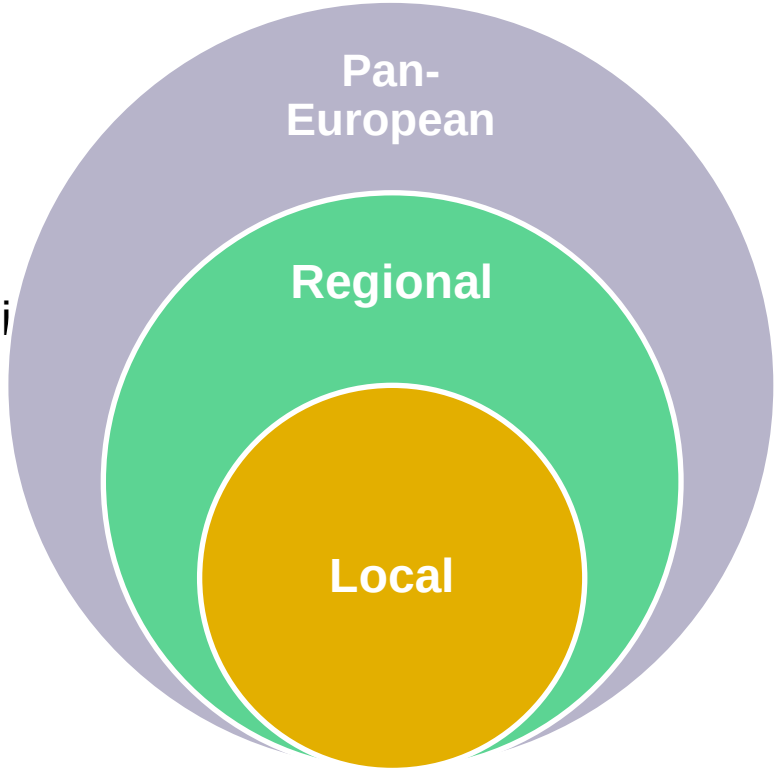


Towards a more integrated energy system

EC framework: R&D within an Integrated Roadmap

TSOs: work for an integrated energy system

- Heating and Cooling
- Transport sector
- Smart Grid deployment
- Use of Gas including power to gas technologi
- Storage



Thank you for your attention !

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Reliable Sustainable Connected

Network codes into force will strengthen consumers

Internal electricity market

3 Connection Network Codes

set requirements for

- Generators
- Demand-side
- HVDC connections

3 Market Network Codes

set market rules for

- Day ahead/intraday & Capacity calculation
- Long-term timeframes
- System balancing

4 Operational Network Codes

set common rules for

- Assessing adequacy
- Planning outages
- System security
- Emergency situations

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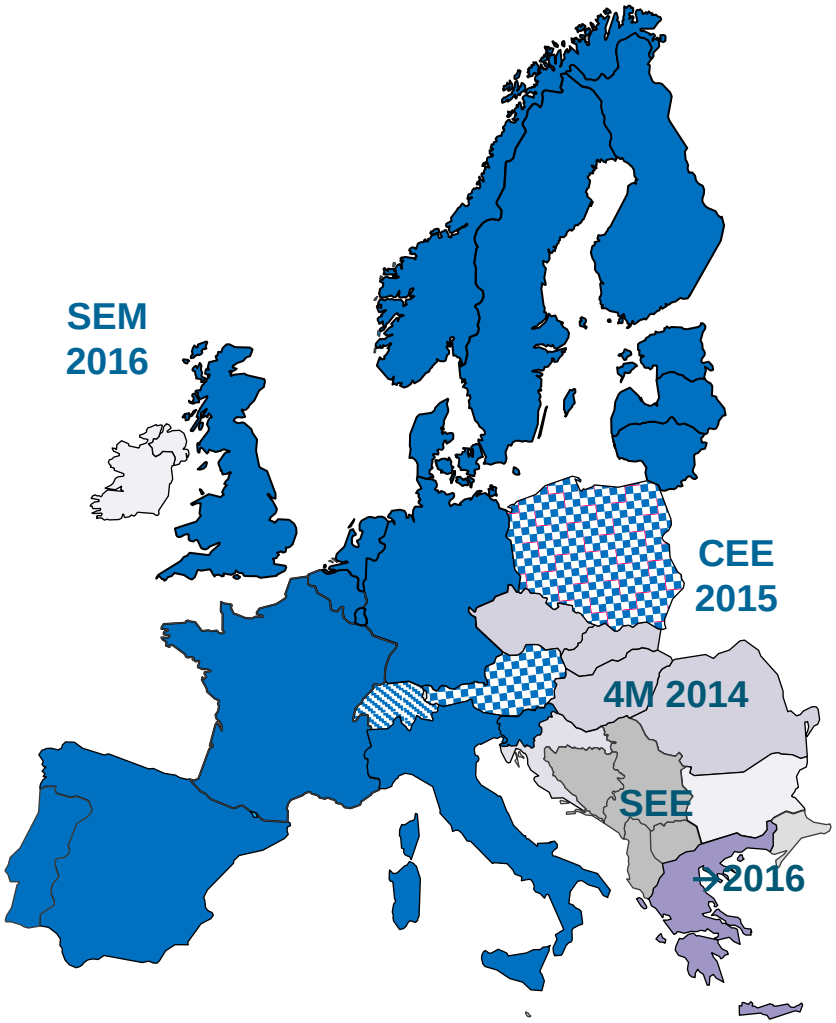
Market coupling: Consumers enjoy purchasing electricity across Europe

- The NWE price coupling project went live in Feb 2014
- Full coupling SWE-NWE in 2014
- Market is supported with a strengthening transmission backbone



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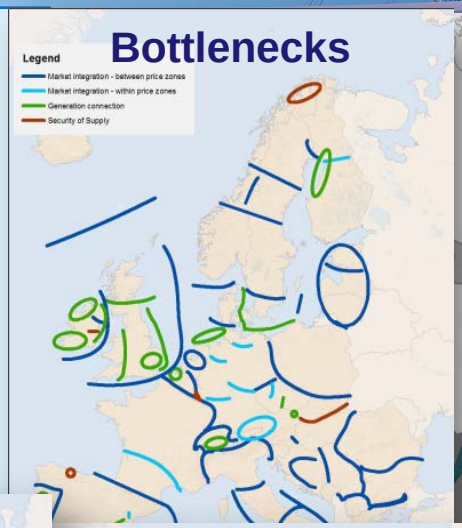
What to expect from the TYNDP 2014

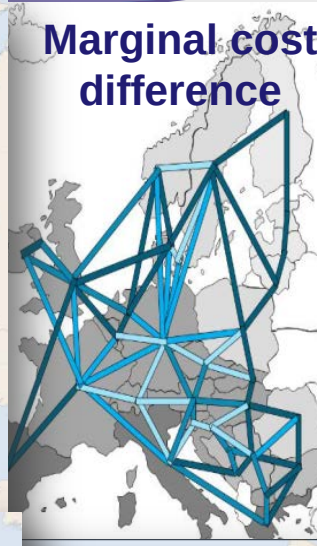
…a comprehensive document suite that includes

- Ten-Year Network Development Plan
- Scenario Outlook and Adequacy Report
- 6 Regional Investment Plans

Main concerns

- RES integration
- Market integration
- Security of supply





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Energy storage related issues presently in EEGI

TSO R&I Clusters

- Grid architecture
- Power technologies
- Network operations
- Market designs
- Asset management

DSO R&I Clusters

- Integration of smart customers
- Integration of DER and new uses
- Network operations
- Network planning and asset management
- Market design

Purpose of EC contract

- provide the EEGI team and EC with consolidated stakeholder views for the research and technology development needs and market uptake measures for end to end pan European electricity grids and energy storage including interaction with other energy networks
- facilitate a technological base to open up for the "active customer“
- 1.5 million € for a 2 year contract