ECONOMIC AND TECHNICAL ANALYSIS OF THE EUROPEAN SYSTEM WITH A HIGH RES SCENARIO

Vera Silva, Marie Perrot

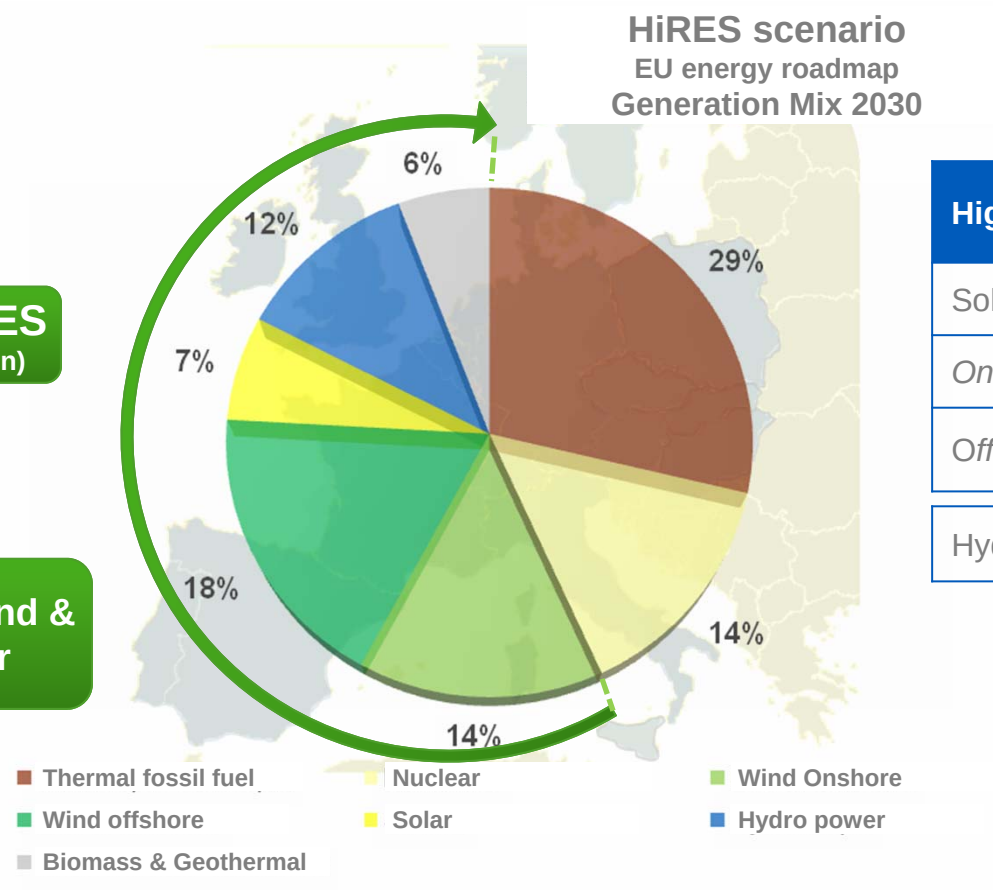
EDF R&D

Toulouse, 8 September 2015

Simulation of the EU Energy Roadmap « HiRES 2030 » scenario

60 % RES
(generation)

40 % Wind & Solar

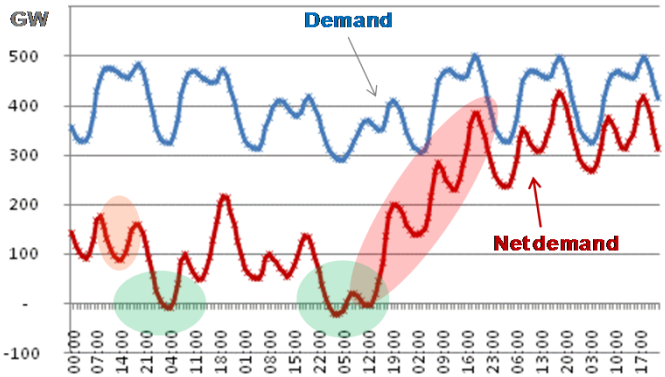


High RES 2030	GW	Load factor (h/yr)
Solar (PV)	220	1100
Onshore wind	280	1900
Offshore wind	205	3200
Hydro	120	3800

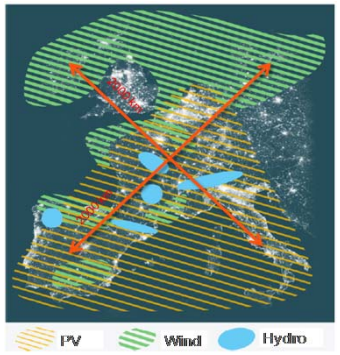
Fuel	Price
Coal	86 €/t
Gas	10 €/MBtu
Oil	107 €/baril
CO_2	35 €/t

What is this study about?

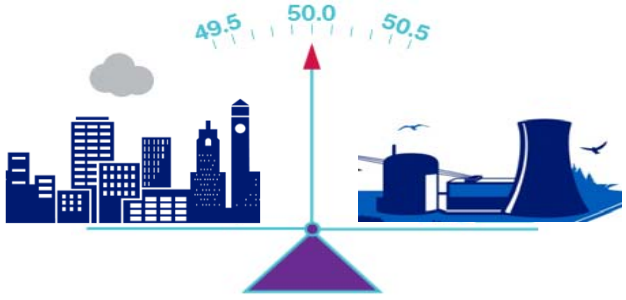
Flexibility to handle variability



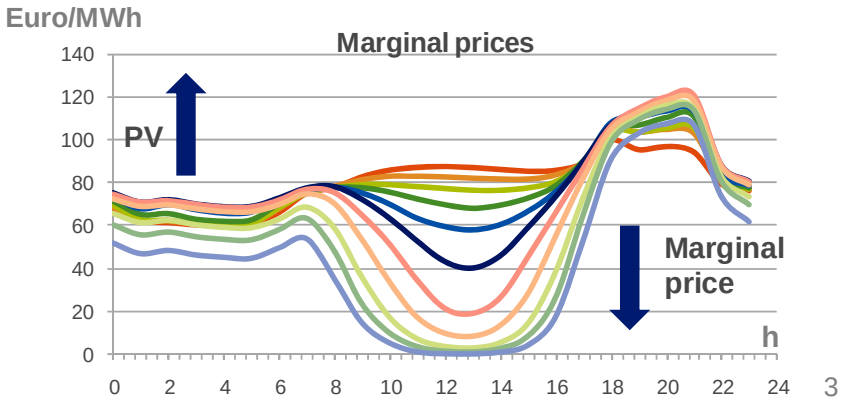
Connecting RES and load



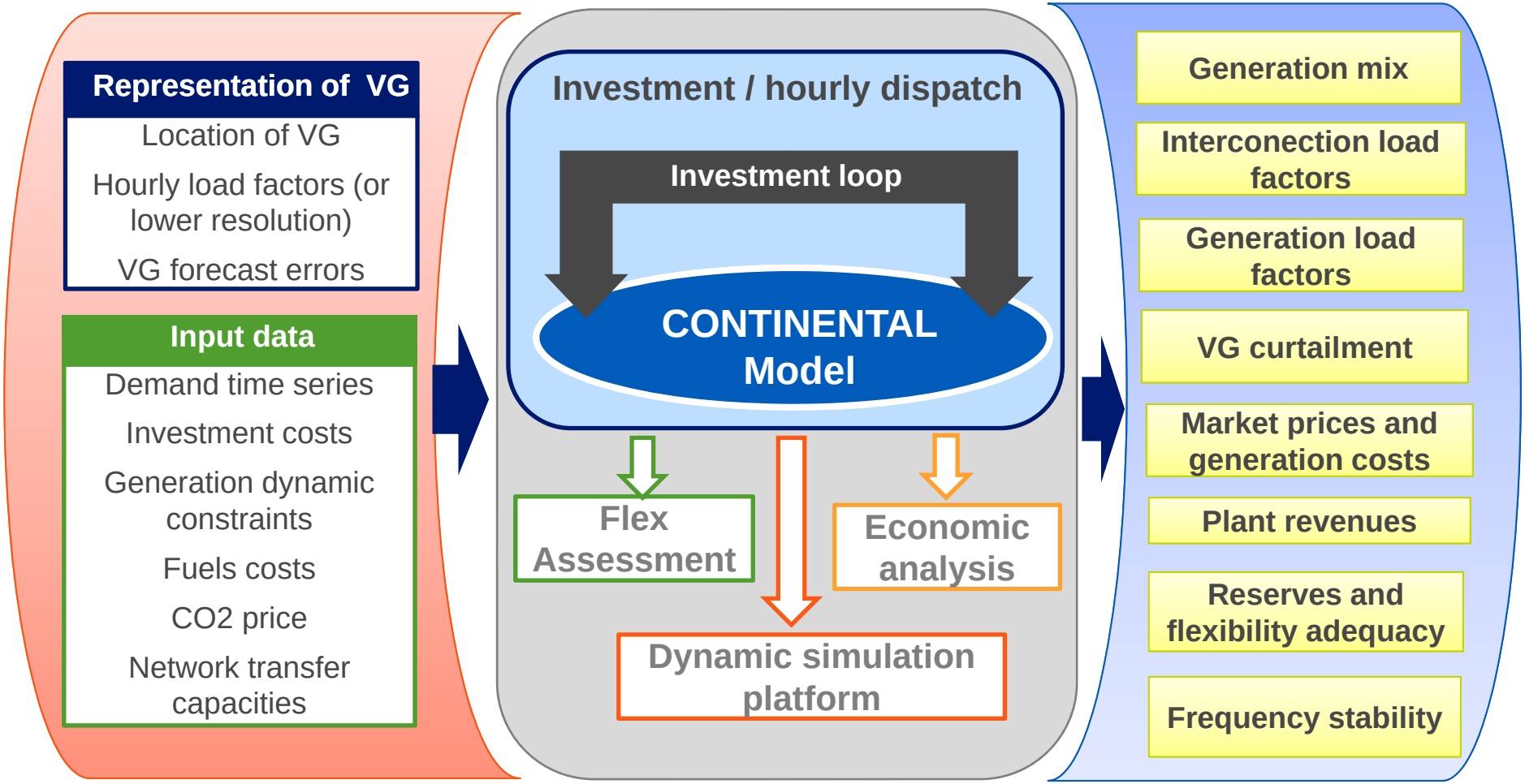
Keeping the lights on



Balancing the economics

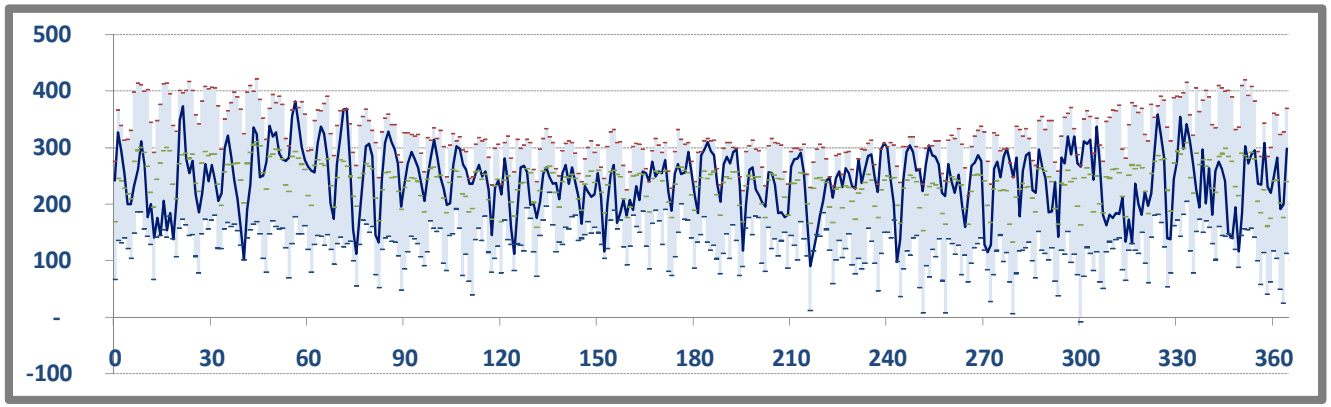


An integrated approach for the technical and economical analysis of High RES scenarios in Europe is required

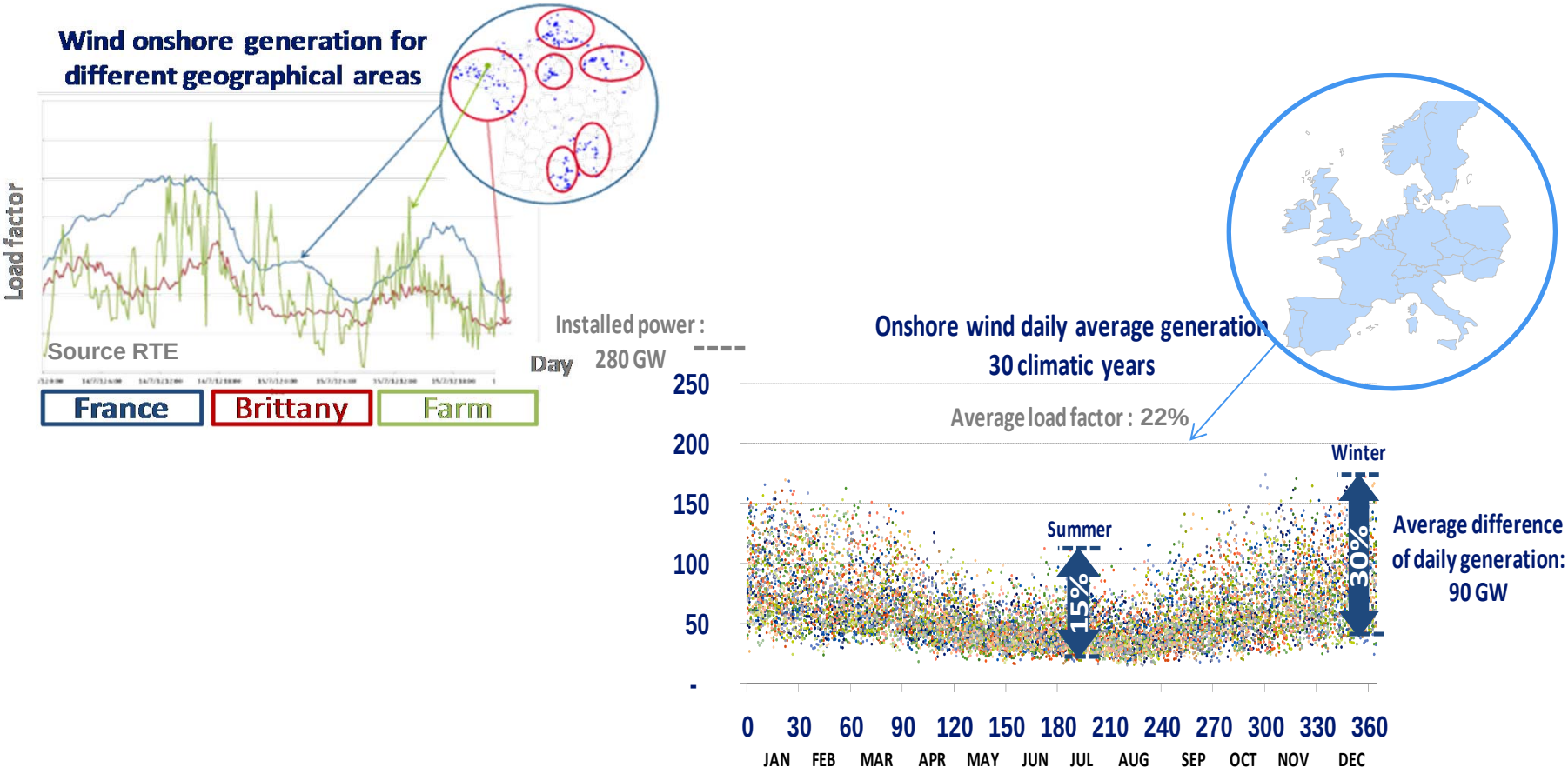


M. Lopez-Botet, et all, *'Methodology for the economic and technical analysis of the European power system with a large share of variable renewable generation'*, presented at IEEE PES General Meeting, Washington, USA, 27-31 July, 2014.
Langrene, N., van Ackooij, W., Breant, F., 'Dynamic *Constraints for Aggregated Units: Formulation and Application*', IEEE Transactions on Power Systems, vol.26, no.3, Aug. 2011.

Understanding the variability



Geographical diversity does help, but there is still significant variability at European level



You can reduce the variability of wind at local level but the correlation in wind regimes acts as a limit at continental level