EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

EU Regulatory Frameworks for the Integration of Wind Energy into Power Systems

Paul Wilczek – EWEA Senior Regulatory Affairs
Advisor – Grids and Internal Electricity Market

6 May 2011

What is the European Wind Energy Association?

EWEA is the **voice of the wind industry** in Europe

Activities include:

- **Researching** the latest developments in the wind sector
- **Coordinating** EC-funded projects
- **Disseminating** high quality, up-to-date information
- **Raising awareness** of the benefits of wind power
- **Organising** Europe's premier wind energy events

EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

www.ewea.org/membership

More than 600 members from almost 60 countries

- Manufacturers with a leading share of the global wind power market
- Component suppliers
- Research institutes
- National wind and renewable associations
- Developers
- Electricity providers
- Finance and insurance companies
- Consultants
- Contractors

This combined strength makes EWEA the world's largest and powerful wind energy network

EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

Members include the following leading players:

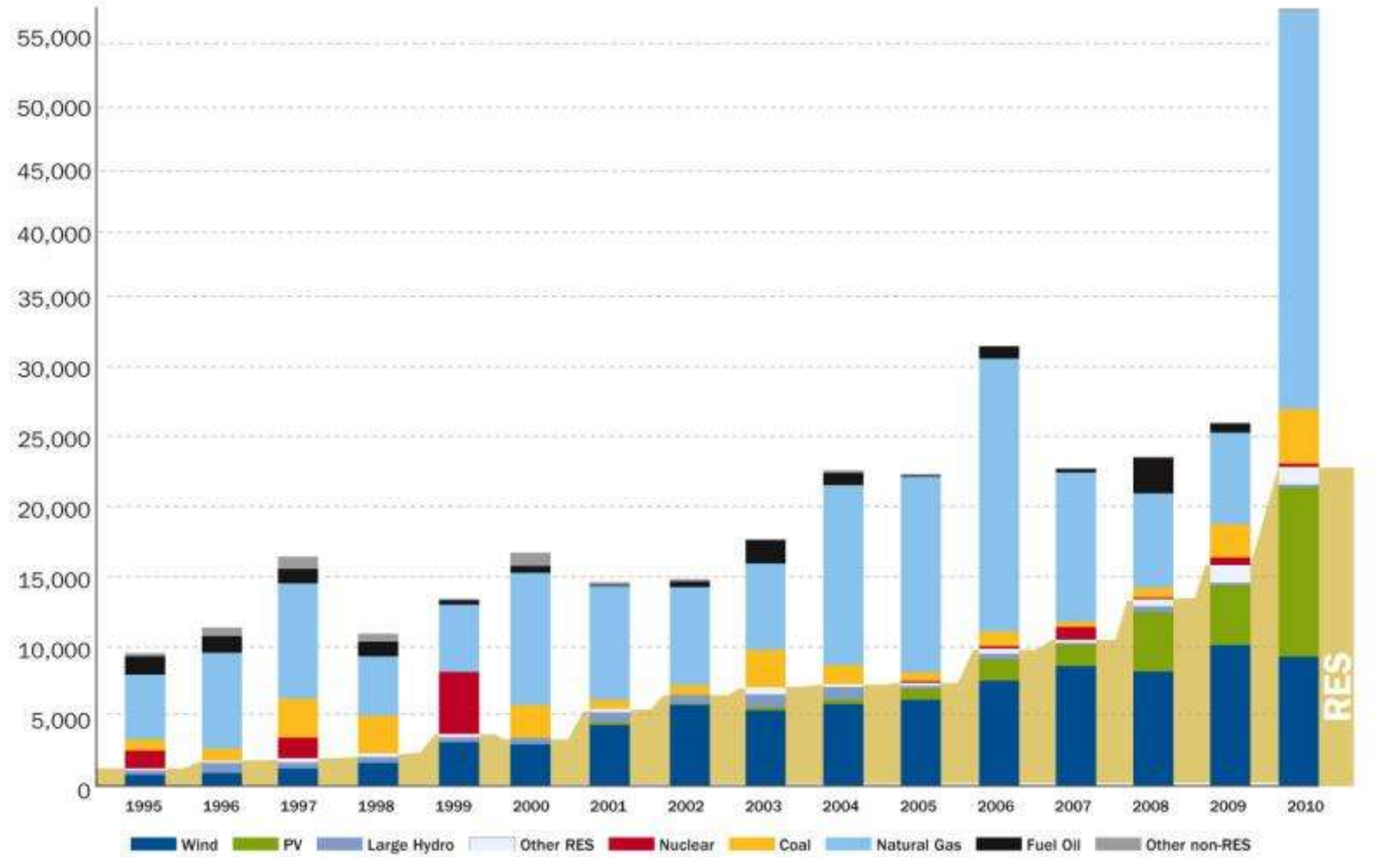
acciona Windpower
DONG energy
edp renovables powered by nature
EnBW
Enel Green Power
e·on Climate & Renewables
GE Energy
IBERDROLA RENEWABLES
MAINSTREAM RENEWABLE POWER
PPC Renewables
res power for good
SIEMENS
SSE Renewables
SUZLON
VATTENFALL
Vestas No. 1 in Modern Energy

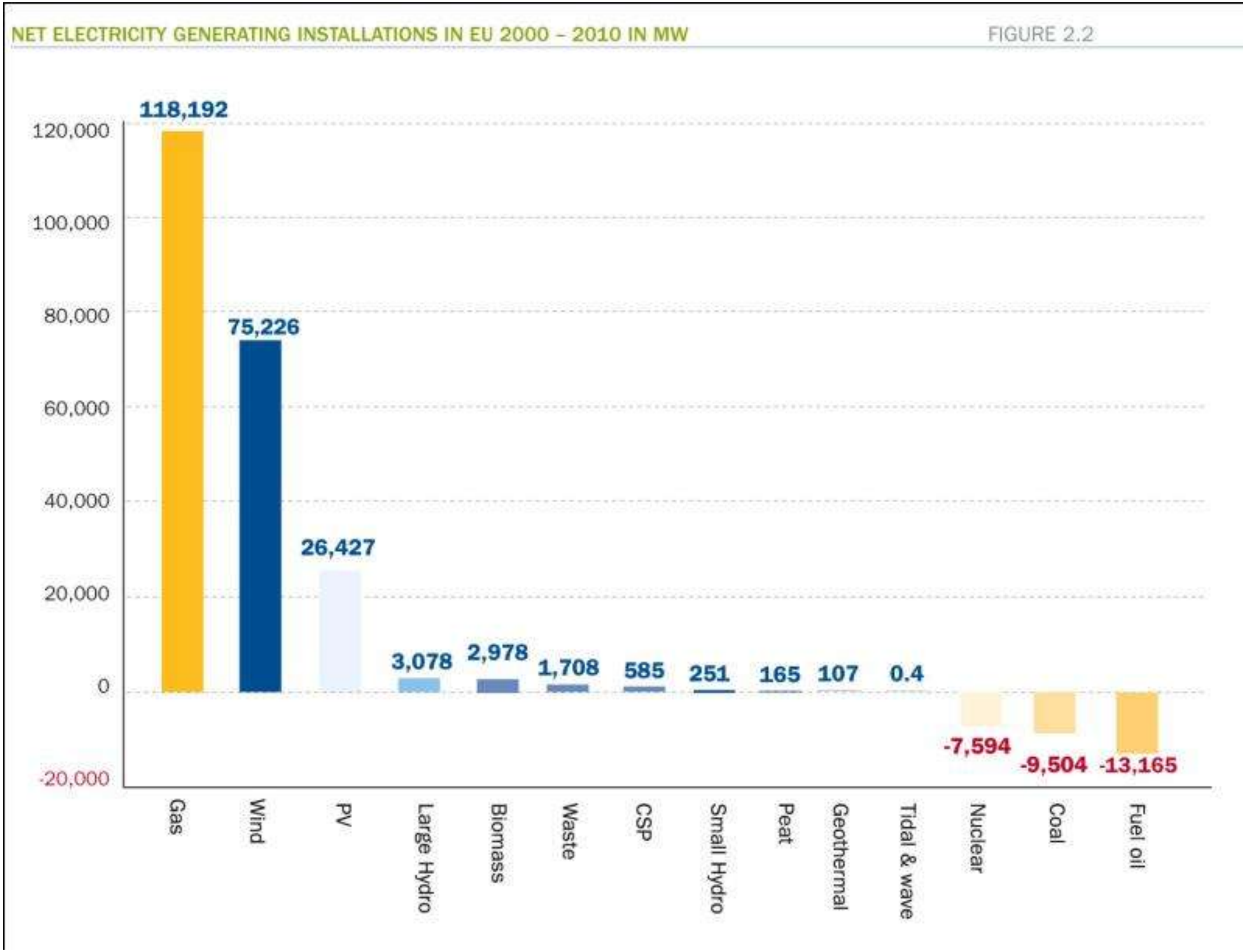
Presentation outline

- Recent developments in the EU power system
- EU Renewable Energy Directive
- 100% renewable electricity by 2050
- Conclusion

NEW INSTALLED CAPACITY PER YEAR IN MW

FIGURE 2.1





EWEA
THE EUROPEAN WIND ENERGY ASSOCIATION

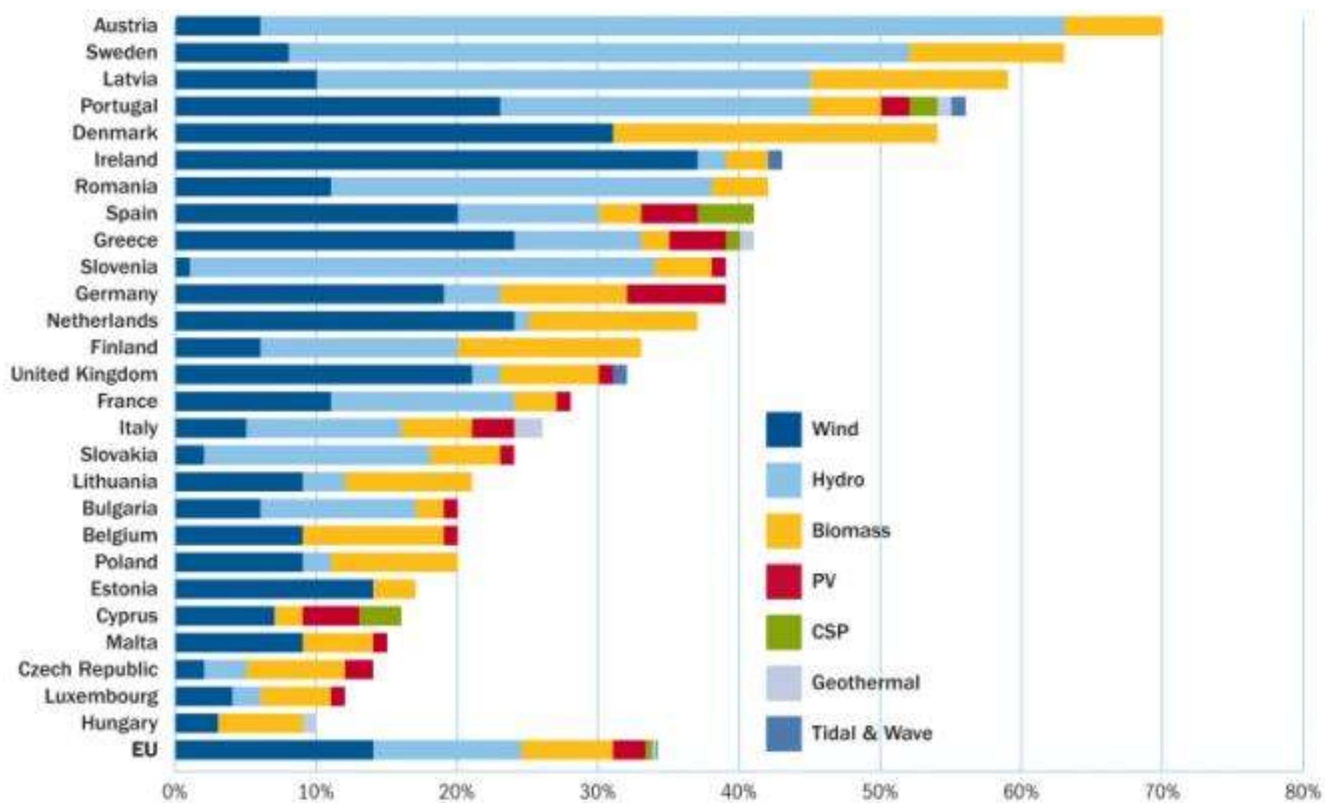
Outline

- Recent developments in the EU power system
- EU Renewable Energy Directive
- 100% renewable electricity by 2050

EU Renewable Energy Directive

- 20% renewable energy target for 2020
  - Meaning 34% renewable electricity
- Minimise curtailment of renewable electricity
- Priority for renewables during dispatch
- Priority or guaranteed access for renewable electricity
- Possible priority connection for renewables to the grid

Renewables' share of electricity consumption per member state (%) in 2020 according to the NREAPS



EU RES targets

EWEA THE EUROPEAN WIND ENERGY ASSOCIATION

RES directive (2009/28/EC)

- 20% RES in EU gross final consumption (Heating and cooling / Transport / Electricity)
- Legally binding national targets
- National Renewable Energy Action Plans

➡ Wind energy according to NREAPs:

- **495 TWh**
- **14% electricity consumption**

EWEA targets in the EU up to 2020 and 2030

Two Scenarios up to 2020:

"Baseline" Scenario: 230 GW installed capacity, of which 40 GW is offshore. 580 TWh, 14.2% of EU electricity demand.

High Scenario: 265 GW installed capacity, of which 55 GW is offshore. 681 TWh, 16.7% of EU electricity demand.

Target for 2030:

400 GW, of which 150 GW is offshore. 1150TWh, 26.2-34.3% of EU electricity demand.

Rationale for network arrangements in the RES directive

- In the absence of effective competition, priority access and dispatch is necessary.
- Member States shall ensure that appropriate grid and market-related operational measures are taken to minimise the curtailment of electricity produced from RES

Priority grid access should not be seen as positive discrimination, but as compensation given there is no functioning internal energy market.

Market design and the integration of wind power

- A cost-effective deployment of wind power, and the integration of European electricity markets are fundamentally linked.

- The market's gate-closure time closer to real-time would have a dramatic impact on forecast accuracy and the cost of balancing the system as proven by various power system studies.

➡ EU-wide deployment of intra-day market trading with implicit auctioning and gate closure times as close to real time as possible is crucial.

Market design and the integration of wind power (II)

- The functioning and liquidity of wholesale markets and cross-border interconnectivity together with the forecast horizon influences to what extent wind farm operators <u>can</u> be at all in balance.

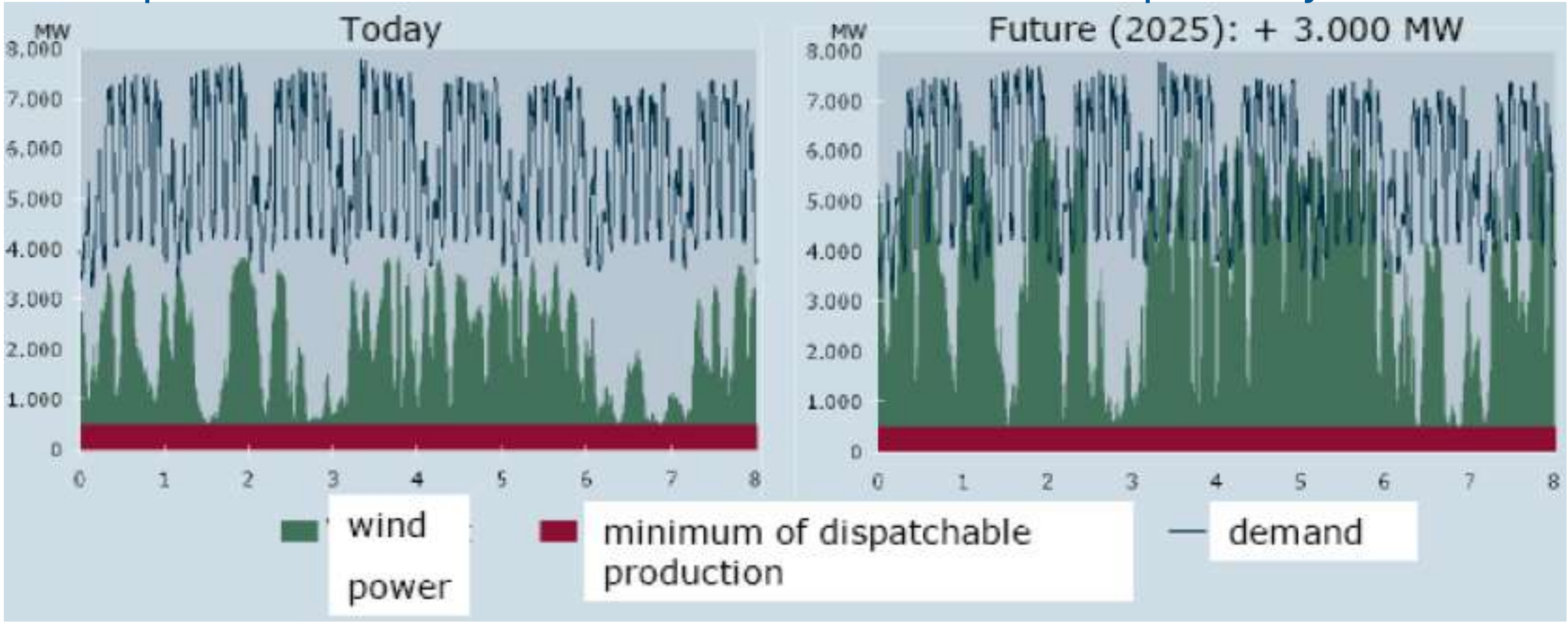
- The application of state-of-the-art forecast tools together with larger balancing areas is the key!

➡ In regimes where balancing costs must be borne by the wind farm operator, regulators should ensure that these costs are transparent and represent only the real cost of balancing.

Why are functioning power markets crucial for the integration of wind energy?

The concern of the TSO:

Consequences of an additional 3000 MW on the Danish power system



Source: Energinet.dk

Optimal utilisation of both, domestic flexibility and international electricity markets is a prerequisite to maintain security of supply and maximise the value of wind power.

Outline

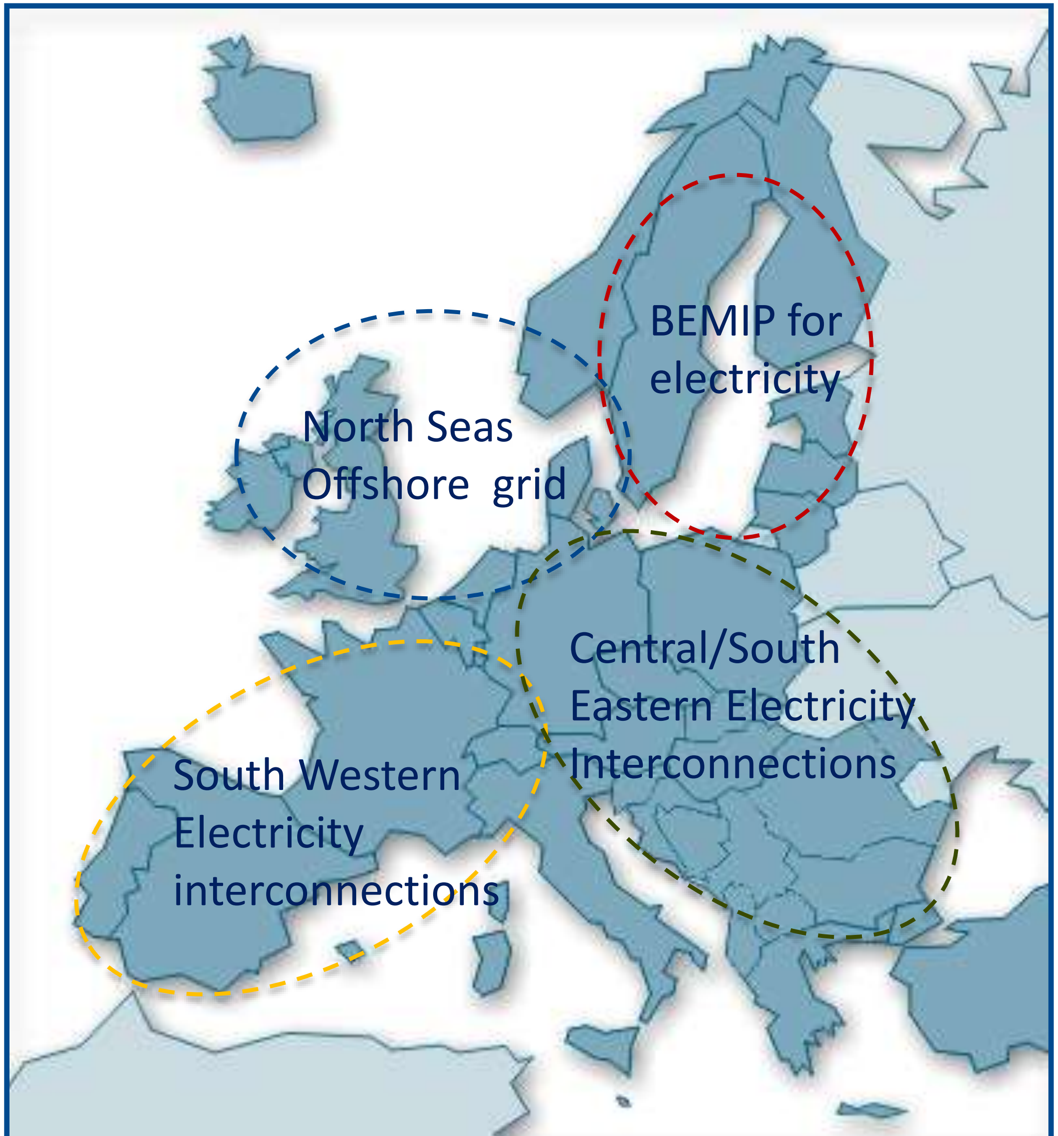
- Recent developments in the EU power system
- EU Renewable Energy Directive
- 100% renewable electricity by 2050

EWEA 100% renewable electricity 2050 vision

Showing the way towards a renewable, fully integrated European power system in the next decades:

- Where would the main generation and load areas be located?
- Where would the dominant power flows of specific generation sources occur?
- Based on current UCTE map, ENTSO-E TYNDP and EWEA 20 year offshore grid master plan

EU Infrastructure priority corridors



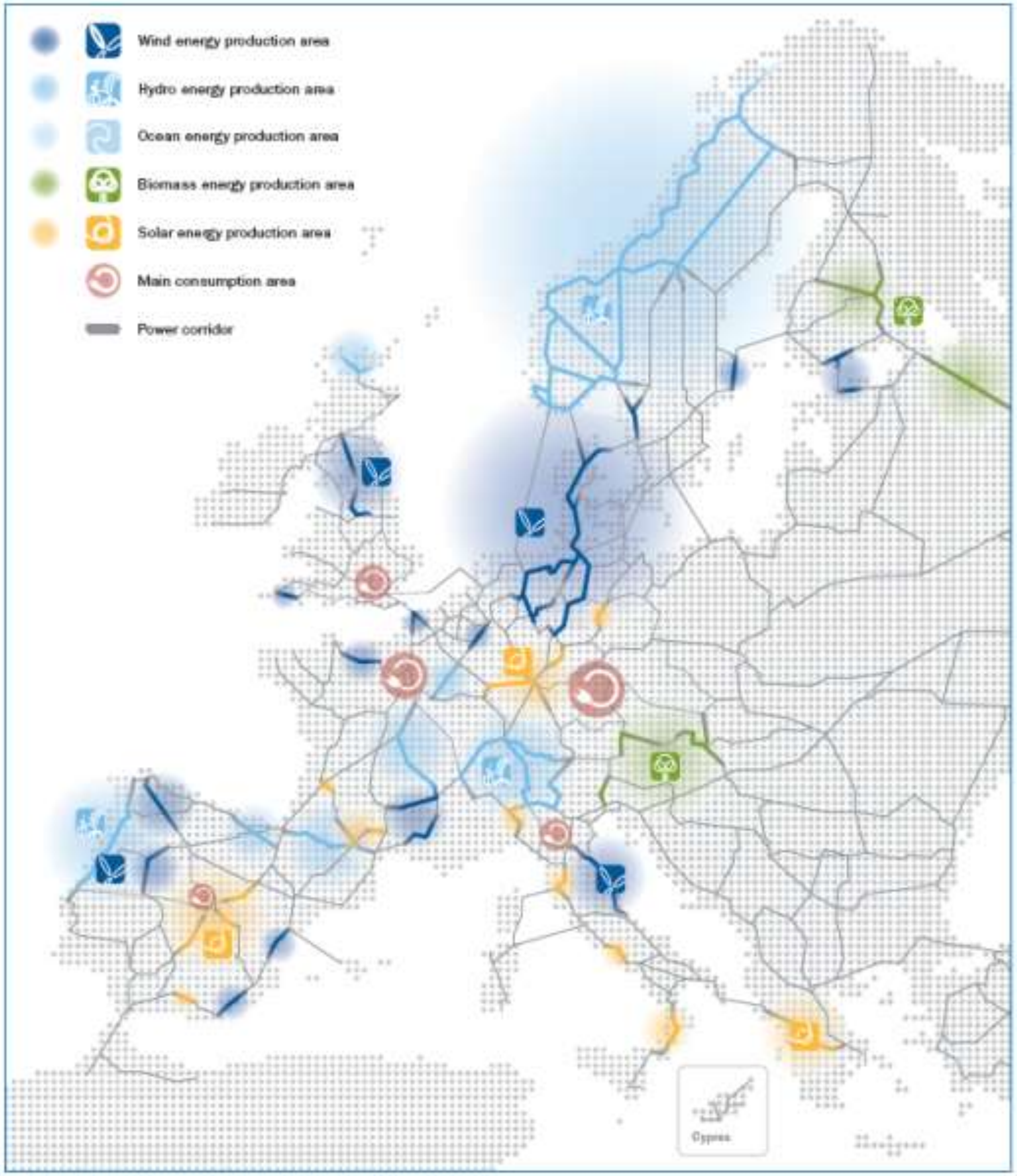
Criteria for projects:

- •Internal market development
- •Security of Supply
- •RES integration

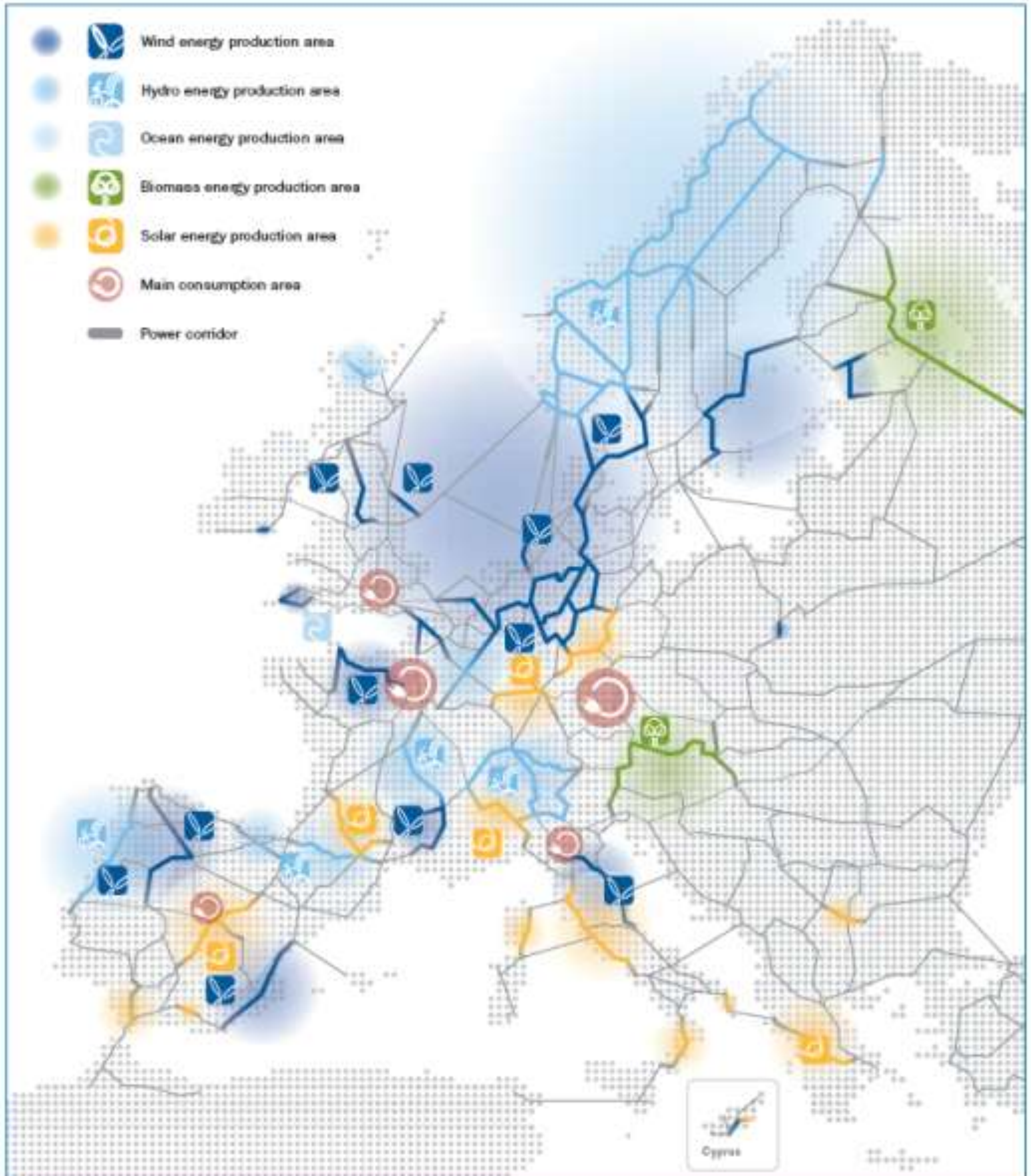
Further priorities:

- •Smart grids
- •„Electricity Highways“ (after 2020)

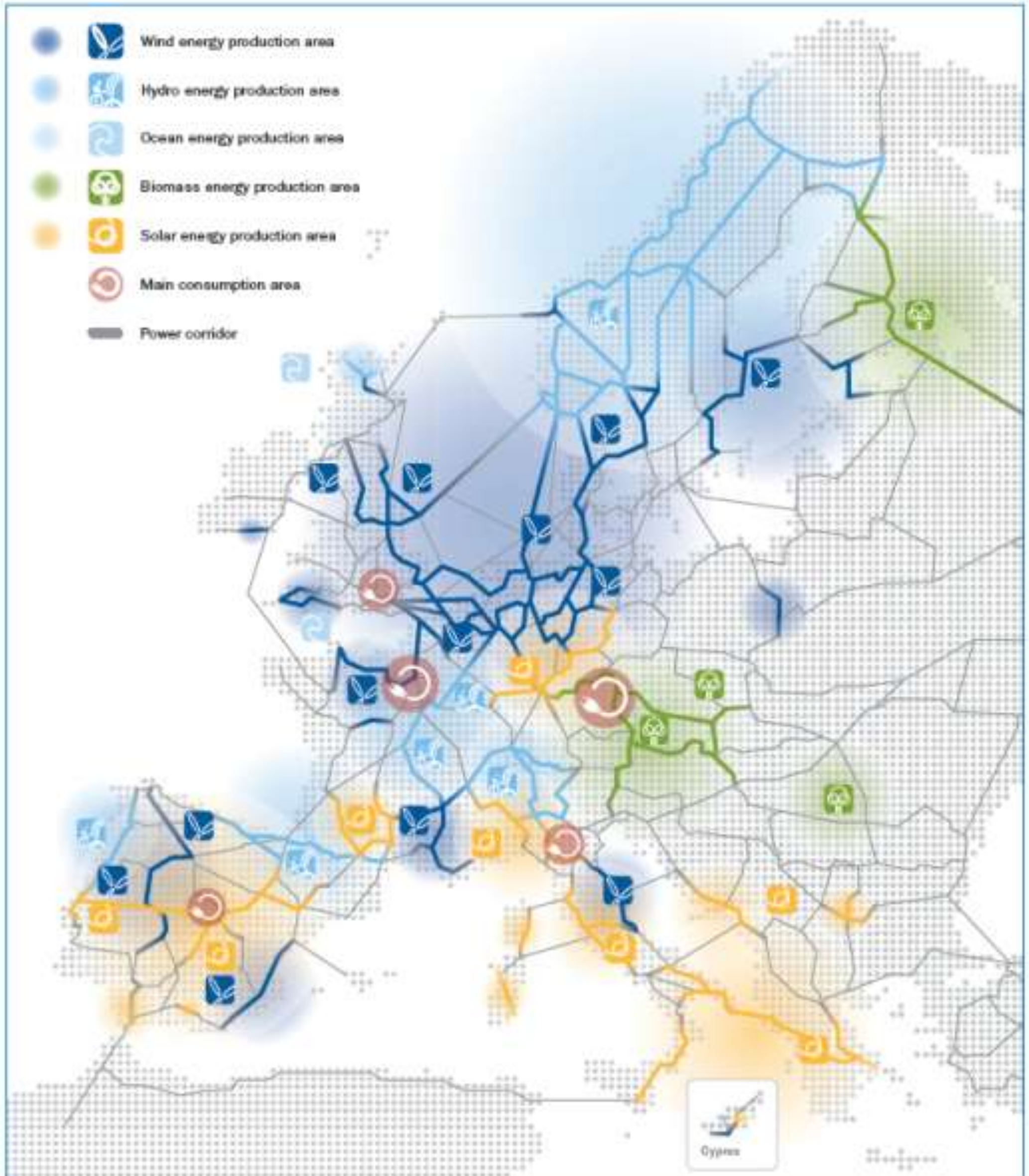
Major RES power flows 2010



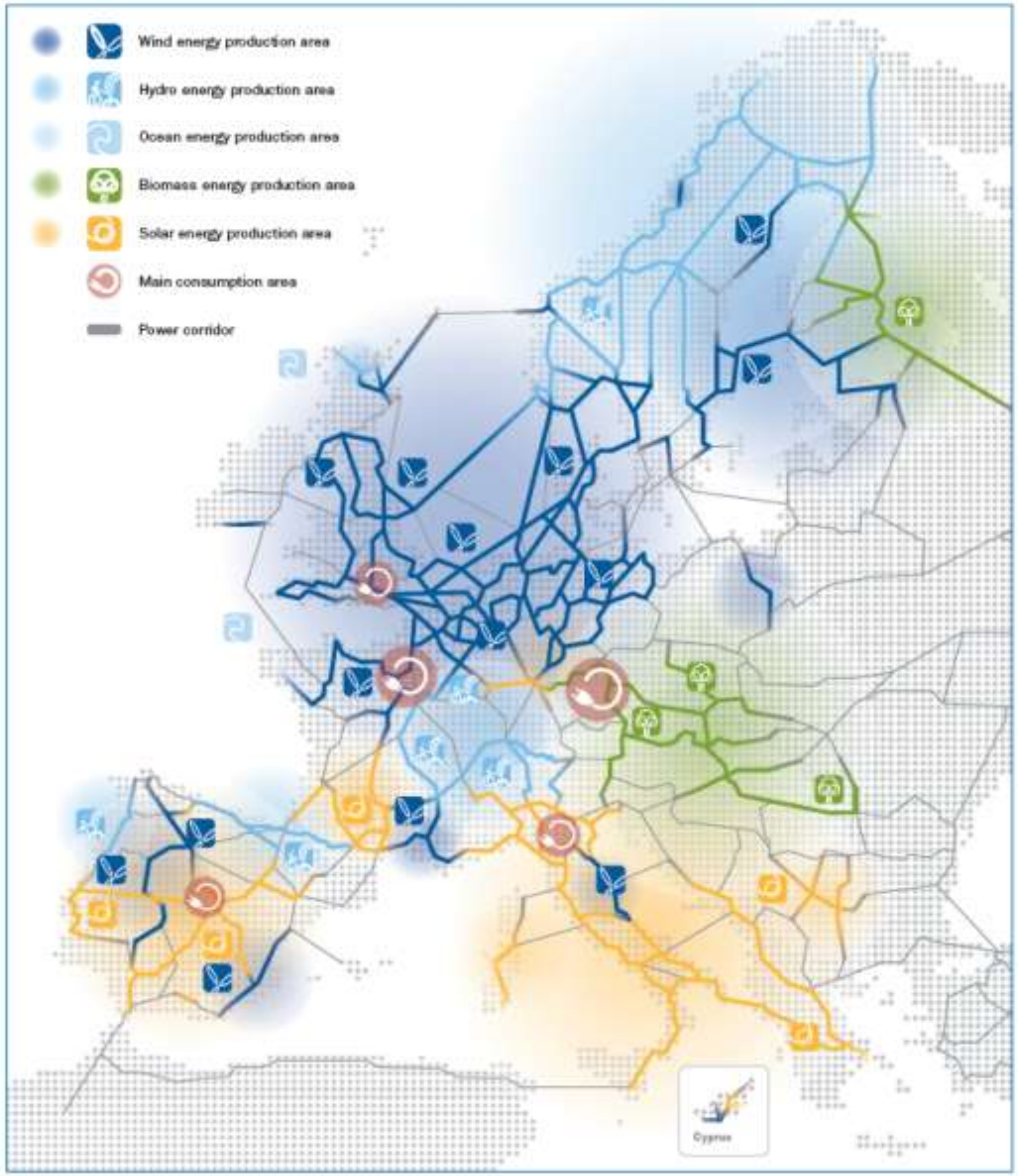
Major RES power flows 2020



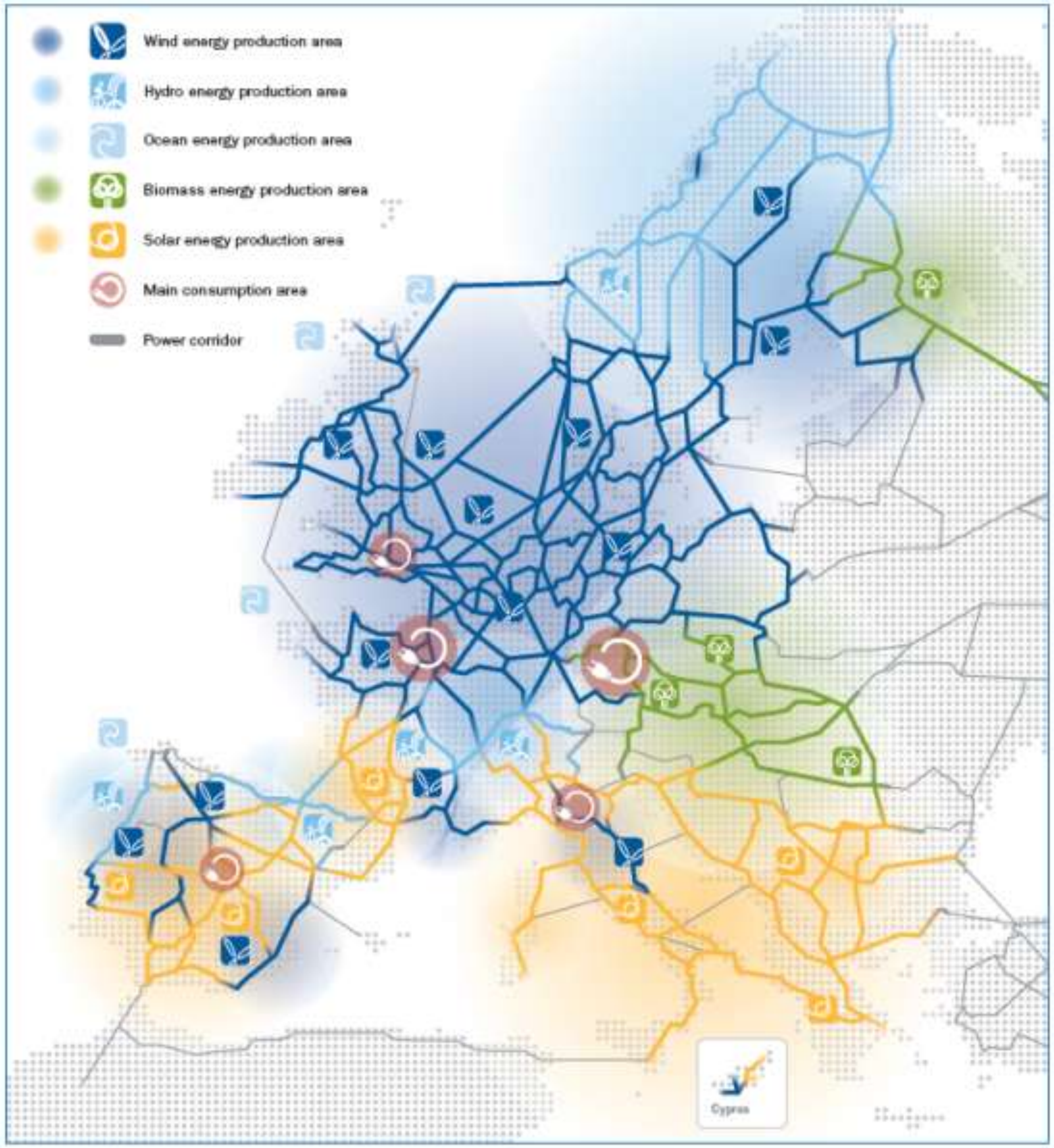
Major RES power flows 2030



Major RES power flows 2040



Major RES power flows 2050



A 100% RES grid is possible - Main challenges for the electricity network

- Increased power flows as wind power capacity increases
- Distance of wind power from load centres – shift from the conventional design where thermal generation was build close to the consumption areas

KEY ISSUES

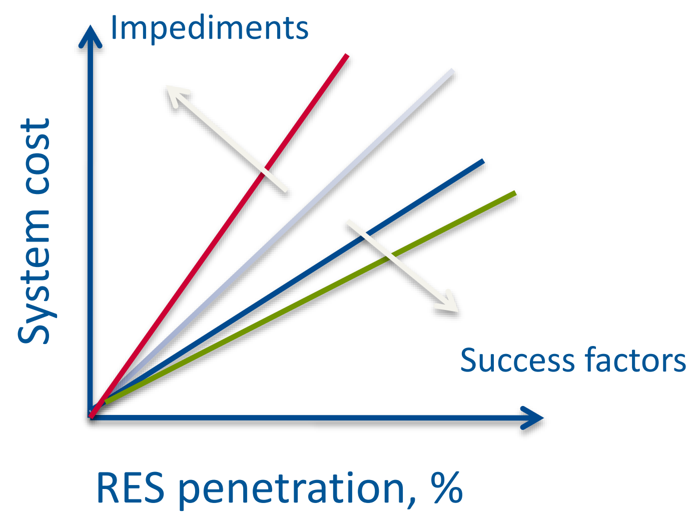
- European grid is weak on interconnections
- Often weak or ageing distribution grids
- Interconnection projects face long lead times (10 years or more) due to planning obstacles
- Cost allocation: investments in electricity infrastructure is a regulated business – regulators don’t take into account long-term benefits

To conclude: How do we achieve a high penetration of RES? Lessons learned up to now…

Impediments:
- Lack of transmission
- Lack of TSO cooperation
- Inflexibility due to market rules and contracts
- Unobservable RES – behind the fence
- Inflexible operation strategies during light load and high risk periods

System cost:
- Unserved energy
- Higher fuel costs
- Higher emission costs
- Higher O&M costs

Success factors:
- Forecasting
- Thermal fleet:
  - More quick starts
  - Deeper turn down
  - Faster ramps
- More spatial diversity
- RES + DG + DSM
- Grid-friendly RES



What's the « limit » is never quite the right question!

Thank you

www.ewea.org

EWEA
80 RUE D'ARLON
B-1040 BRUSSELS

T: +32 2 213 1811
F: +32 2 213 1890
E: ewea@ewea.org