IEA Wind Recommended Practices for Selecting Renewable Power Forecasting Solutions

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Part 3: Evaluation of Forecasts and Forecast Solutions

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Background

IEA Wind Task 36 members comprise:

- 53 organisations from 13 countries and 3 continents
- forecast vendors, consumers and academia represented

This *Recommended Practice:*

- aims to increase the value of forecasts in the wind industry
- is a product of member experience, stakeholder workshops and industry consultation

Principals of Recommended Practice

Part 3 addresses forecast verification and evaluation.
Evaluation results should be:

1. **Representative** of true forecast performance that can be expected operationally
2. **Significant** in the sense that apparent differences in forecast performance are properties of the forecasting system and not a result of random variation
3. **Relevant** to the specific business function for which the forecast service is employed, see Figure 1, for example

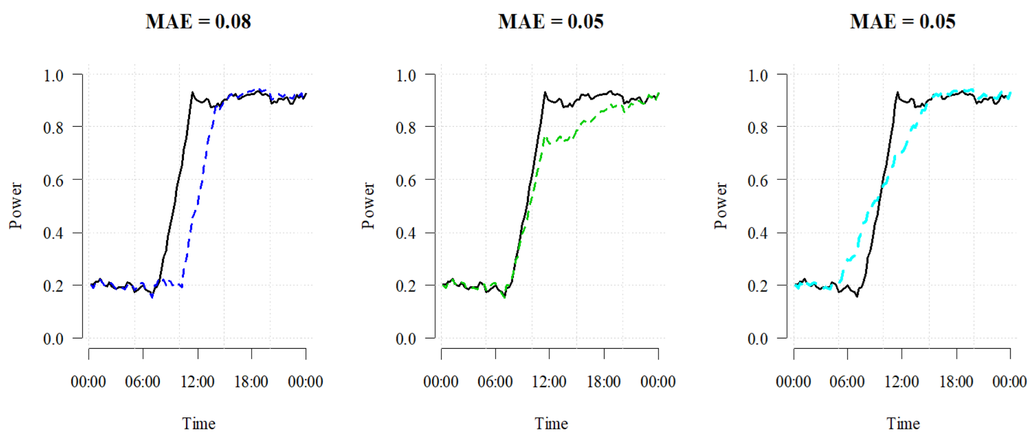

Figure 1: What type of forecast error matters to you (above, left to right) ***phase,*** ***level*** or ***ramp rate***? Note the different contribution to the error metric, mean absolute error (MAE)

Significance Tests

The box-plots in Figure 2 show the error distribution for six forecasting models. The red triangular markers indicate the confidence range of the median. If these ranges do not overlap for two models, the medians are different to a 5% significance level under certain assumptions. This corresponds to a visual representation of a *t*-test.

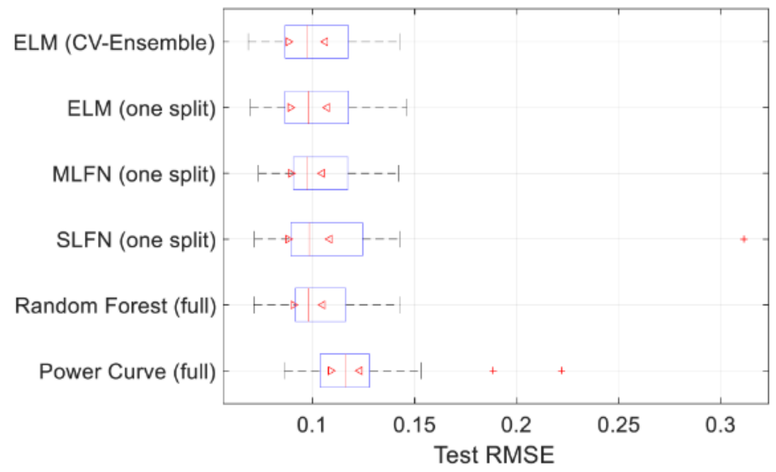

Figure 2: RMSE distribution for six different forecasting models forecasting for 29 wind farms

- Only the "Power Curve" model has a *significantly* higher RMSE than any of the others
- Top five models cannot be clearly distinguished from one another
- Full distribution of errors and other characteristics should be considered
- Simple error metrics can easily mislead and result in poor decisions being made

Figure 3: Testing multiple characteristics of a forecast system is often necessary

Recommendations:

1. Developing an Evaluation Framework

- A comprehensive evaluation framework is an effective way to mitigate the "relevance" issues associated with the tuning of forecasts to target a single metrics that may not be optimal for an end user's application

2. Operational Forecast Value Maximisation

- Continuously monitor forecast performance
- Focus should be on maximising forecast value, not simply error metrics, see Figure 3
- Consumer should incentivise innovation from their supplier

3. Evaluation of Benchmarks and Trials

- Ensure the three principals of the recommended practice are central to trial design and execution
- This topic covered in detail in *Part 2: Designing and Executing Forecasting Benchmarks and Trials*

4. Evaluation of Development Techniques

- Complex IT infrastructure and systems mean innovation can be expensive to implement
- Systems need to be structured to enable improvement over time without requiring changes to infrastructures

More from IEA Wind Task 36 at ICEM…

RP Part 1 & 2 Presentation: Building 101, Room M1, Tuesday 14:00-15:50
ICEM IEA Task 36 Workshop: Building 101, Room S1, Wednesday 16:15-18:00
IEA Task 36 Overview: Poster #1 | More Information at: www.ieawindforecasting.dk/news