

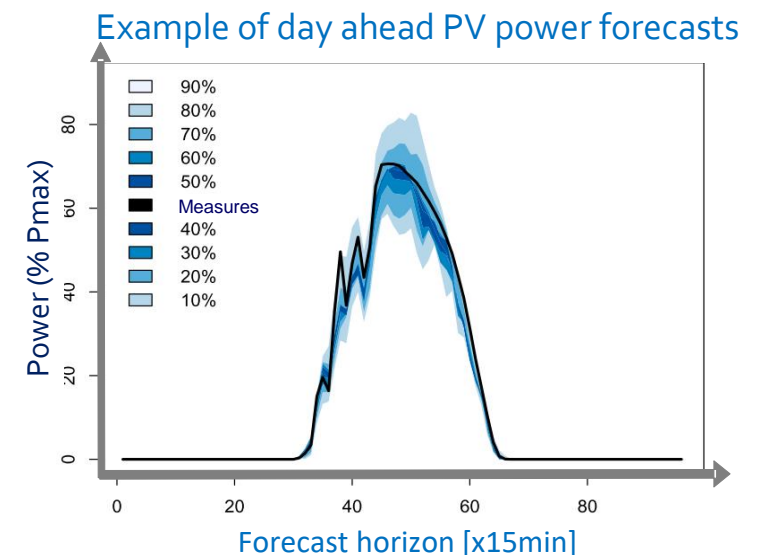
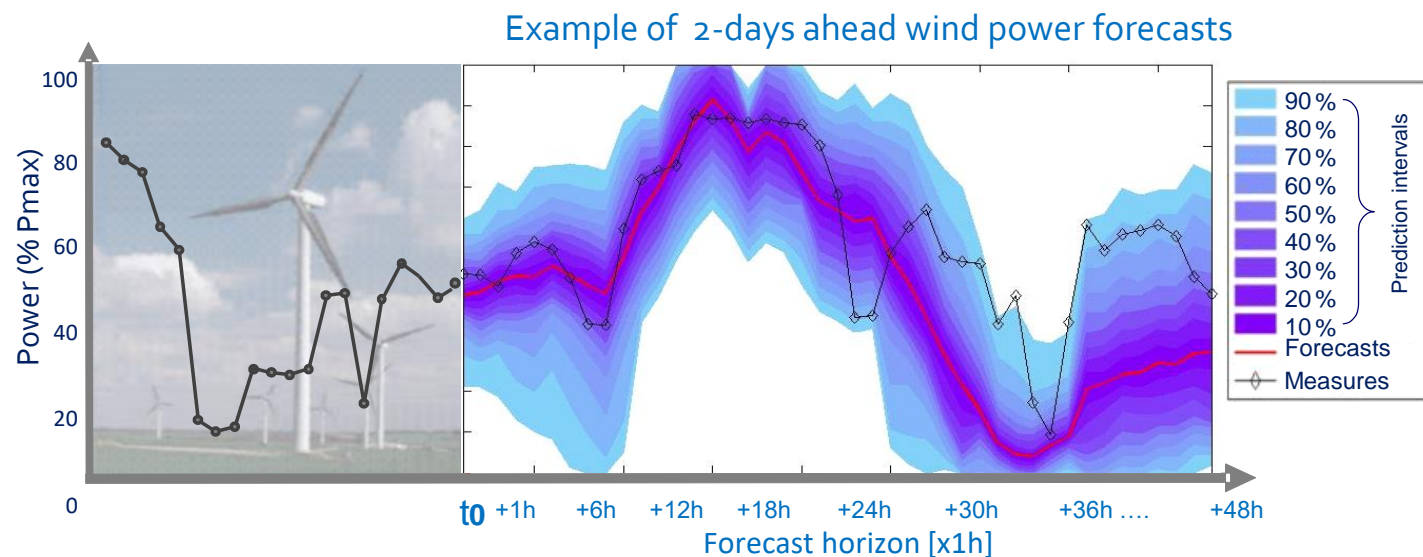
An outlook of Smart4RES and research perspectives for renewable energy forecasting

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- Short-term (minutes-days ahead) forecasts of renewable generation (wind, solar) (RES) are necessary for a secure and economic operation of power systems.
- Forecasting solutions are used operationally by all stakeholders.
- However, large forecast errors may occur with a high financial/technical impact.
- Improving forecasting accuracy has been a continuous requirement by end users.



The Smart4RES project in a nutshell

■ A multi-disciplinary consortium

7 countries

13 partners

End-users

Industry

Research

Universities

Meteorologists

Funds: H2020 program

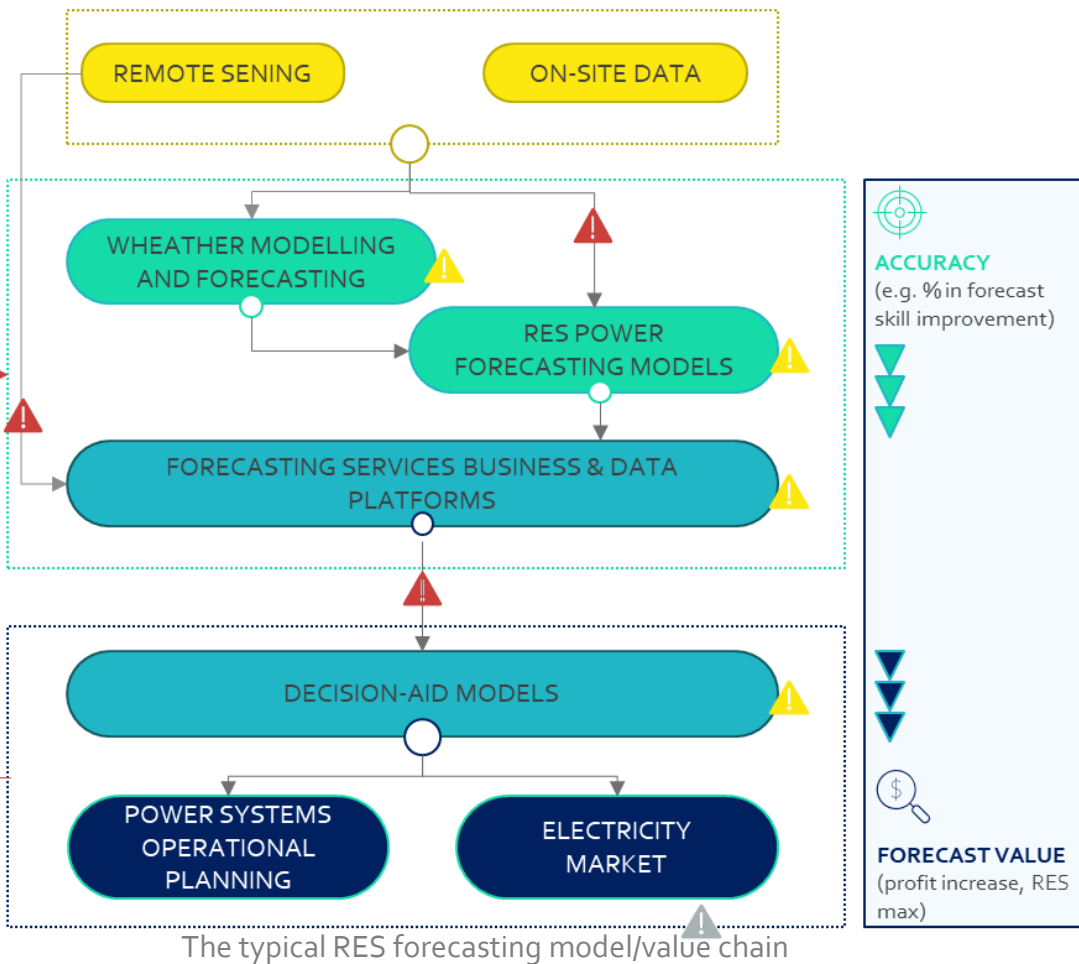
Budget: 4 M€

Duration: 3.5 years

11/2019-4/2023



The Smart4RES project in a nutshell



Project vision: Achieve outstanding improvement in RES predictability through a **holistic approach**, that covers the whole model and value chain related to RES forecasting

Objectives (& take aways)

- Methods to extract the value out of data through data sharing and data market concepts
- Advanced weather modelling & forecasting adapted to the energy sector
- New RES forecasting tools which, by design, are not only optimized to maximize accuracy, but also other properties, like simplicity, resilience, robustness, value in applications.
- A new generation of AI-based tools to simplify decision making of operators like meta-forecasting and prescriptive analytics .

Recommendations for future research directions

- A list of 14 recommendations were identified for future research on RES forecasting
- These are presented in a SLIDO poll. You are invited to select the 3-4 you consider as most important.
- At the end of the session we will present and discuss the results.

Recommendations for future research directions (1/2)

1. Research towards RES-dedicated weather forecast products.
2. Higher temporal resolution and frequency of updates for classical NWP.
3. Ultra high spatio-temporal resolution modelling of weather variables (i.e. Large Eddy Simulations).
4. Advanced techniques for combination of multiple sources of data for RES forecasting.
5. Towards digital twins of the weather system (i.e. Destination Earth).
6. Better forecasting of extreme situations (ramps, fog, snow, icing, lightnings,...)
7. Improve seasonal forecasting and associated uncertainty

- NWP: Numerical Weather Predictions
- AS: Ancillary services.

Recommendations for future research directions (2/2)

8. Forecasting RES production under external constraints (curtailments due to congestions, AS provision, noise, birds...).
9. Collaborative forecasting based on privacy/confidentiality preserving data sharing.
10. Go beyond “accuracy-oriented” RES forecasting to “value-oriented” forecasting.
11. Develop tools to compile heterogenous forecast information (scenarios, ramps etc) to simplify decision making by operators.
12. End-to-end interpretable AI-based approaches, like prescriptive analytics, to simplify the classic model chain “Forecast then Optimise” to “Joint Forecasting and Optimisation”.
13. Promote knowledge sharing and open code and data to be able to verify academic contributions.
14. Work towards standardisation of RES forecasting products.



THANK YOU !



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Germany



Netherlands



Denmark



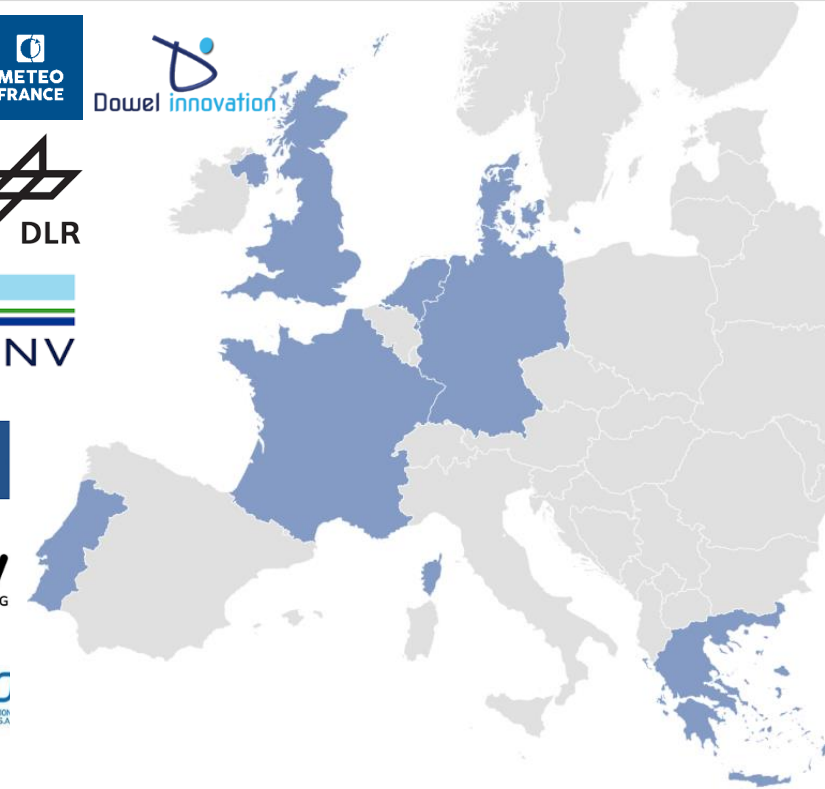
UK



Portugal



Greece



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- Ricardo Bessa; Carla Goncalves; **INESC TEC, Portugal.**
- Ivana Aleksovska, Bastien Alonzo, Marie Cassas, Quentin Libois, Laure Raynaud; **Meteo France, France.**
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- Theodora Anastopoulou, Efrosini Korka, Christos Vitellas; **HEDNO, Greece.**
- Stephanie Petit; **Dowel Innovation, France.**



<https://www.smart4res.eu/workshop-and-webinar/>

Smart4RES Final Conference

Session 1: General overview

- Keynote speech 'EU's research and innovation priorities on renewable energy', M. Soede (DG Research and Innovation, European Commission)
- Evolution of the state of the art and The Smart4RES project in a nutshell, G. Kariniotakis (MINES Paris)

[Download the presentation](#)

[Watch the recording](#)

Session 2: Advances in Weather Modelling

- RES-dedicated weather forecasting models, Q. Libois (Météo France)
- High-resolution weather models – Large Eddy Simulation (LES): the future, R. Verzijlbergh (Whiffle)
- Improvement of solar forecasting through the use of multi-source observations, J. Lecaza (DLR)

[Download the presentation](#)

[Watch the recording](#)

Session 3: Next Generation RES Forecasting

- Improved RES models in particular weather conditions, M. Lange (EMSYS)
- Data driven methods for minute-scale wind power and structural load forecasts using Lidars, T. Göçmen (DTU)
- How to simplify RES forecasting using a seamless approach, D. van der Meer (MINES Paris)

35 + publications and conference papers



Publications

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2023

- Lindberg O, Lingfors D, Arnqvist J, van der Meer D, Munkhammar J. Day-ahead probabilistic forecasting at a co-located wind and solar power park in Sweden: Trading and forecast verification. *Advances in Applied Energy*. 2023

<https://doi.org/10.1016/j.adapen.2022.100120>

[Download the pre-proof.](#)



<https://www.smart4res.eu/publications/>



ANNEX

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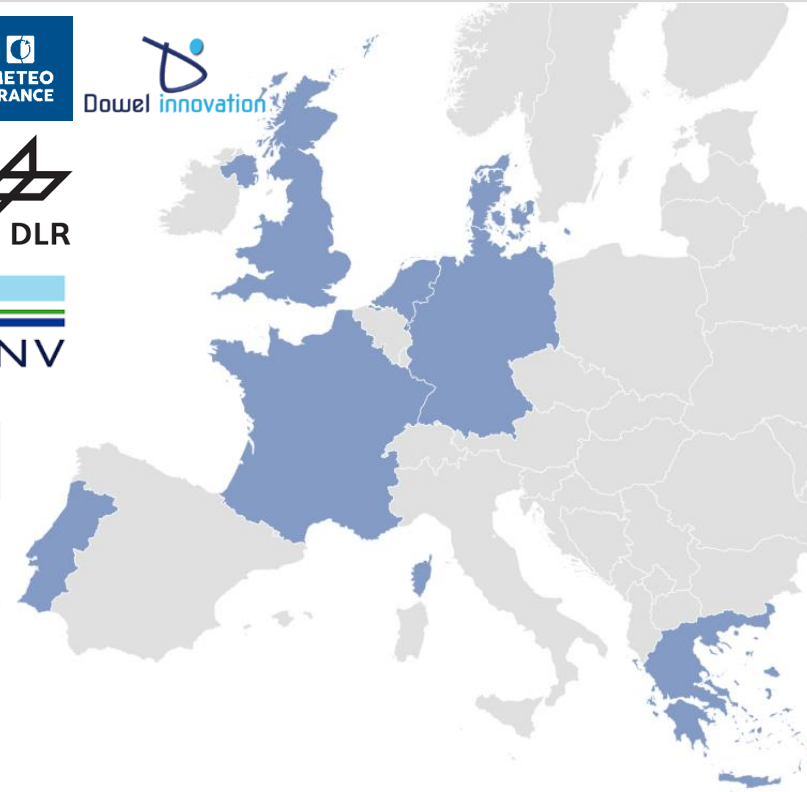


Imperial College
London

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