

How to integrate up to 60% renewables to the EU power system

*ENTSO-E's outline on why **transmission infrastructure** is key in reaching in a secure and affordable way the EU's 2030 climate and energy objectives*

Pierre Bornard, Chairman of the Board
Strasbourg, 10 February 2015

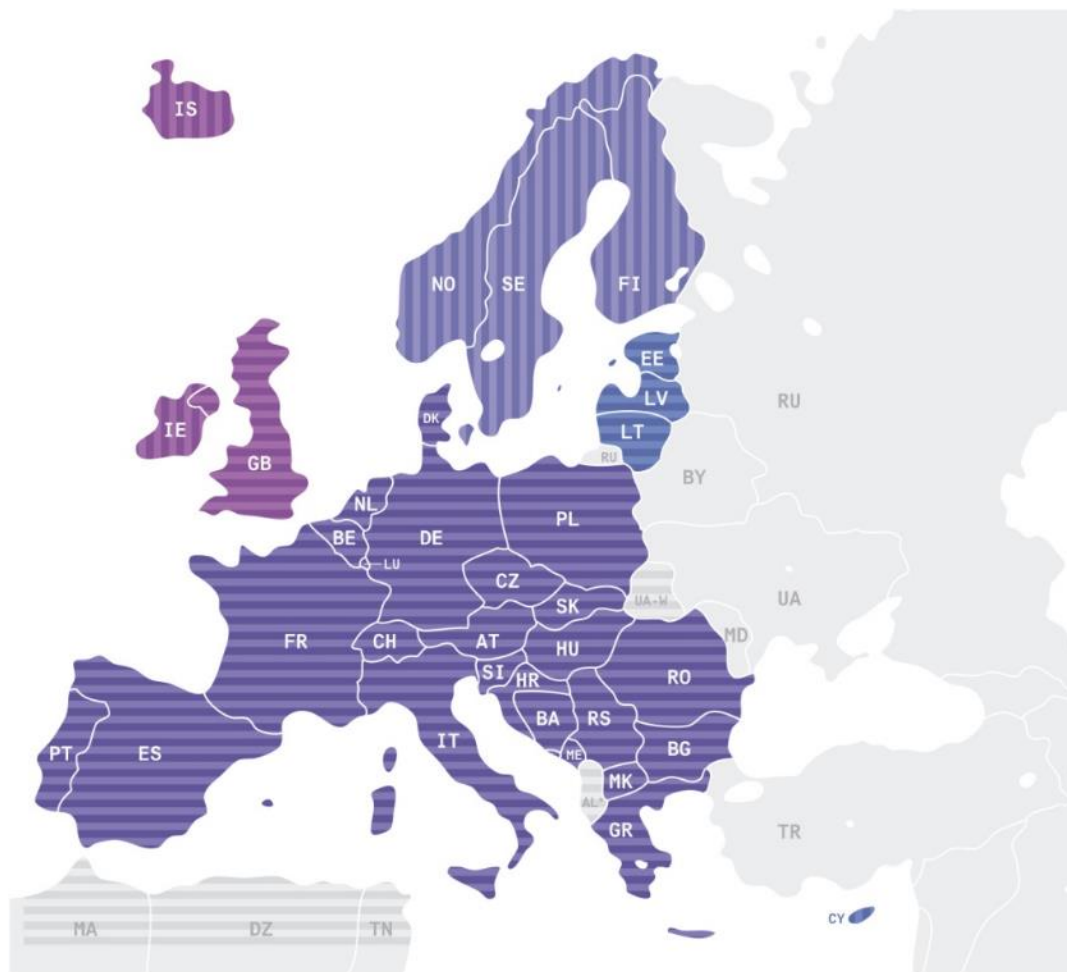
Who is ENTSO-E?

The European Network for
Transmission System
Operators for Electricity

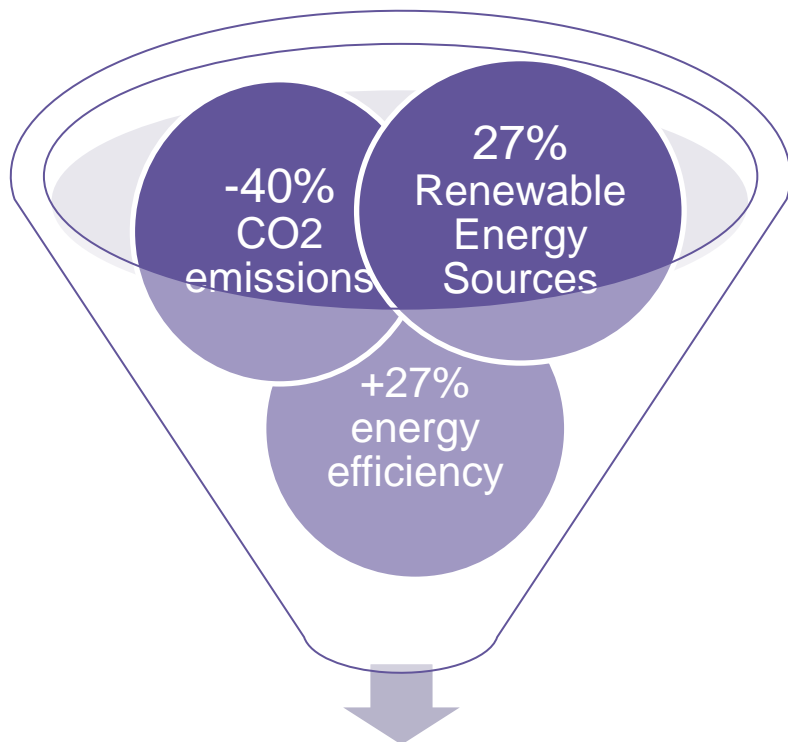
41 TSOs from 34 countries

532 million citizens served

Legal mandate => Third
Package / Regulation
(EC)714/2009

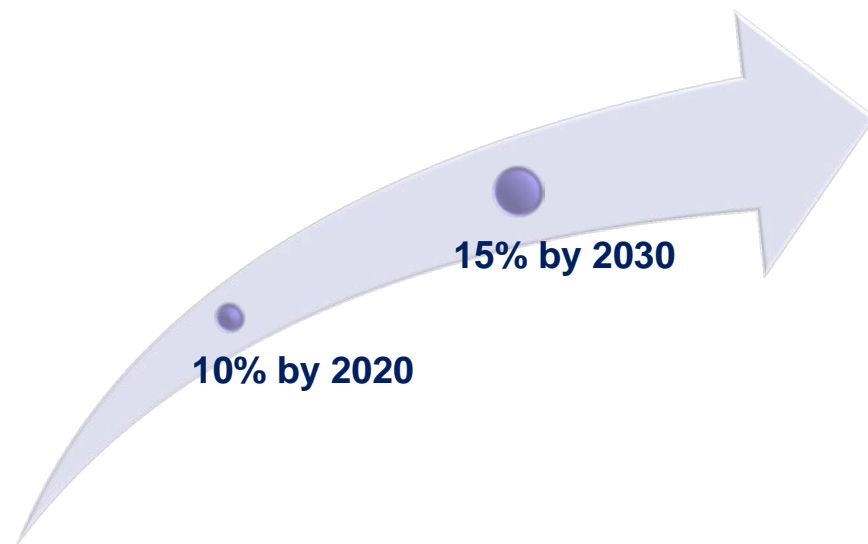


The 2030 EU Council targets and the electricity transmission system



About **45%** of RES generation in the electricity transmission system

Interconnection target

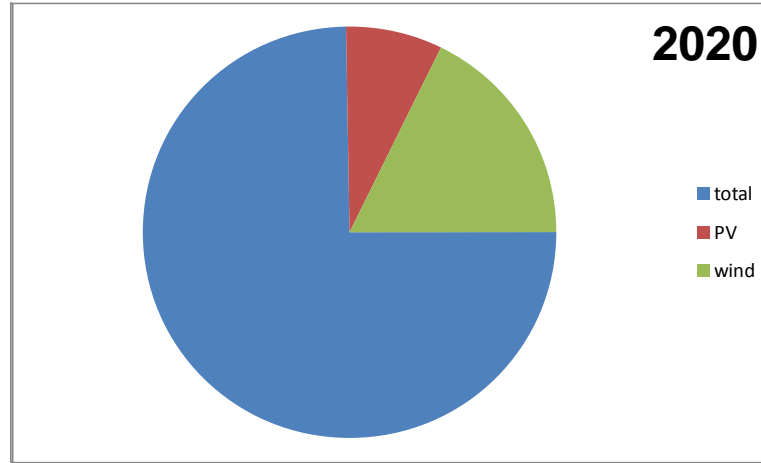
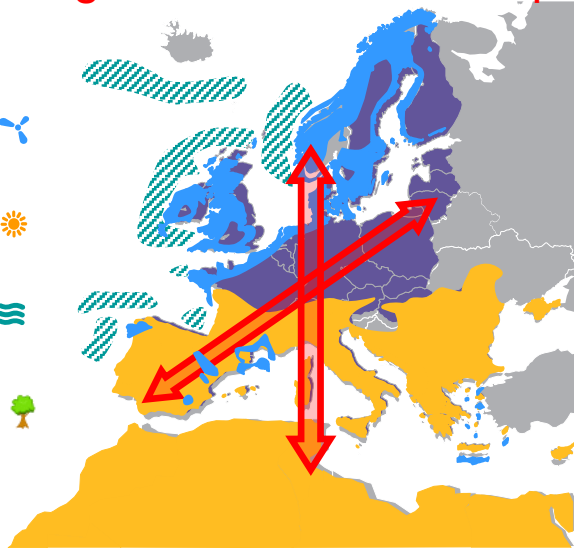


IMPORTANT
regional differences & needs
must be considered

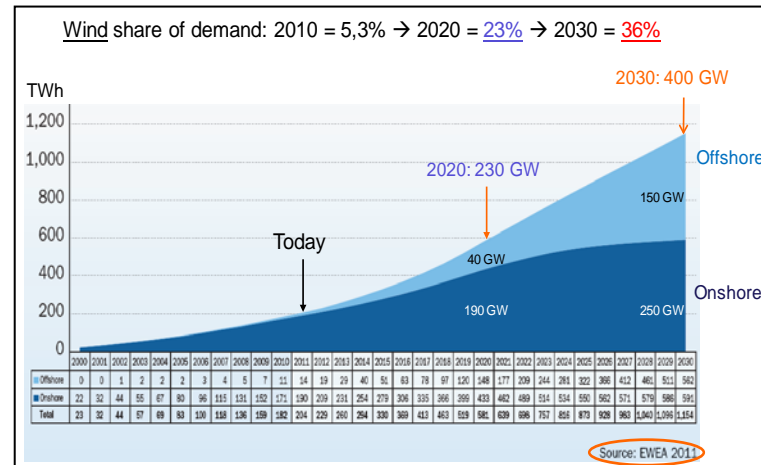
Impact of the rapid increase of intermittent RES on Europe's electricity system



Huge flows all over Europe



Thousands of small units



What does this energy transition require?



New hardware



**Investment in 73.000 km
transmission lines**

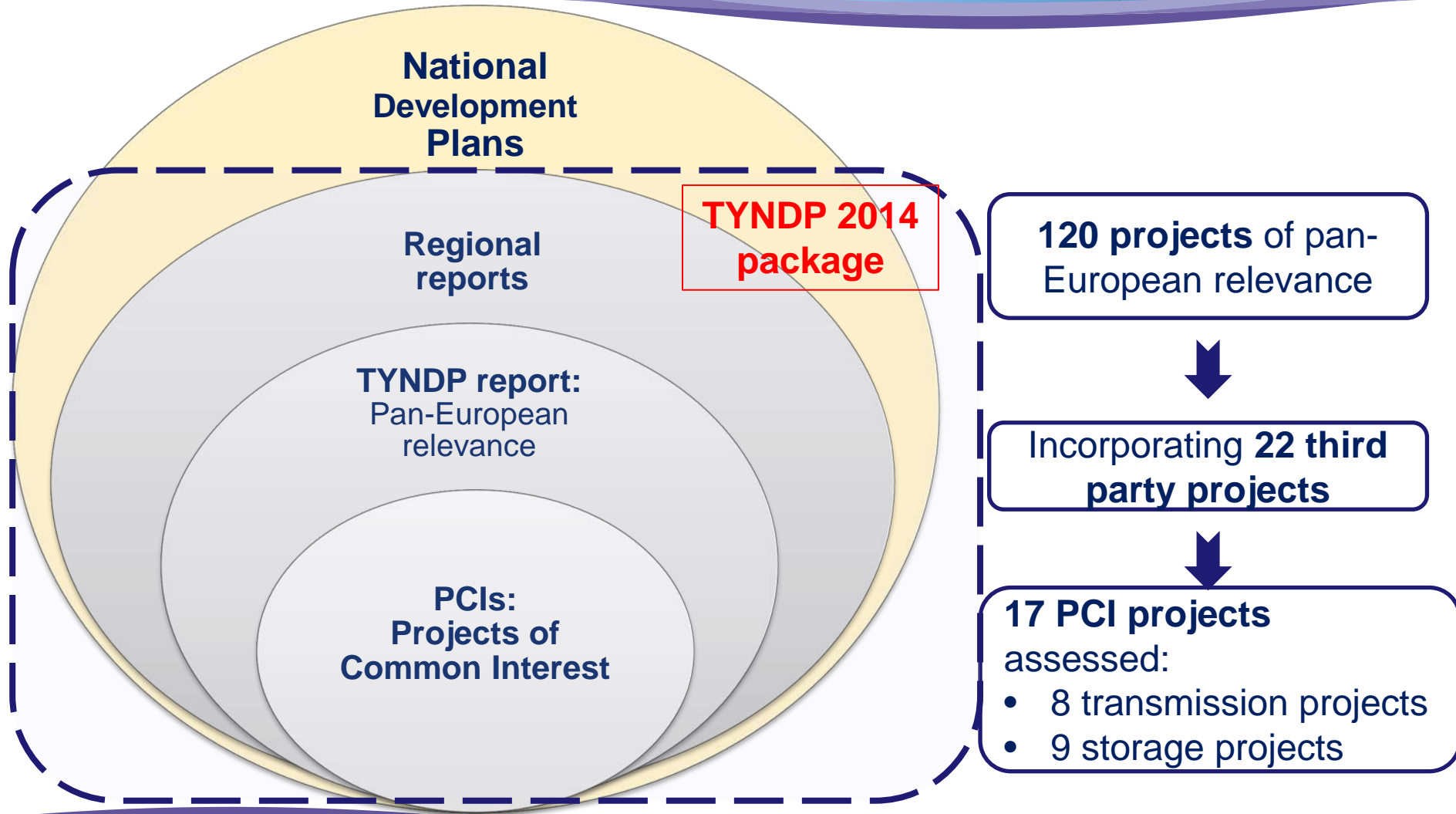
New software

network
codes.



10 network codes

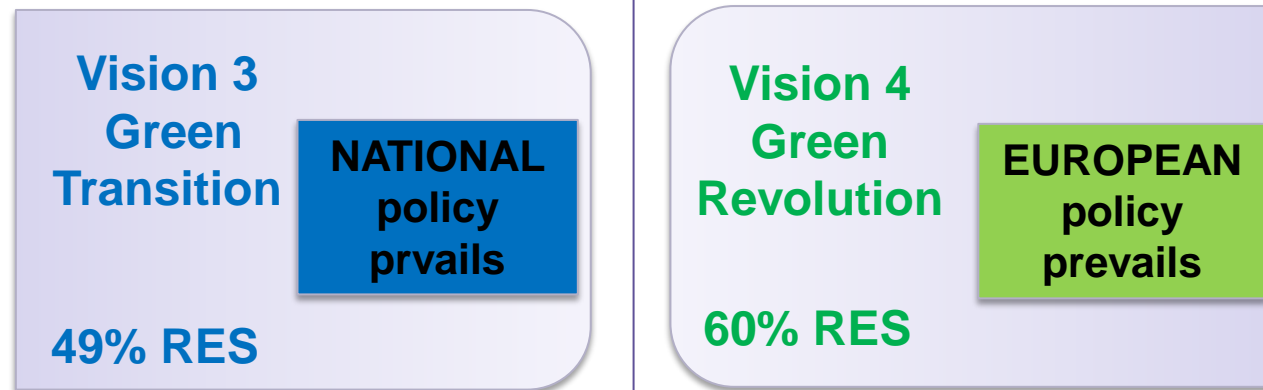
TYNDP + EU list of Projects of Common Interest = consistency



TYNDP: Framing uncertainties to build the right infrastructure

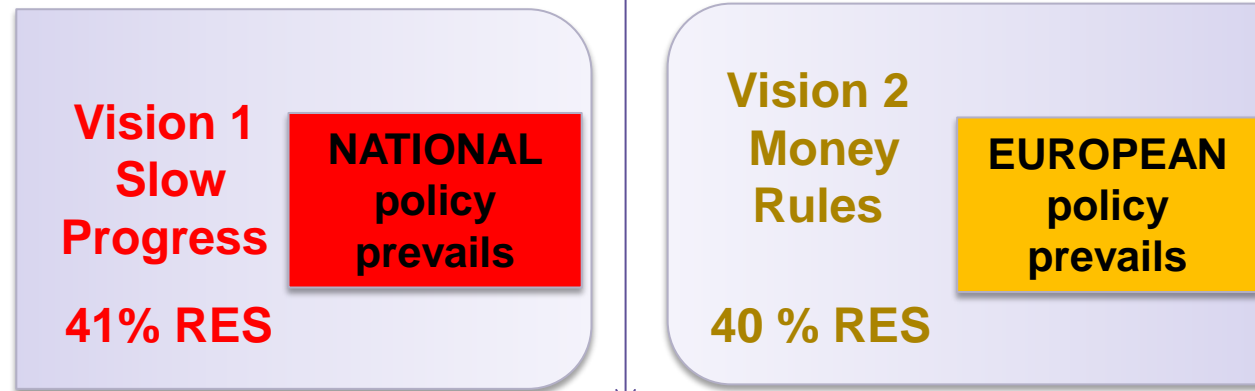
Accounting for economic conditions; policies; R&D schemes; CO₂ & Energy Prices

On track for Energy Roadmap 2050



IEM LOW

IEM HIGH



Delay of Energy Roadmap 2050

Renewables targets are driving EU's grid development



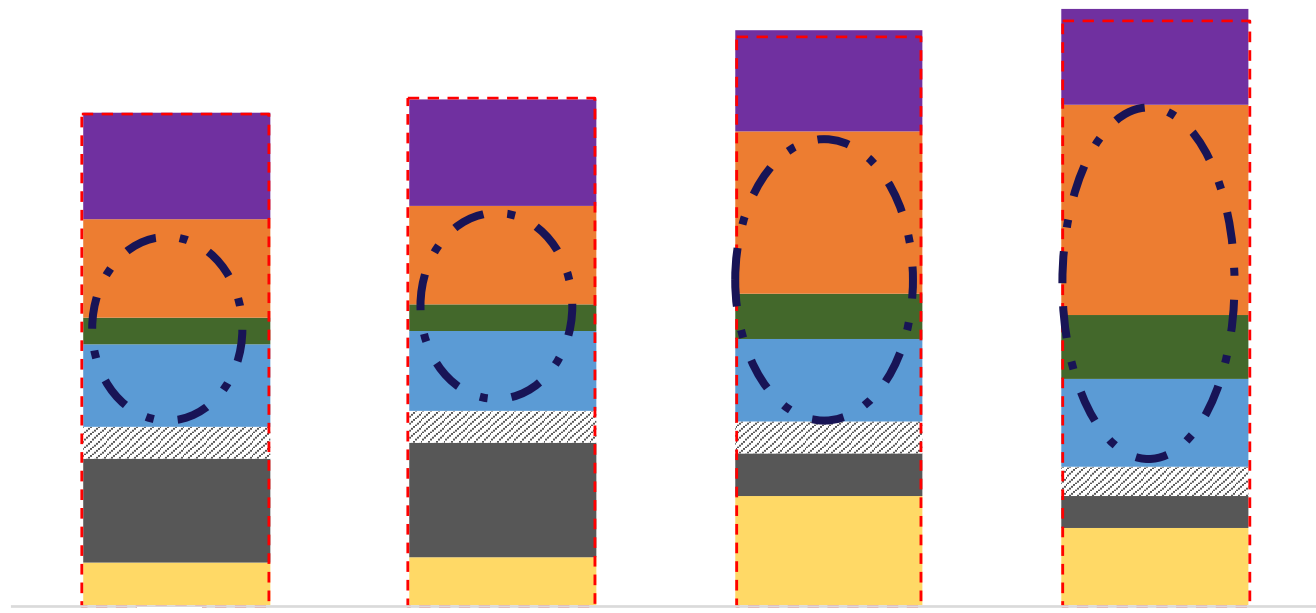
From 197 GW up to 876 GW of installed renewable capacity by 2030

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

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

Annual generation and demand (TWh/year)

5
4500
4000
3500
3000
2500
2000
1500
1000
500
0



- Nuclear
- Solar and wind
- Other RES
- Hydro
- Other fossils
- Coal
- Gas
- Annual demand

TYNDP 2014 main findings



Costs of up to €150 billion for projects of pan-EU significance by 2030
(1-1.5 €/MWh, about 1% of bill)



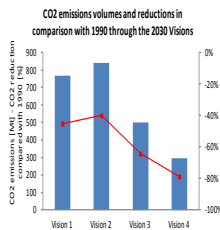
Savings of 2 to 5 €/MWh for bulk power prices by 2030



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

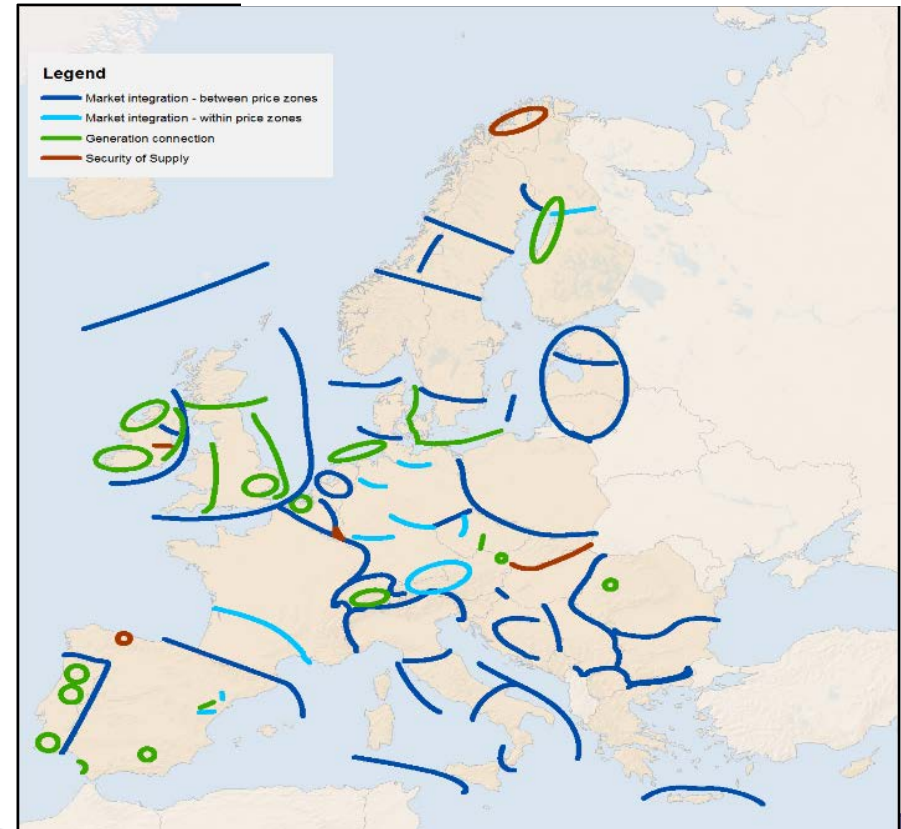
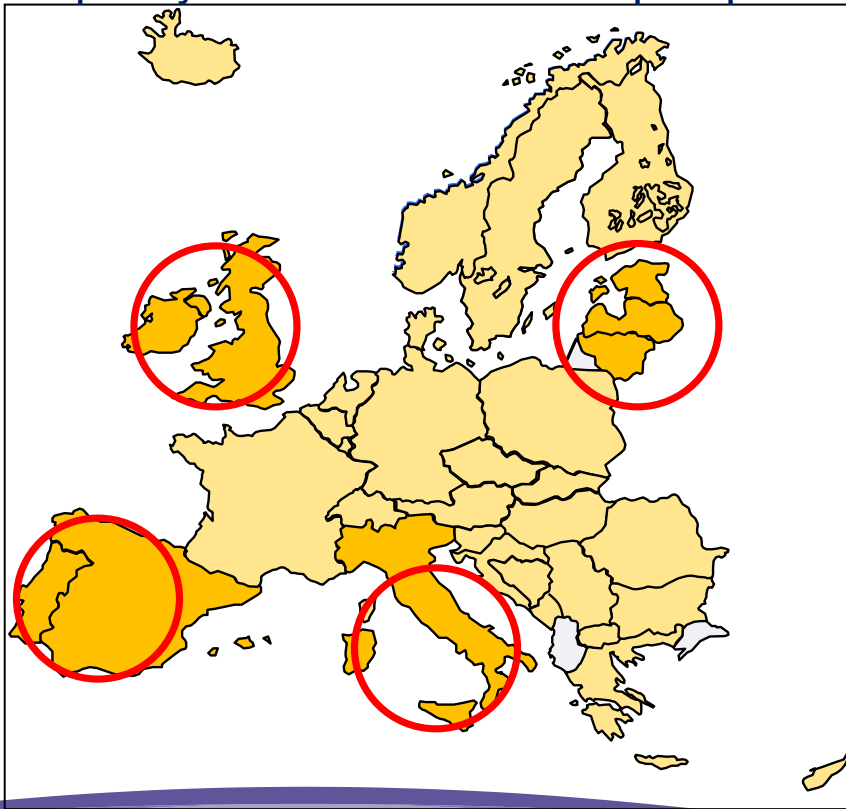
Main bottlenecks and 'electric peninsulas'



100 bottlenecks which are impeding market integration, RES integration, security of supply => TYNDP = optimal capacity from a welfare/cost perspective

Legend

- Market integration – between price zones
- Market integration – within price zones
- Generation connection
- Security of supply



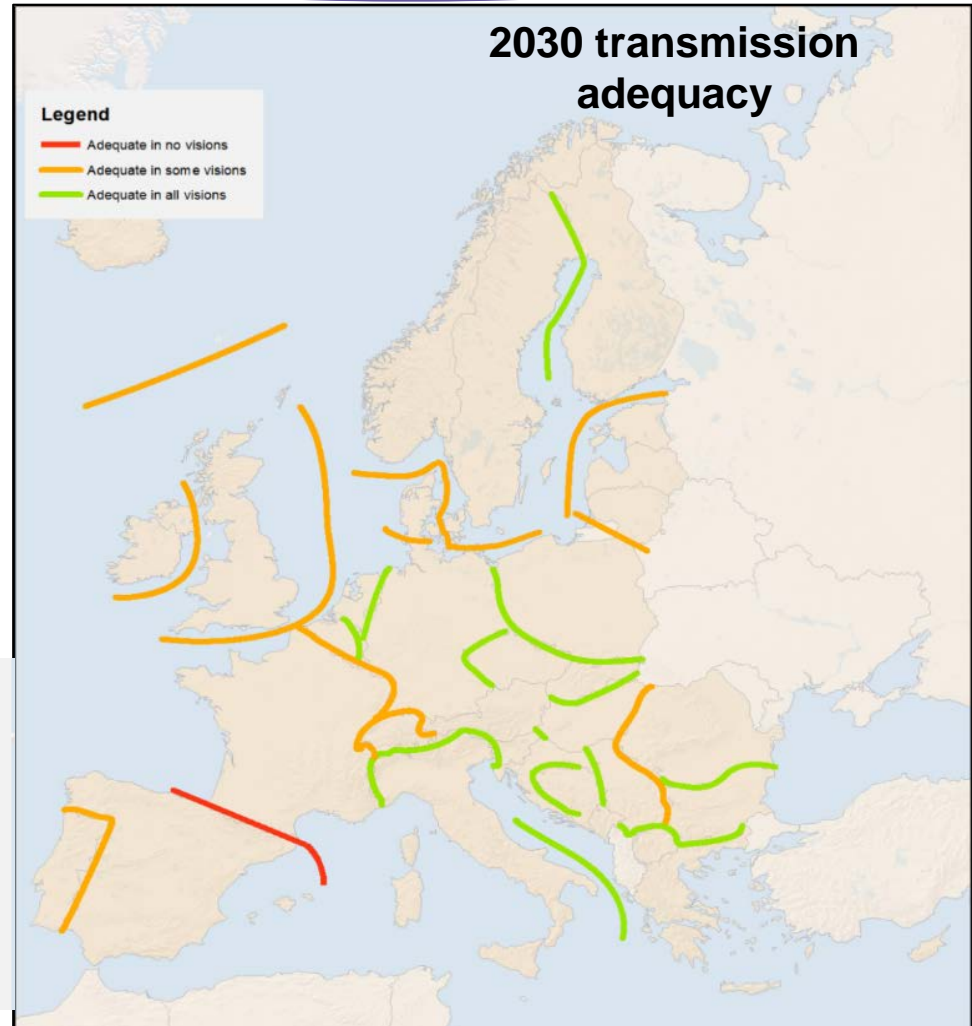
Focus on cross-border interconnection needs

120 pan-European projects

- **Green:** 1/3 of all boundaries are solved
- **Orange:** additional grid reinforcements required for most ambitious scenarios of RES development
- **Red:** projects between the Iberian Peninsula and the rest of Europe, remain complex due to geography

Legend

- Adequate in no visions
- Adequate in some visions
- Adequate in all visions



What are the main obstacles to timely infrastructure building?

Permit granting

- Procedures are lengthy and often cause commissioning delay
- **30% of investments are delayed by 2 years**

Public acceptance

- More effort to **bring citizens and interest groups on-board** and increase understanding of Europe's energy needs

Financing

- Transmission infrastructure is a **long term investment** => a **stable regulatory framework** is crucial
- **Tariffs** must be adapted to **support the energy transition**

Conclusion: moving towards an Energy Union, infrastructure is one important piece of the puzzle

But there are other important pieces needing attention:

**Facilitate
infrastructure
investments**

**Implement Third
Energy Package
(network codes)**

**Update the Market
Design
(add demand side &
Renewables)**

**Facilitate Member
States' energy-mix
coordination at
regional level**

**Define co-ordination
mechanisms in
energy scarcity
situations**

**Foster R&D and
innovation
investments in
transmission
networks**



Thank you for your attention!

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