

RED
ELÉCTRICA
DE ESPAÑA

Wind Generation Forecasting at REE.

9th June 2016

Situation in Spain

Introduction



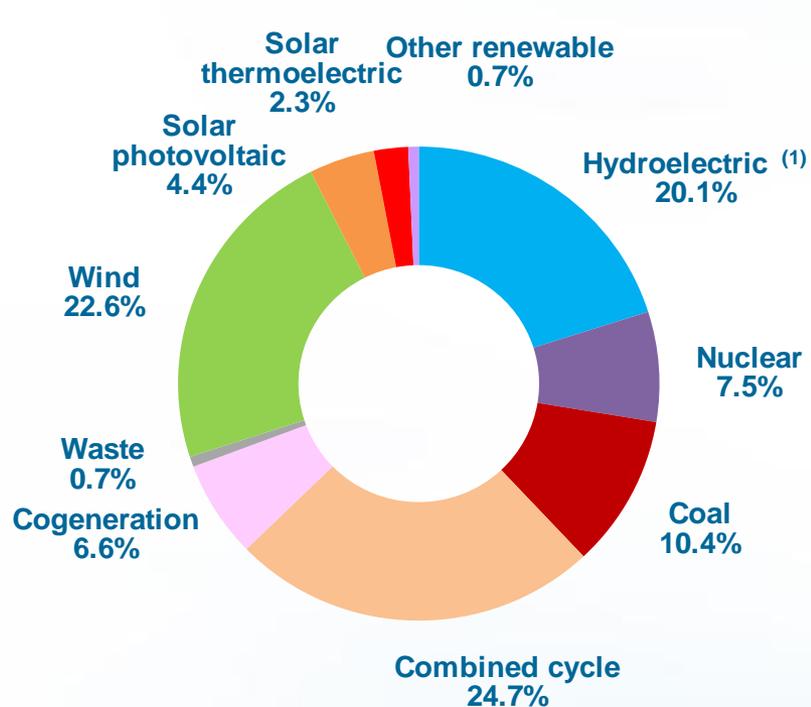
- Renewable energies, wind and solar energy,...Is this new in Spain?



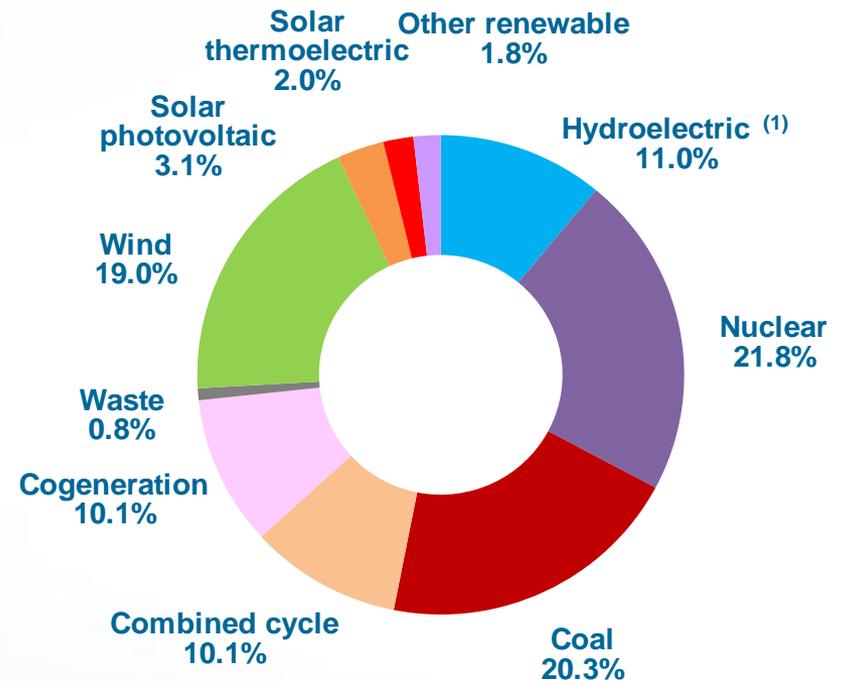
Installed capacity and demand coverage in Spain December 2015



Introduction



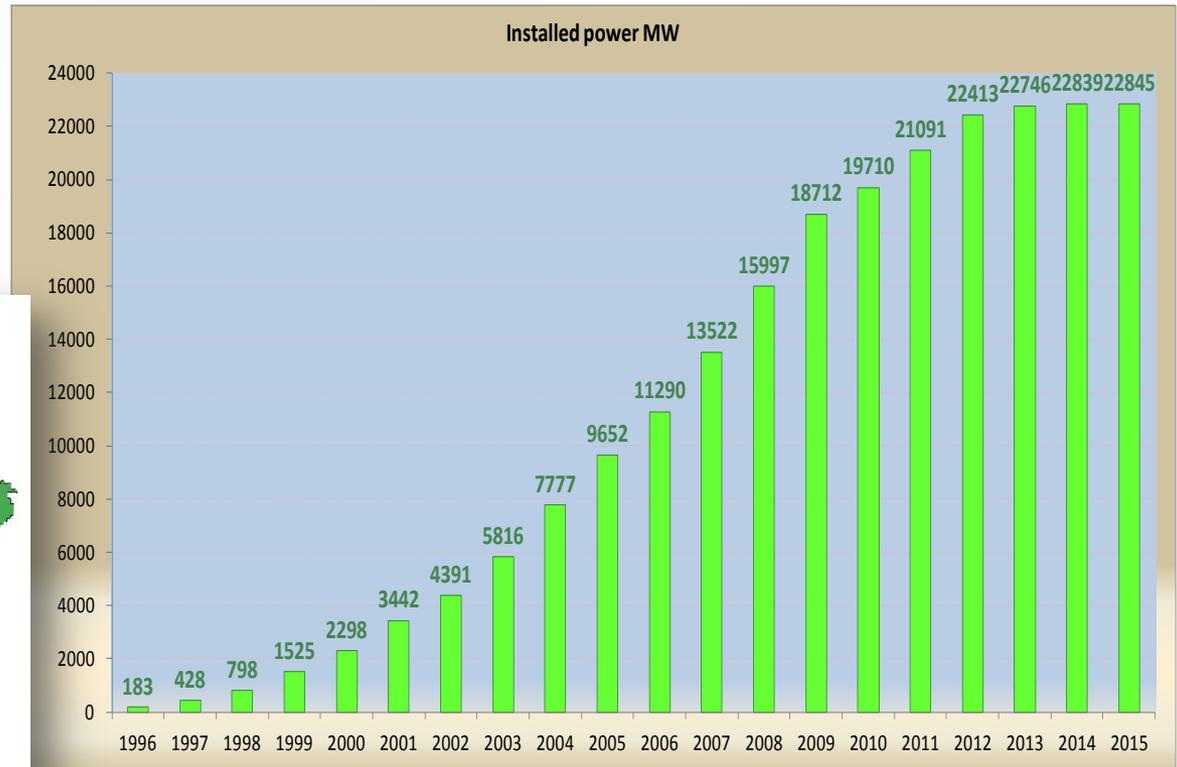
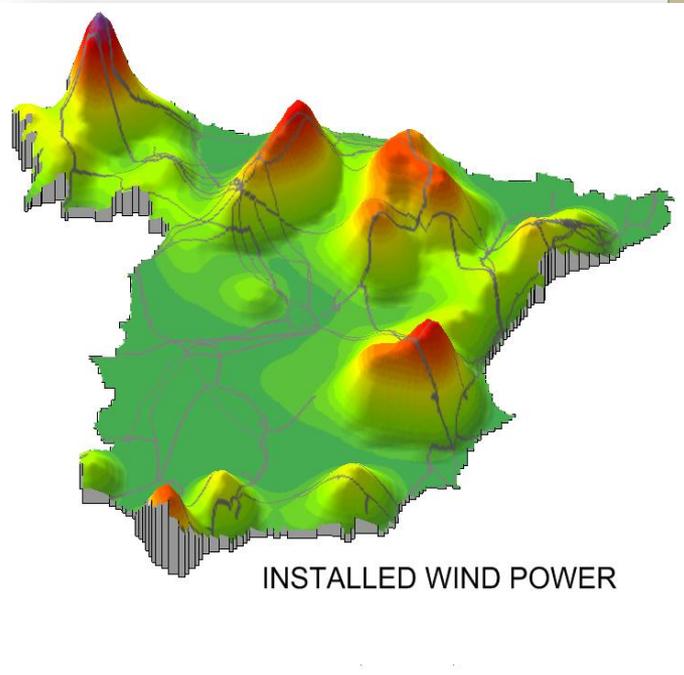
Installed capacity



Demand coverage

Installed wind power capacity evolution in Spain

Introduction



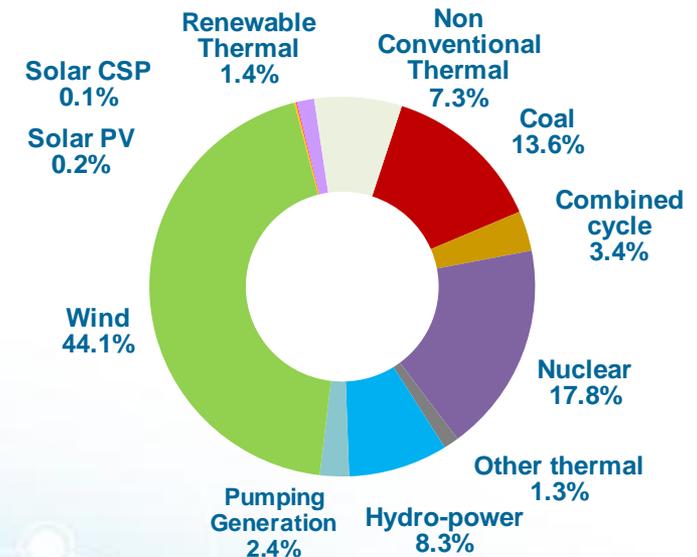
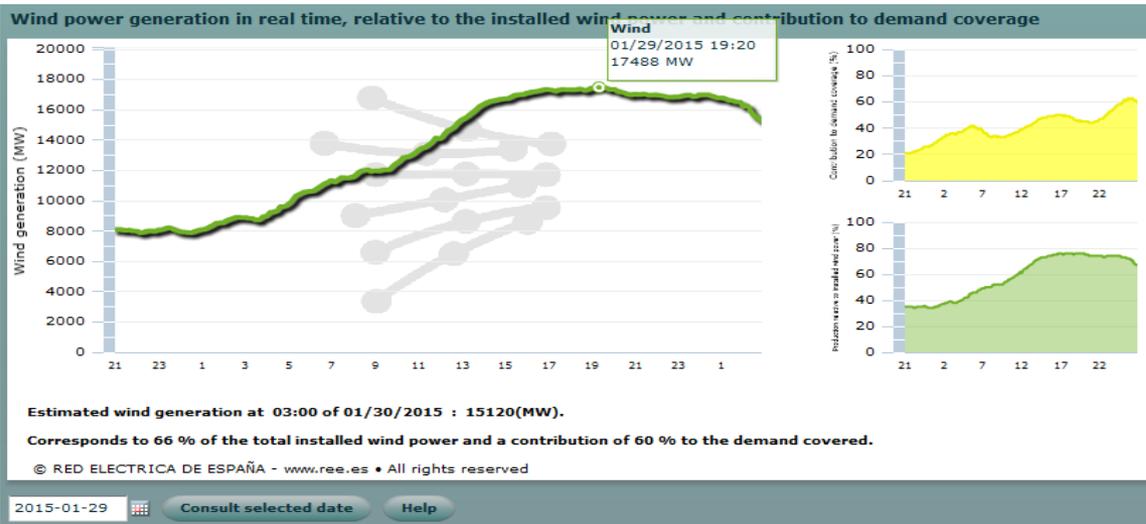
Historical record of wind generation

Introduction



Wind Power Generation	Thursday 29/01/15
Power (MW)	17,553 (7:27 pm)

Demand coverage at the moment of maximum wind production (29/01/15 at 19:27 h)



Control Center of Renewable Energies (CECRE)



- Target: achieve a greater level of integration for renewable energy sources
- Real-time production supervision and control

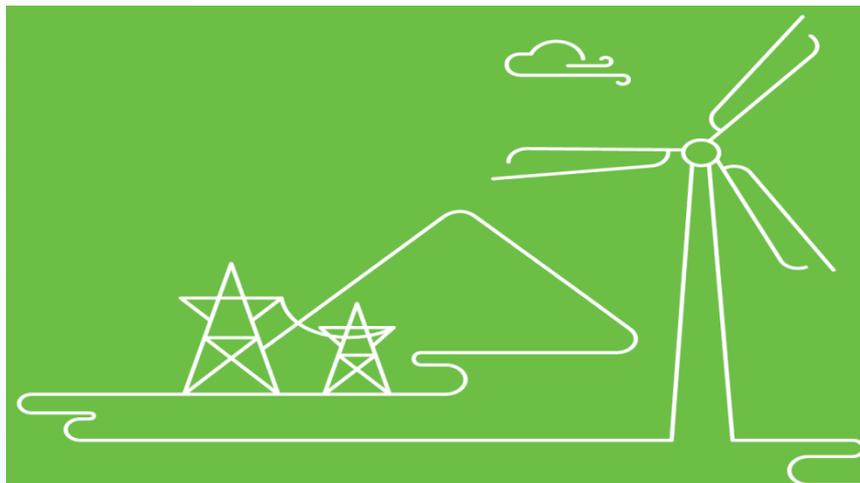


System overview

Sipreolico



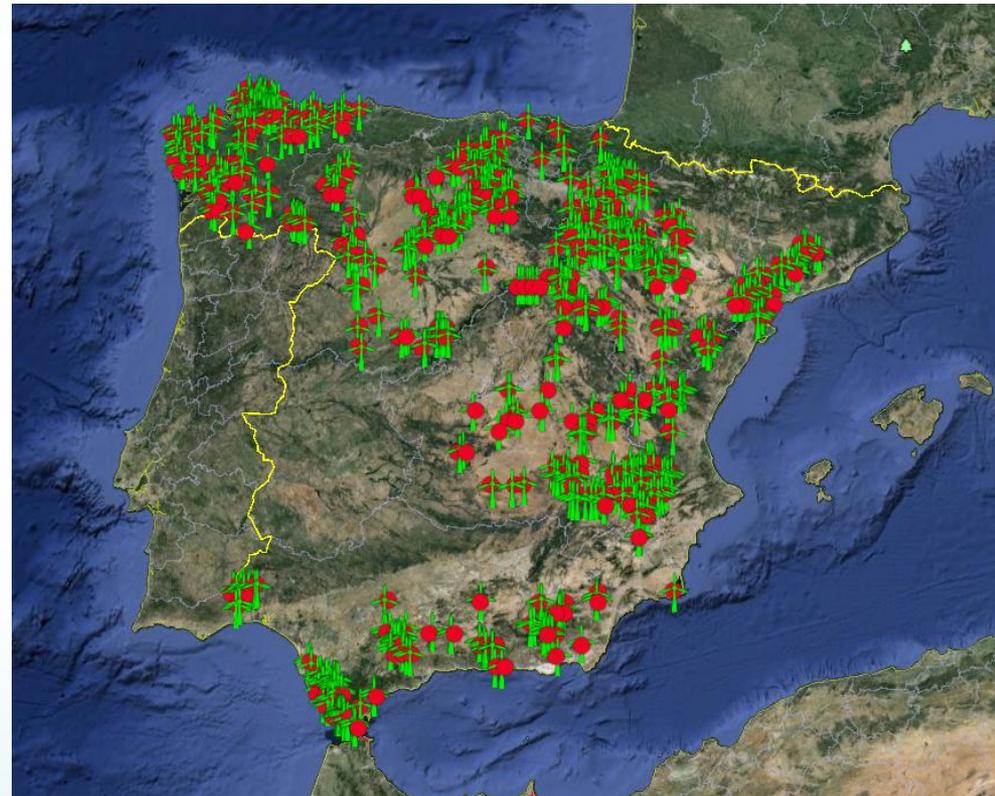
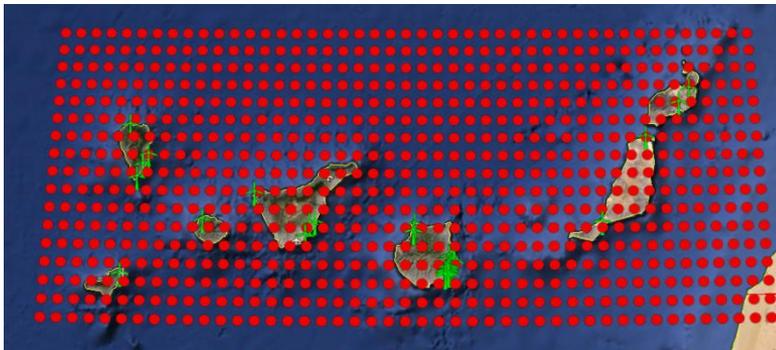
- SIPREOLICO forecasts are calculated for individual wind farms, up to 240 hours horizon
- Aggregated national hourly forecast by adding individual wind farms forecast.
- Prediction method: based on neural networks. (More than 800 NN)
- Probabilistic wind power forecast: confidence intervals



Essential input: meteorology



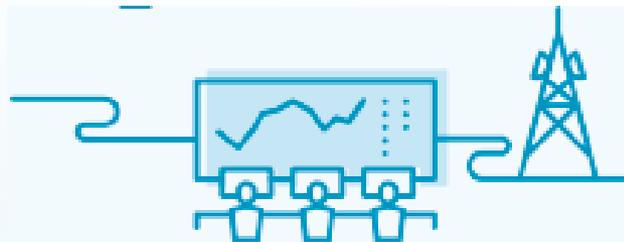
- Numerical Weather Prediction model
- Grid results: wind speed and direction forecast



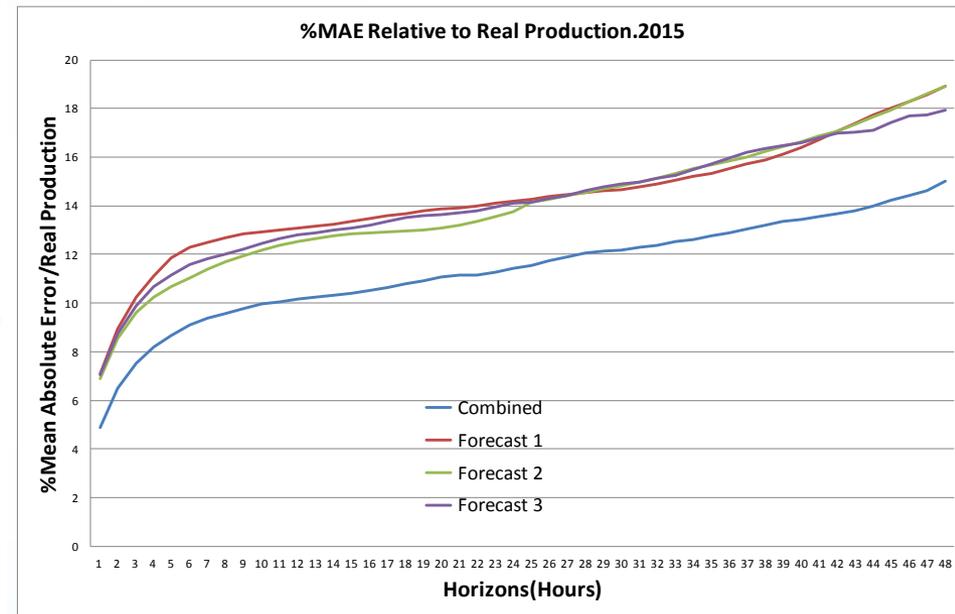
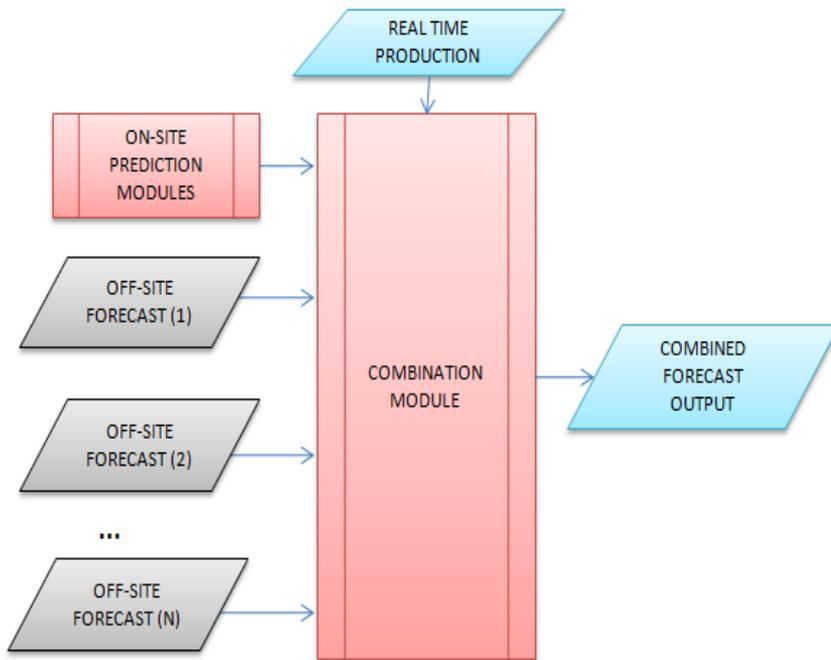
Input Data: Real production measurements



- CECRE receives the telemasures of all the wind/solar plants with an installed power > 1 MW:
 - ✓ 96% of wind installed power
 - ✓ 100% of CSP installed power
 - ✓ 70% of PV installed power
- These telemasures are supplied as an input to our forecasting algorithms



Combination strategy

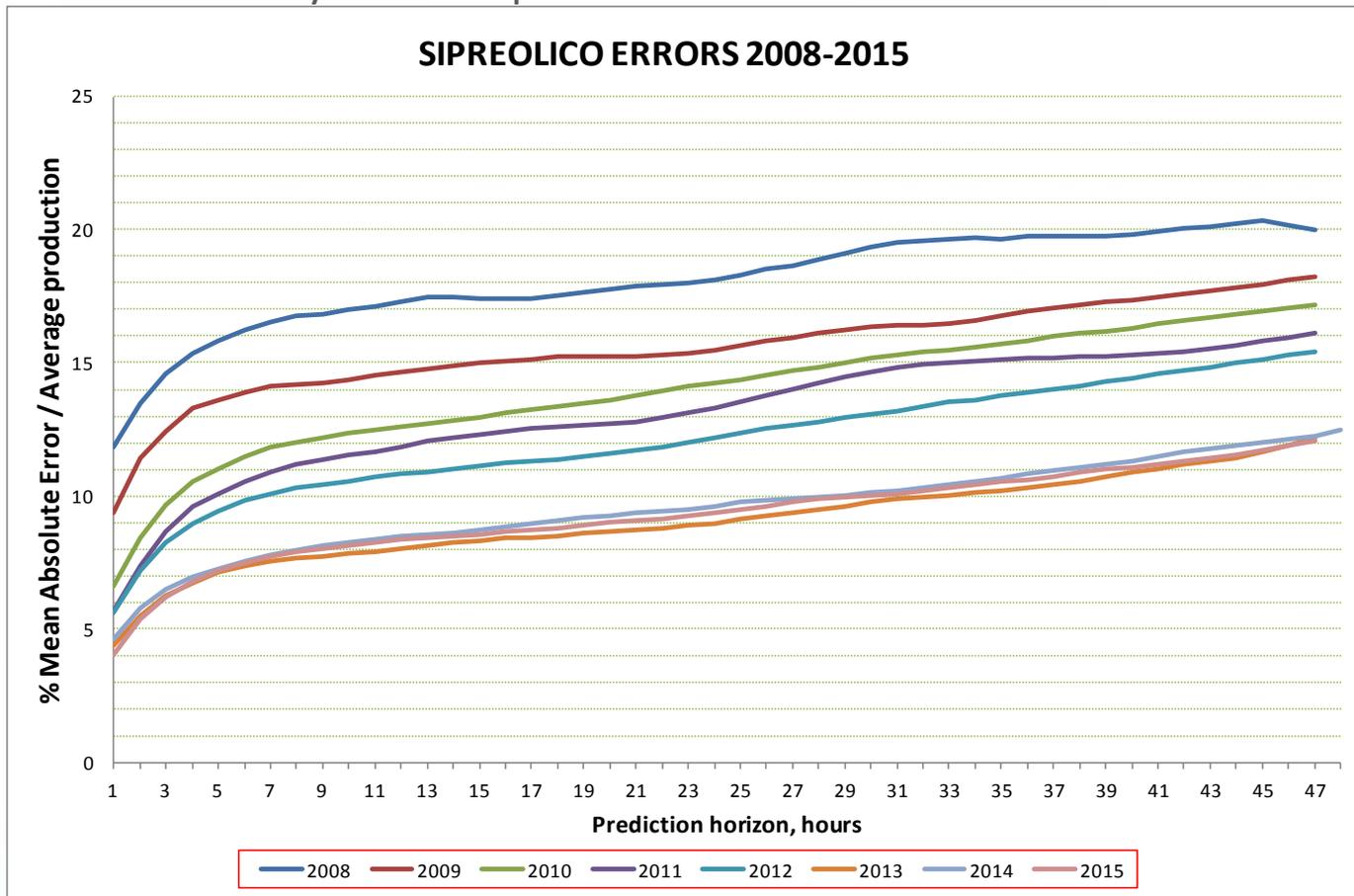


Evolution of wind power forecast errors

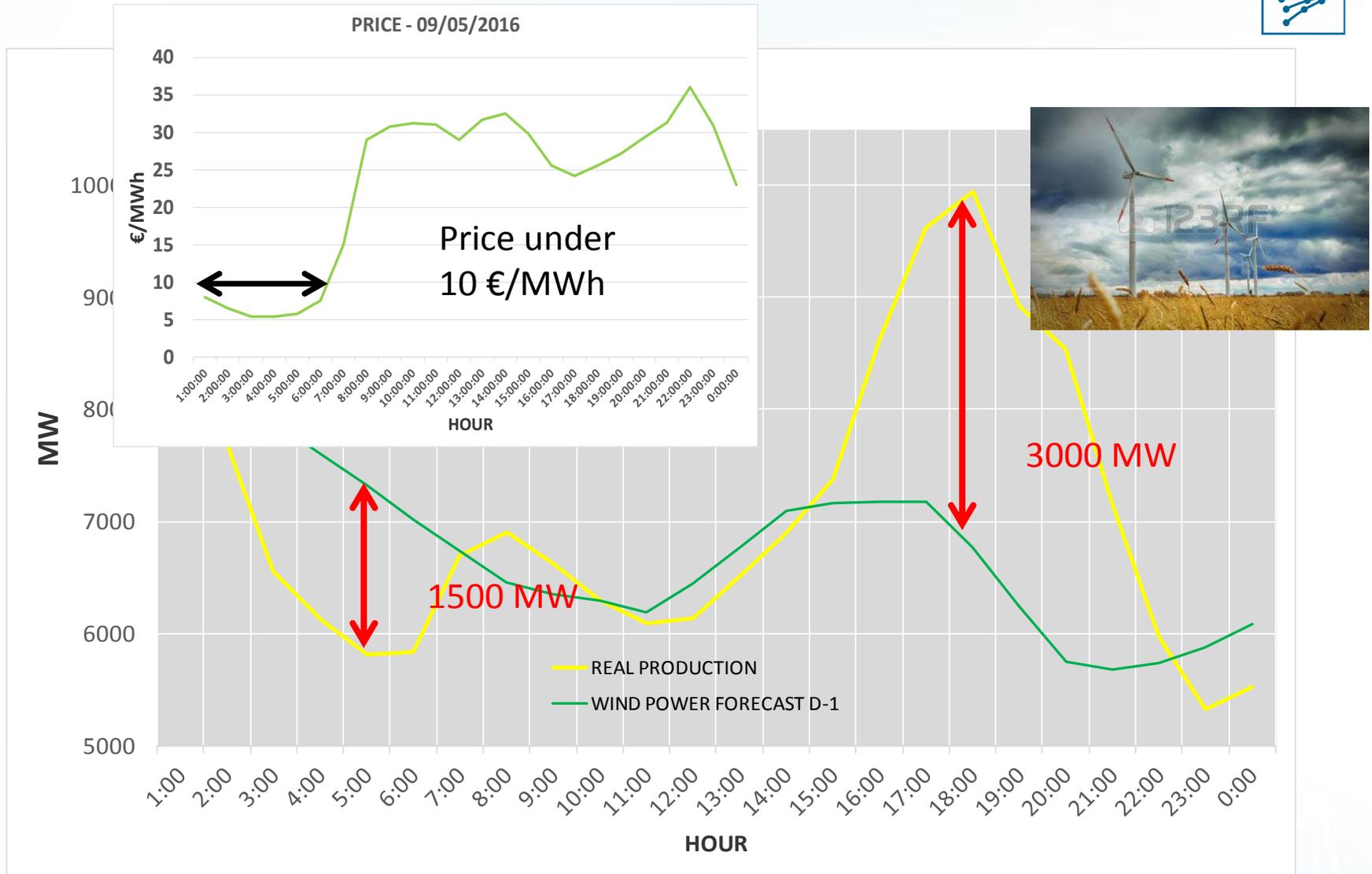
Error calculations



- SIPREOLICO has improved significantly in the last 8 years. Further improvements seem to be limited by weather prediction models



Singular days: 09 may 2016



Working on ...

Sipreolico



- REE Wind Generation Forecasting System has been improved year by year since it was developed.
- Main challenge: improving our forecast for days with a very high error
- Wish list:
 - Use of NWP with higher spatial resolution grid
 - Increase the update frequency of the NWP (every 3 hours)
 - Nowcasting : wind forecast including storm cells



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Thank you