



**EWEA**  
THE EUROPEAN WIND ENERGY ASSOCIATION



# Wind power integration in Europe – A 100% renewable grid is possible

Dr Klaus Rave  
Vice President  
European Wind Energy Association

## Outline

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

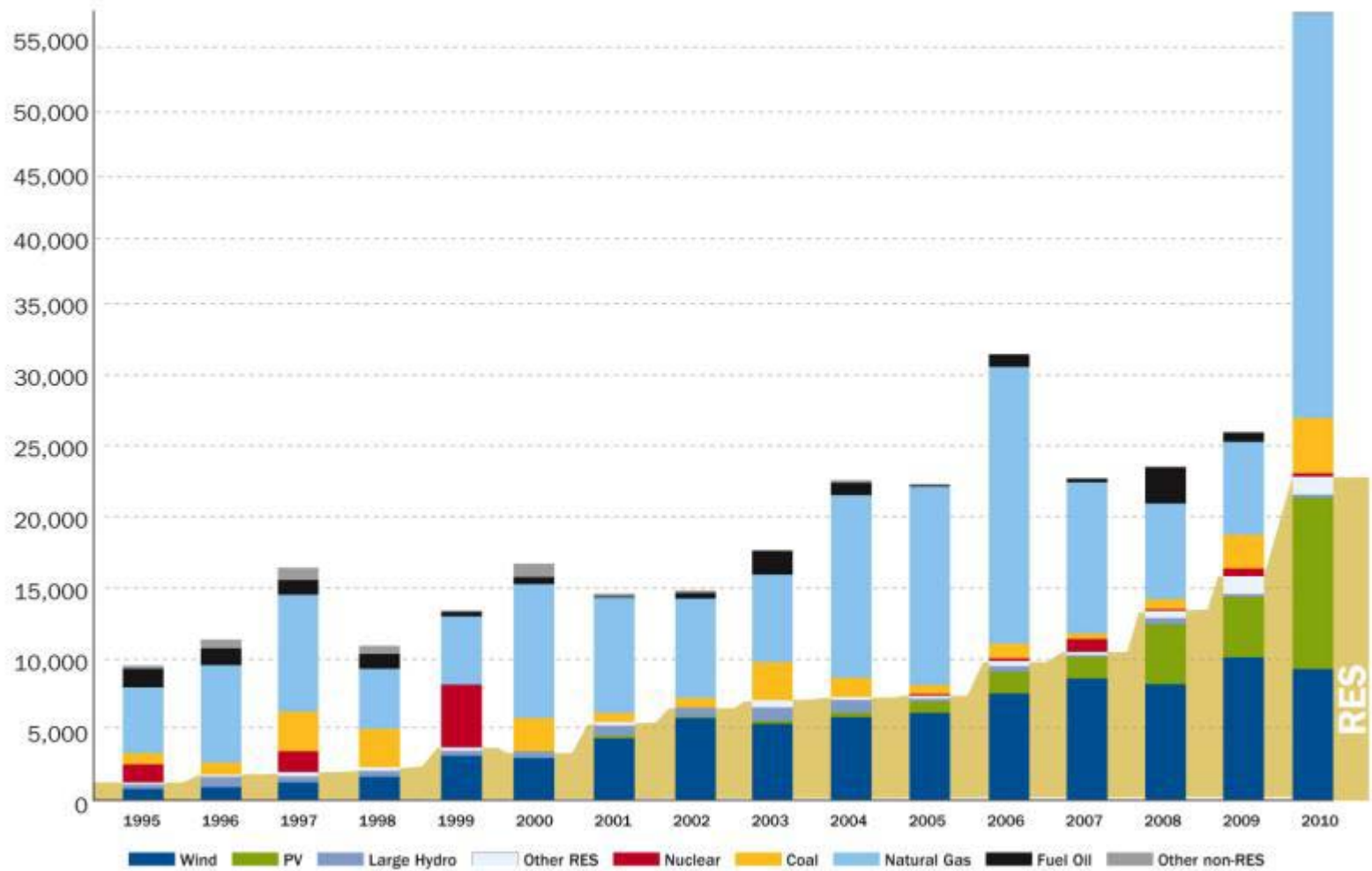
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**NEW INSTALLED CAPACITY PER YEAR IN MW**

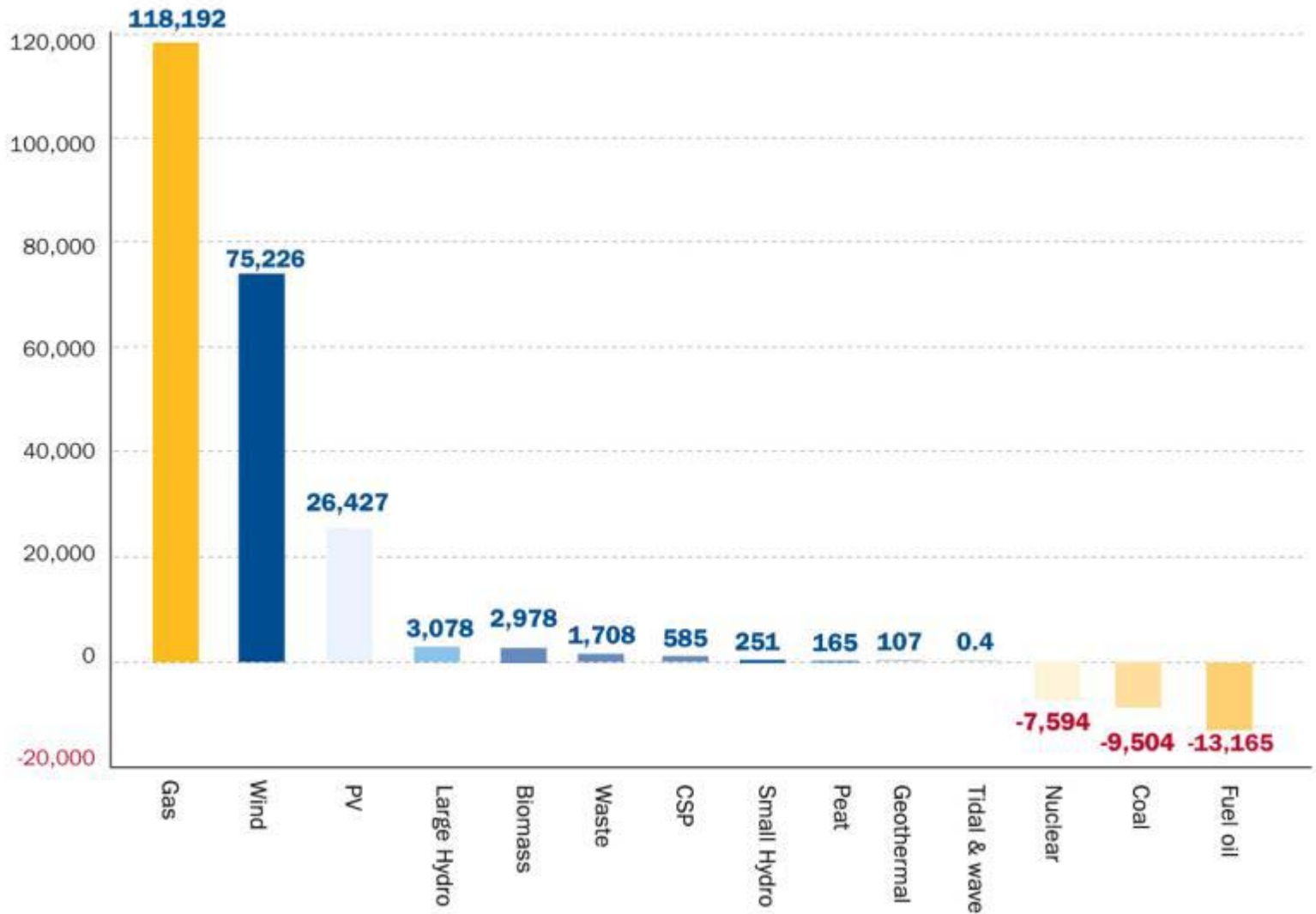
FIGURE 2.1



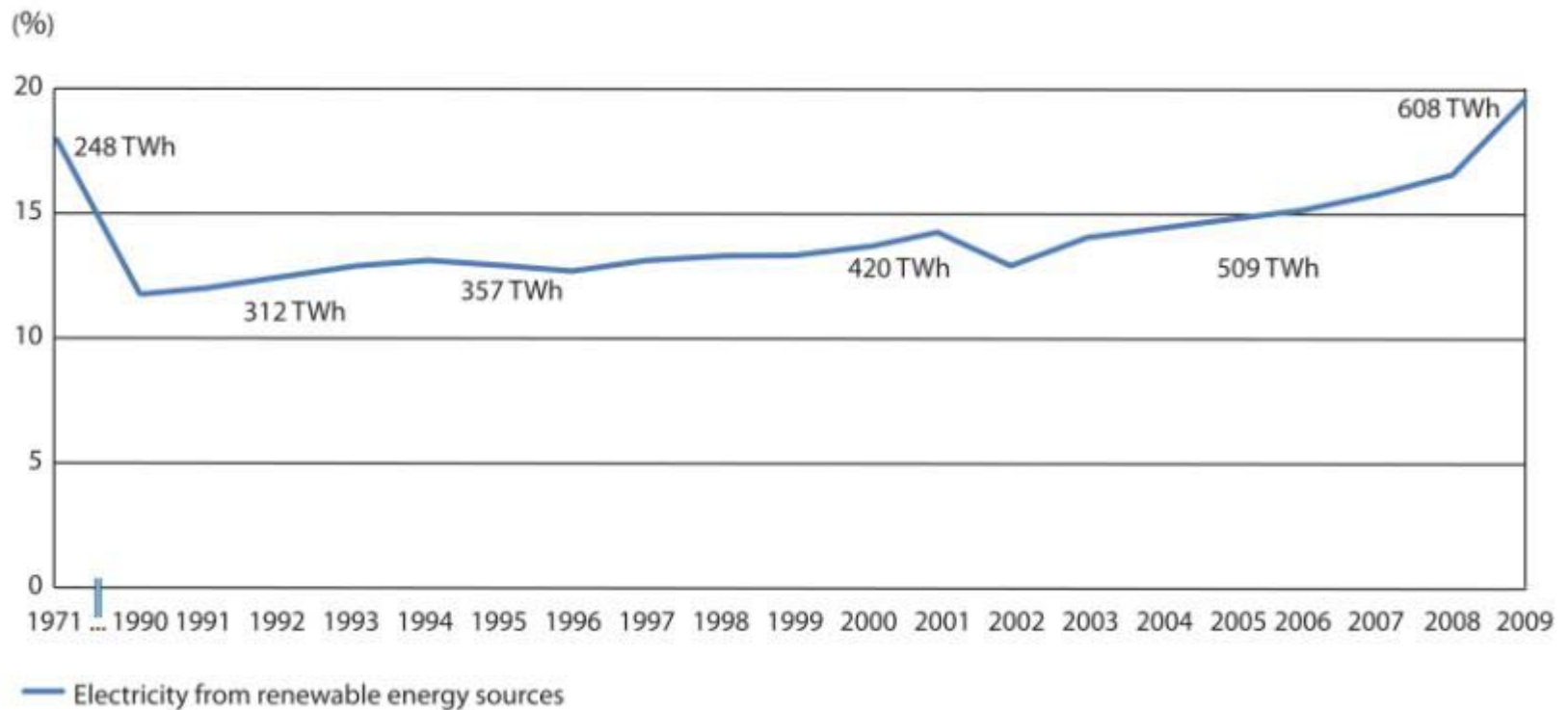


NET ELECTRICITY GENERATING INSTALLATIONS IN EU 2000 – 2010 IN MW

FIGURE 2.2



# Renewable electricity's share of total EU27 electricity consumption 1971-2010 (%)



## Outline

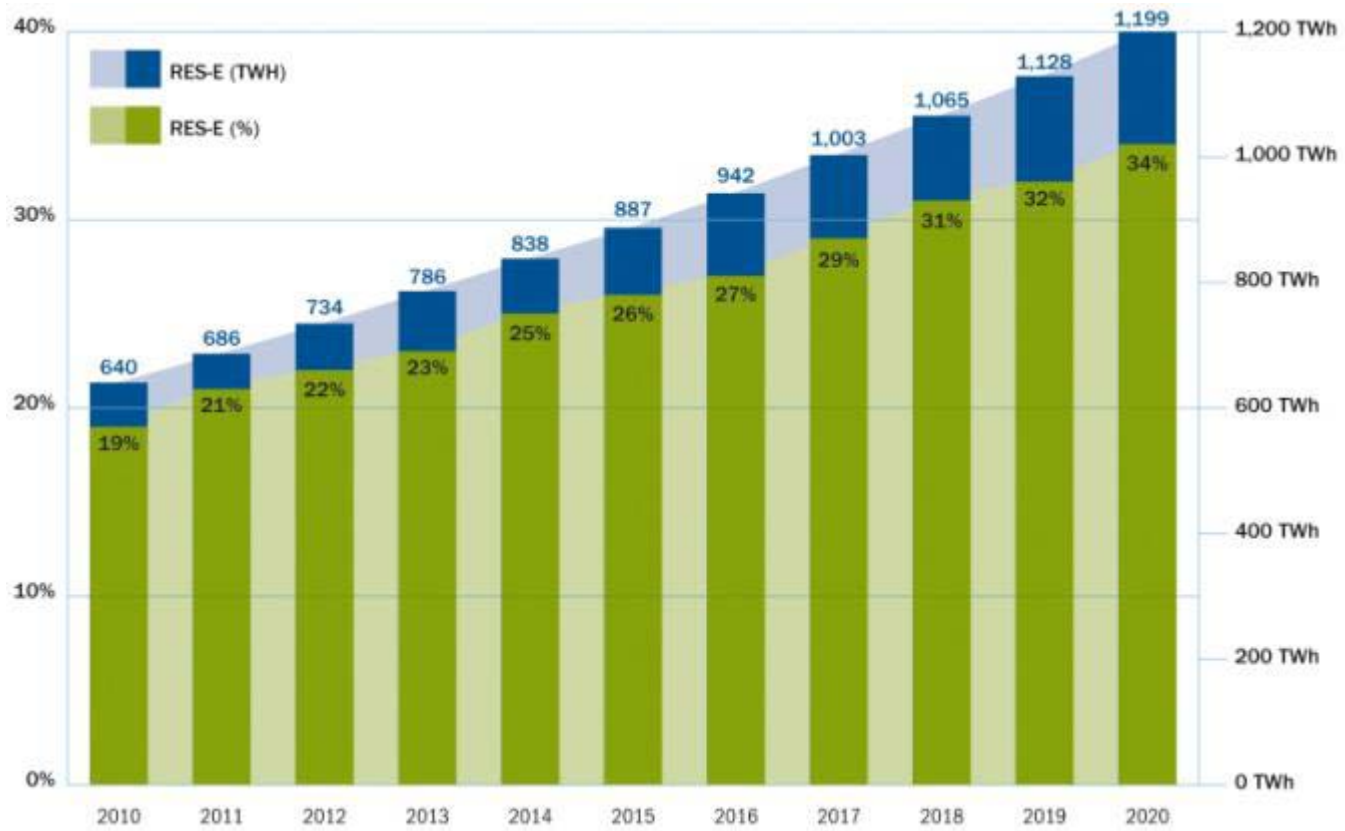
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# EU Renewable Energy Directive

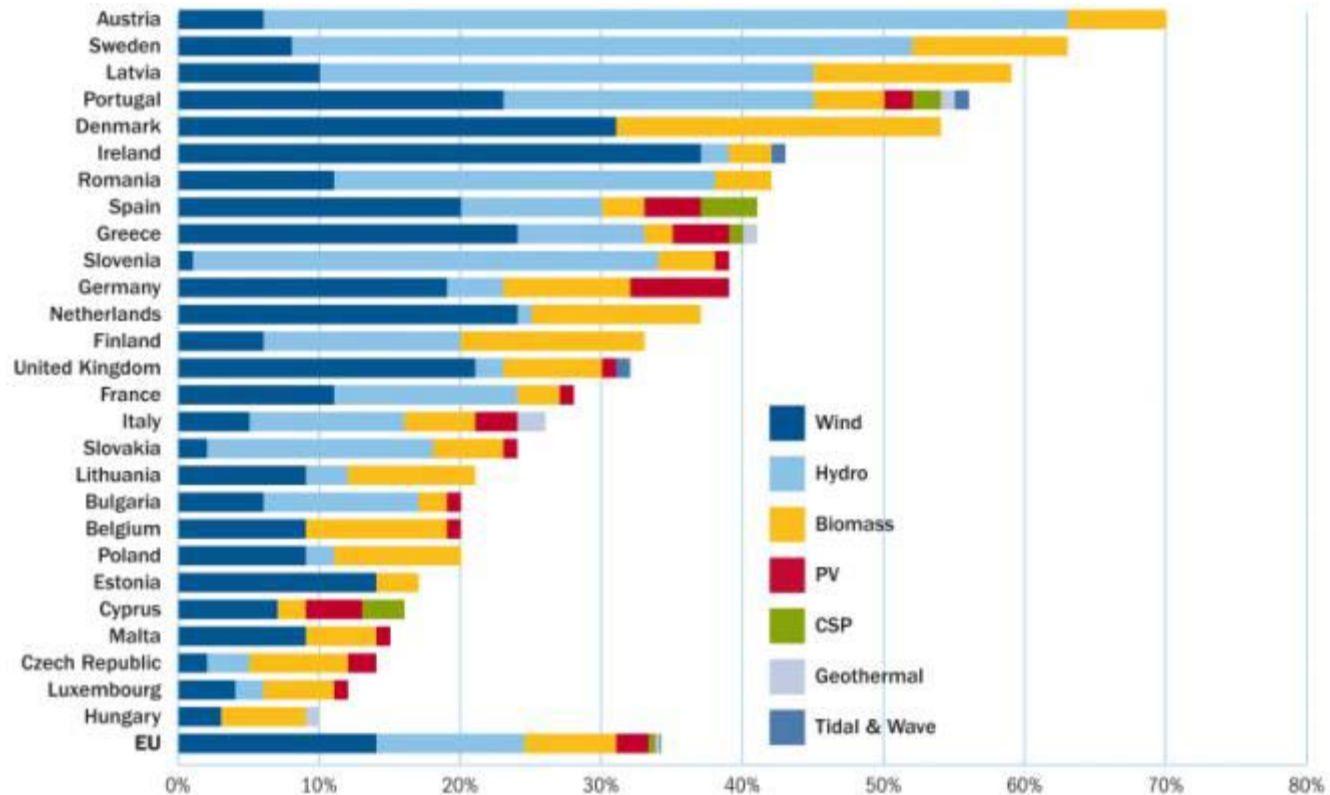
- 20% renewable energy target for 2020
  - Meaning 34% renewable electricity
- Minimise curtailment of renewable electricity
- Priority for renewables during dispatch
- Priority or guaranteed access for renewable electricity
- Possible priority connection for renewables to the grid



# Electricity production from renewable energy sources according to the NREAPS (EU-27)



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



## Outline

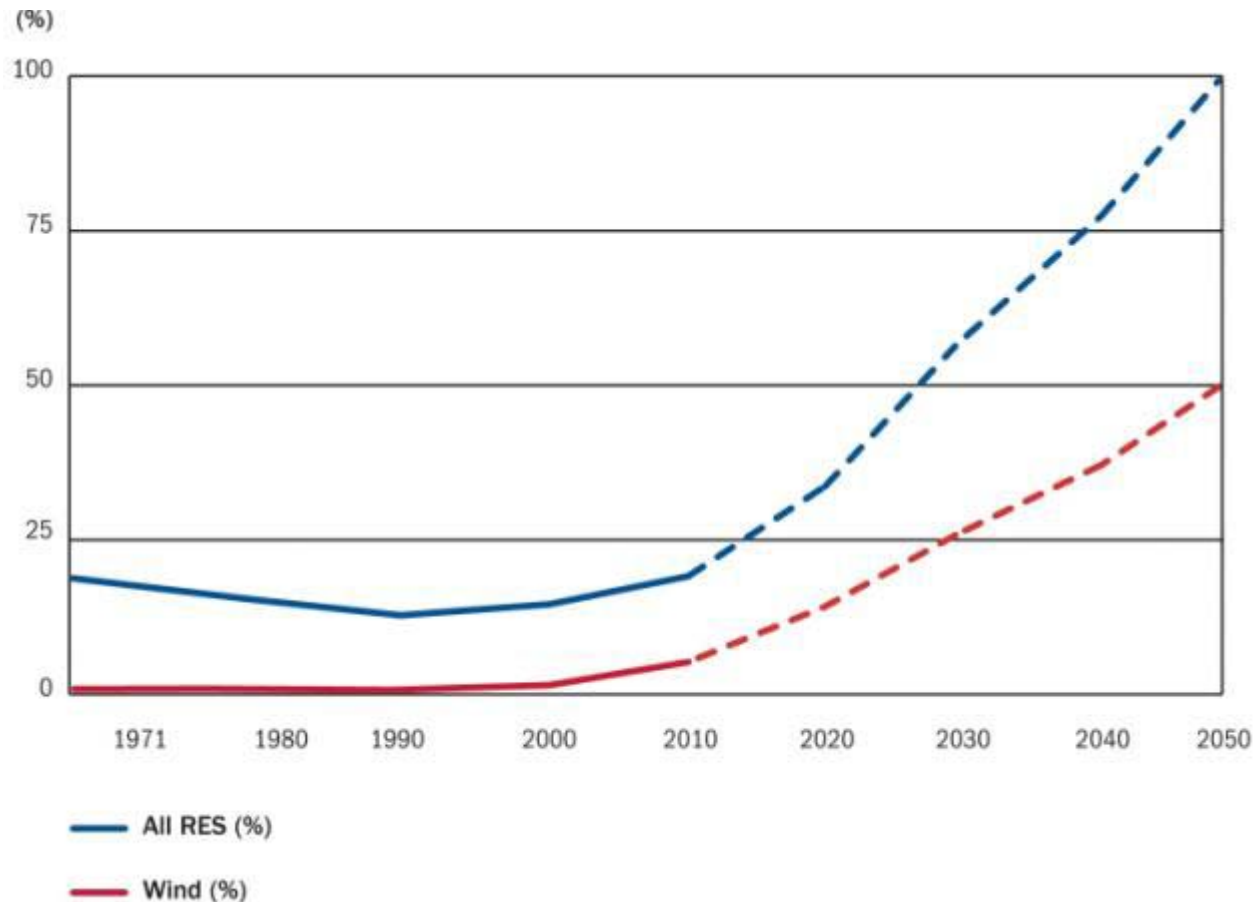
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## **EWEA 100% renewable electricity 2050 vision**

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

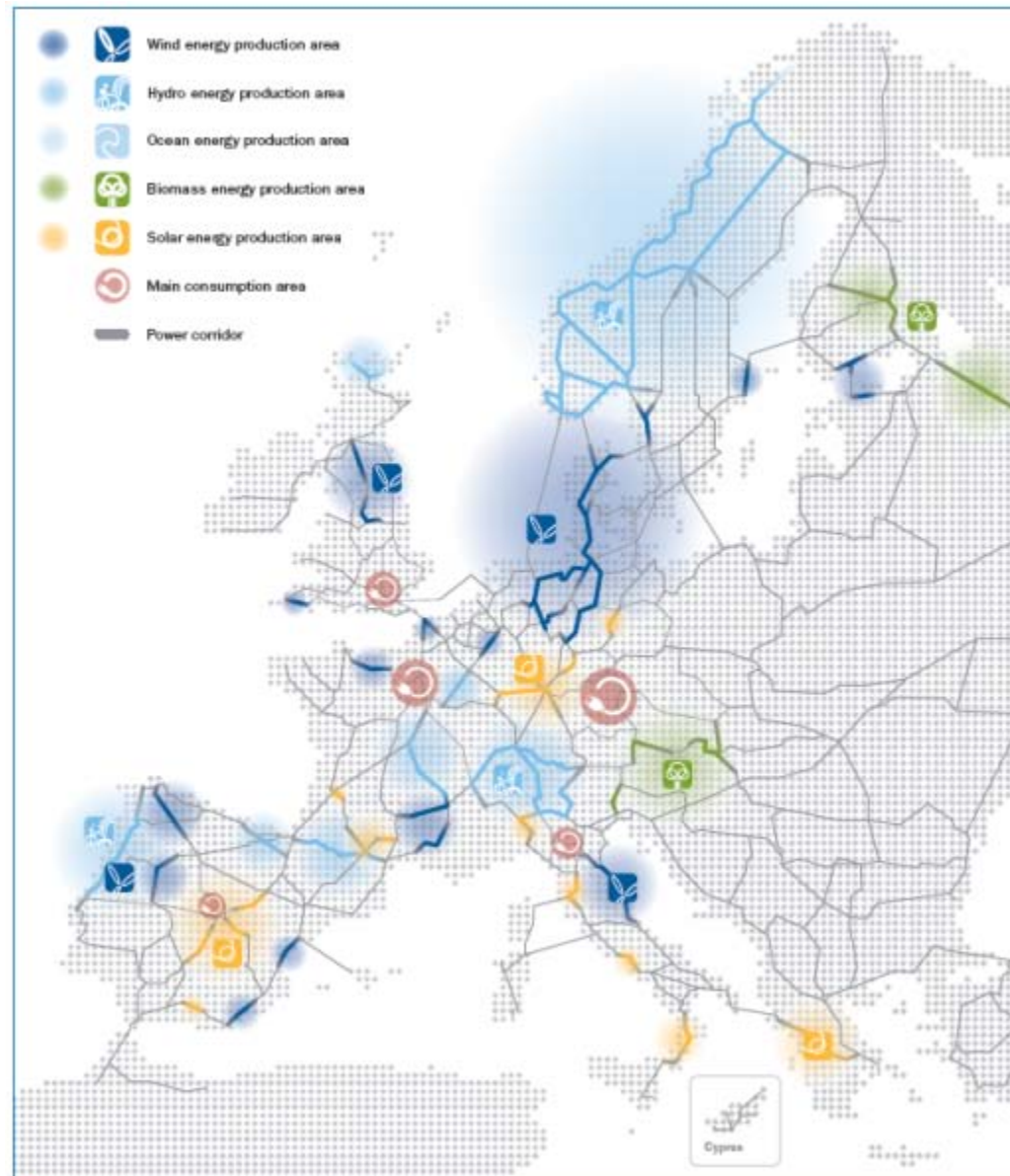
- Where would the main generation and load areas be located?
- Where would the dominant power flows of specific generation sources occur?
- Based on current UCTE map, ENTSO-E TYNDP and EWEA 20 year offshore grid master plan

## Contribution of wind and other renewable electricity 1970-2010 and expected contribution 2011-2050 (% share of consumption)



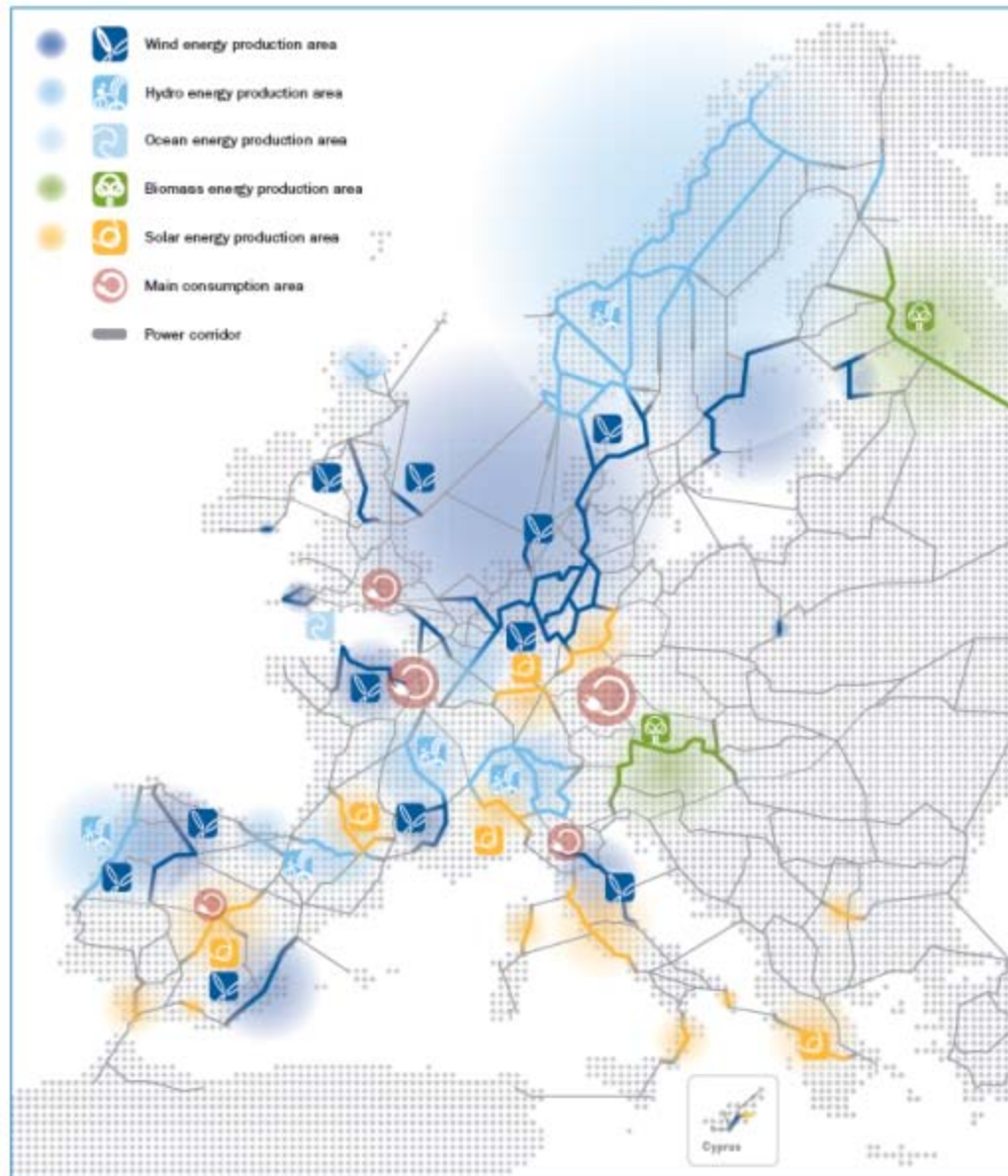


# Major RES power flows 2010



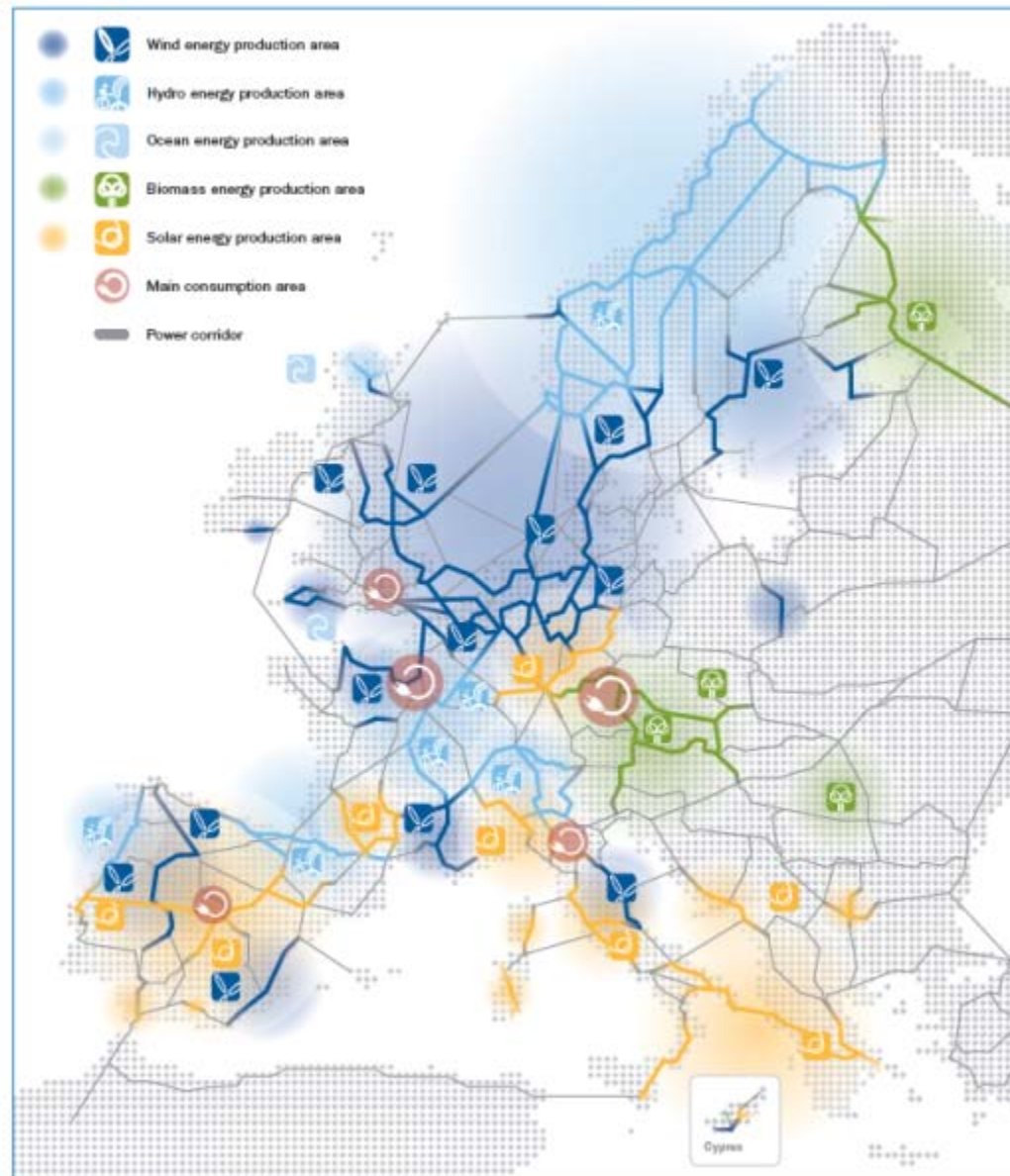


# Major RES power flows 2020





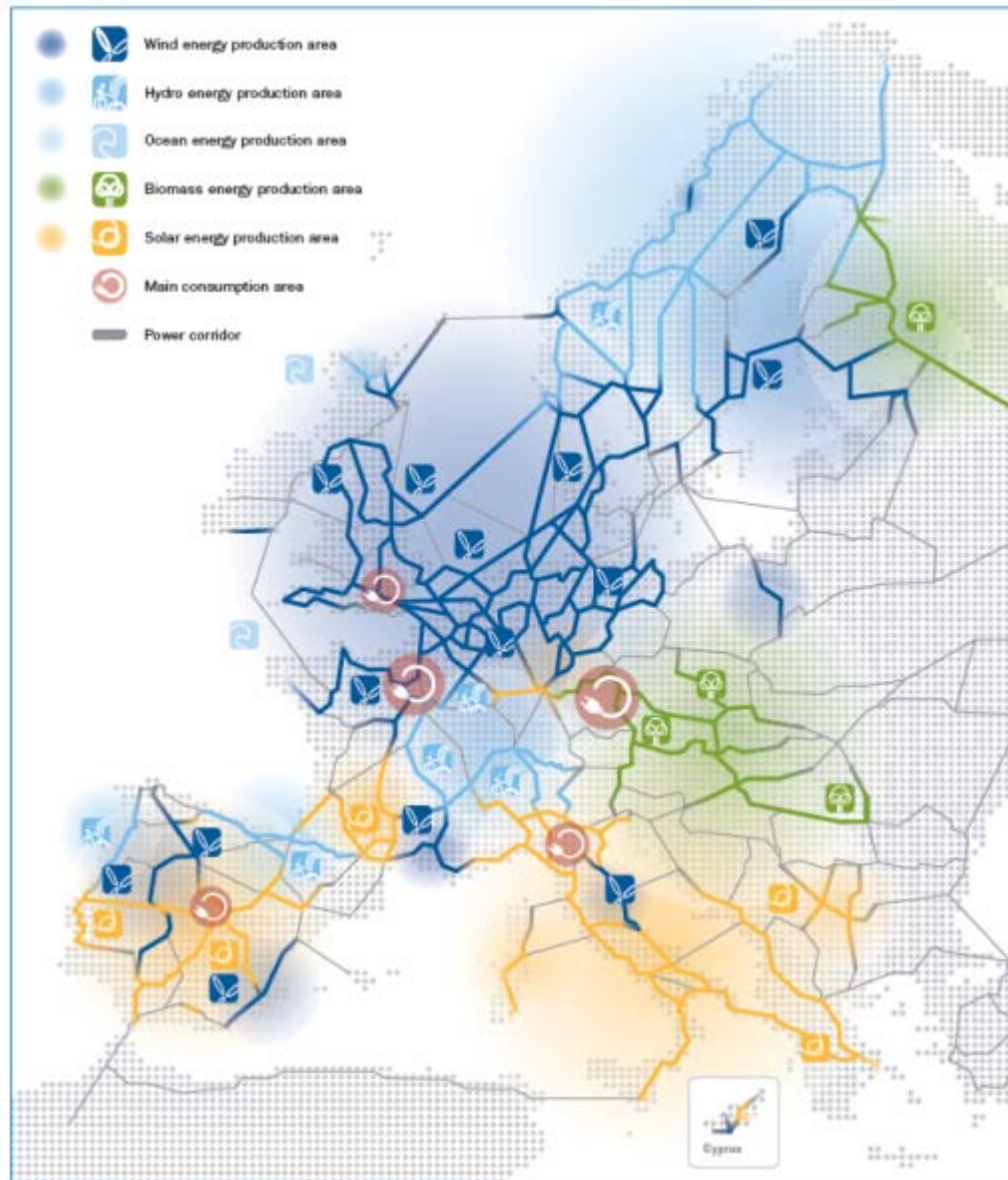
# Major RES power flows 2030





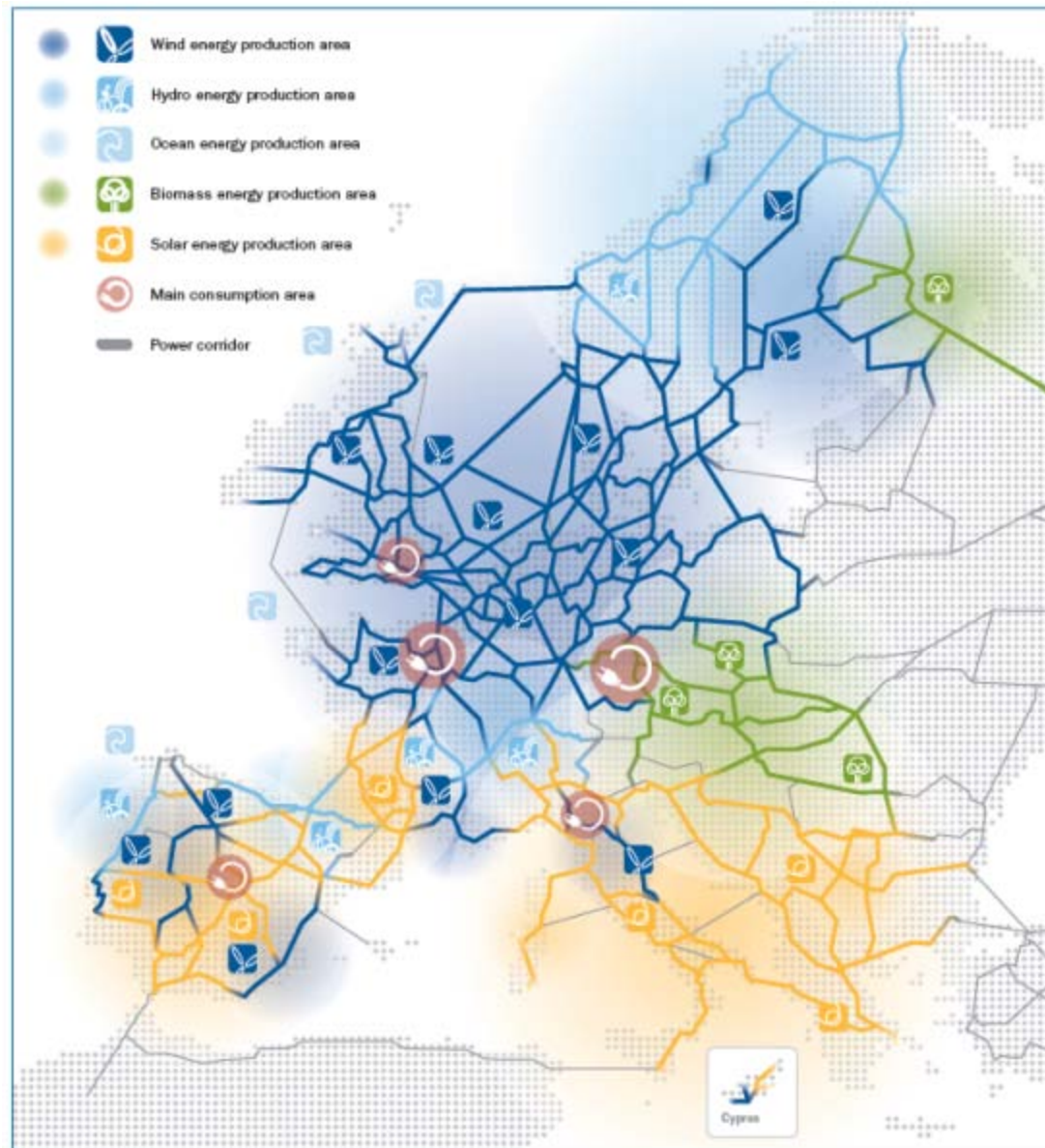


# Major RES power flows 2040

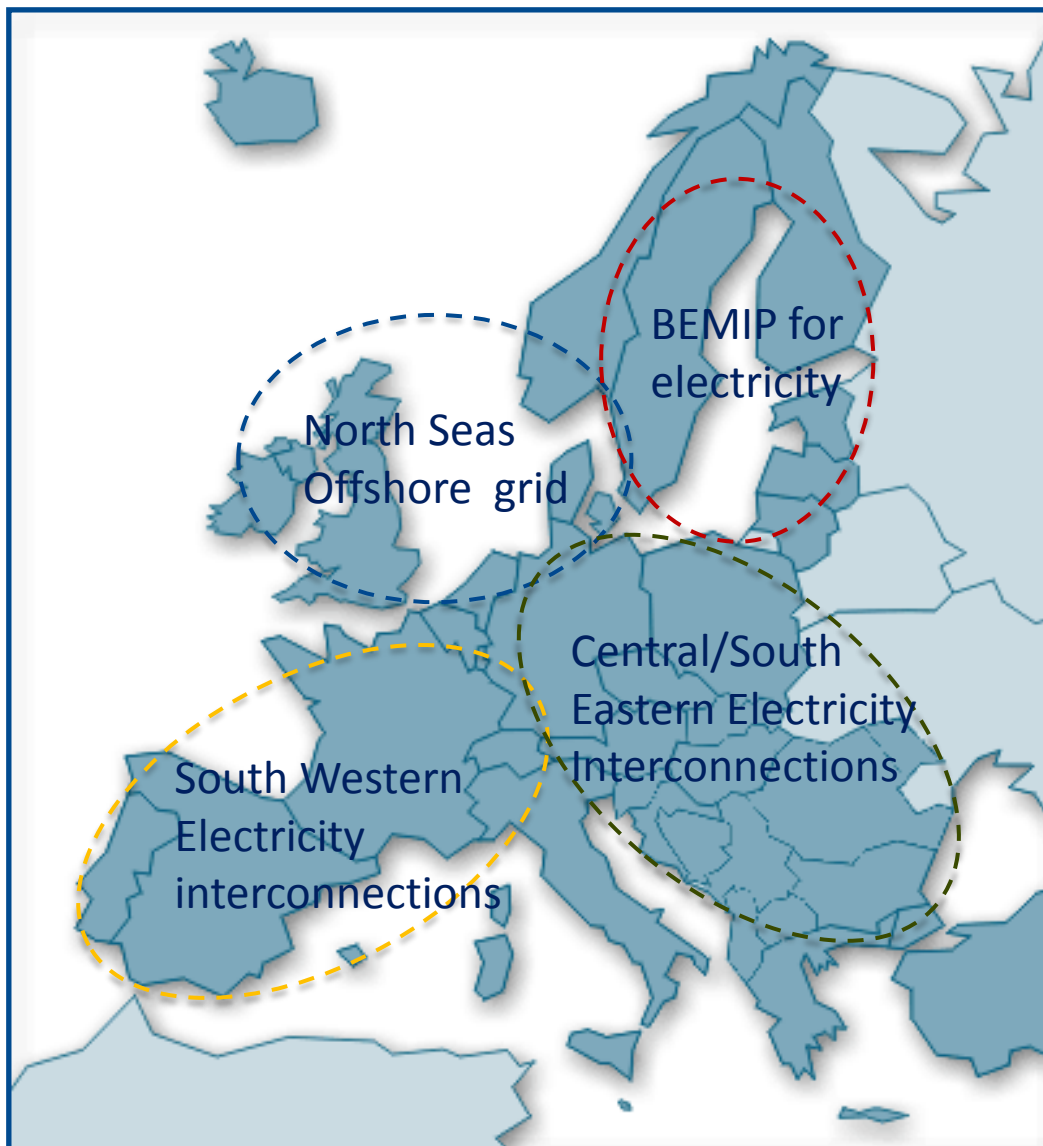




# Major RES power flows 2050



# Link with current policy development: EU Infrastructure priority corridors



Criteria for projects:

- Internal market development
- Security of Supply
- RES integration

Further priorities:

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

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# 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
- Issues above not only in Europe, but also with increasing wind power penetration in US, China, India and elsewhere



# How do we achieve such a large scale penetration of RES up to 2050?

## 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

# How do we achieve such a large scale penetration of RES up to 2050?

## Lessons learned up to now...

### Success factors:

- Forecasting
- Thermal fleet:
  - Higher quick starts
  - Deeper turn down
  - Faster ramps
- More spatial diversity
- RES + Distributed Generation + Demand Side Management
- Grid-friendly RES

## **To conclude: Flexibility as a key feature of power systems in the future**

Flexibility is key to ensure success factors for a large-scale integration of RES:

- Flexible generation
- Interconnection
- Demand side management
- Energy storage

**What is the »limit« is never quite the right question**





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# Thank you

[www.ewea.org](http://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](mailto:ewea@ewea.org)