PO.021

Long-Term Operational Energy Assessments

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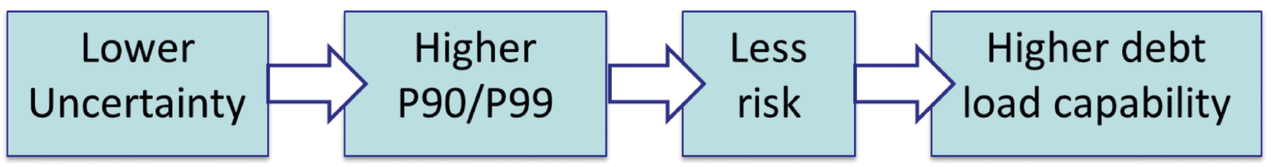
Abstract

Pre-construction long-term energy production estimates are necessary to anticipate generation and estimated revenue of wind plants, but generally, these pre-construction assessments are calculated using only wind data collected prior to the construction of the project. However, after the wind farm has been in operation during a representative period, it is possible to derive more accurate results and reduce uncertainties of yield assessments. Long-term operational energy assessments performed using actual production data of the plant require fewer assumptions and it is possible to produce results with lower uncertainty and more realistic.

Objectives - Why would you need an operational assessment?

The ultimate goal of an operational energy assessment is to obtain an updated estimate of the energy production of the wind farm during the whole project life cycle using the available operational data.

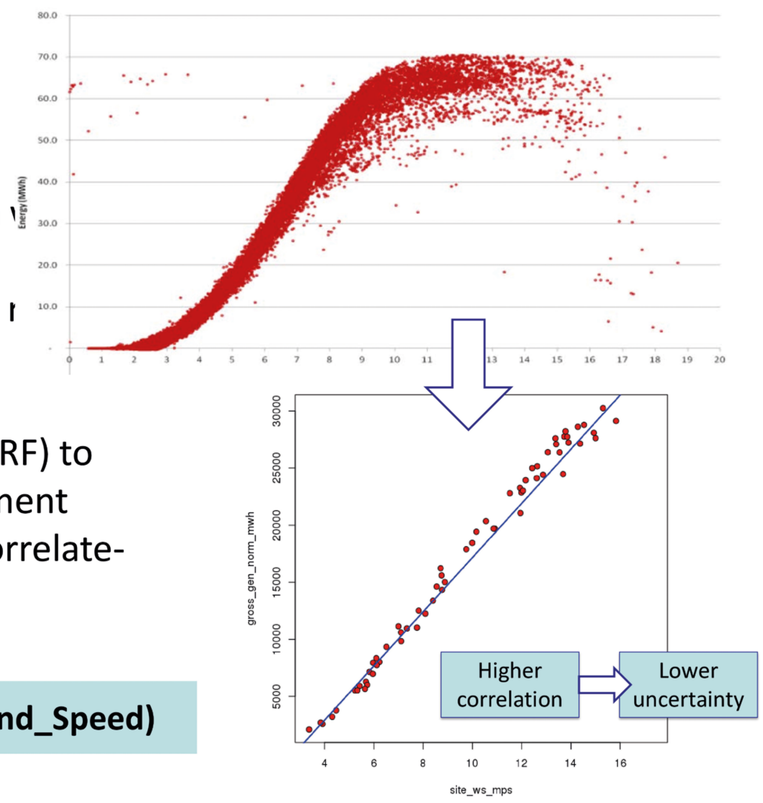
- **Obtain accurate results.**
- **Update the value and ROI of your asset.**
- **Reduce uncertainty and risk**
- **Refinance debt, mergers or acquisitions**



Method

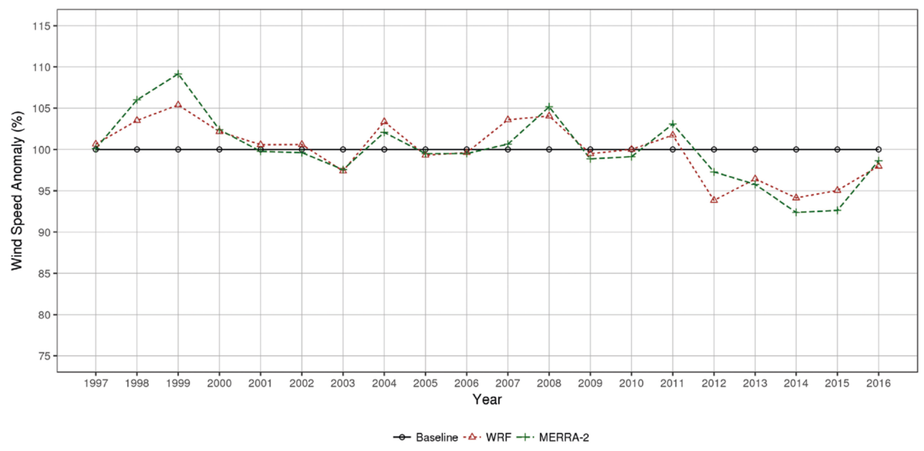
The key point of the method consists in deriving a numerical relation between long-term reference wind speed data and the actual energy generation of the plant. This relation can be understood as a statistical plant power curve.

This power curve is constructed by correlating actual monthly plant production data from one or more long-term meteorological and/or simulated reference datasets (CFSR/MERRA-2/ERA-I/WRF) to perform a climate adjustment following the Measure-Correlate-Predict (MCP) procedure.

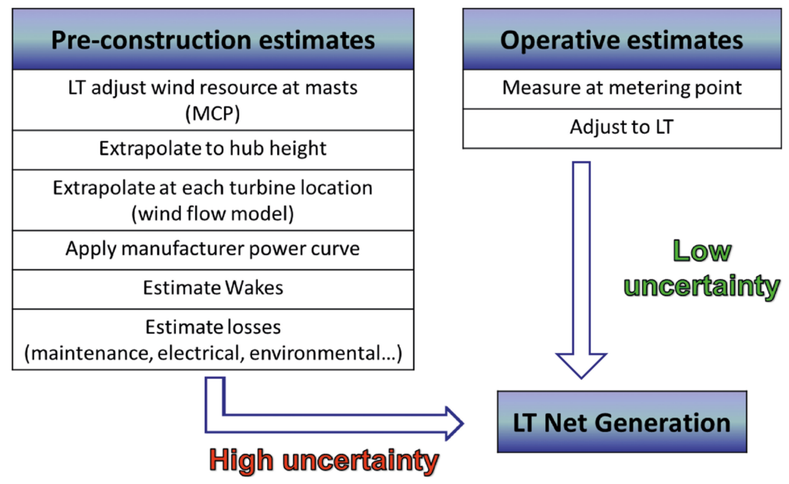


Plant Production = ƒ (Wind_Speed)

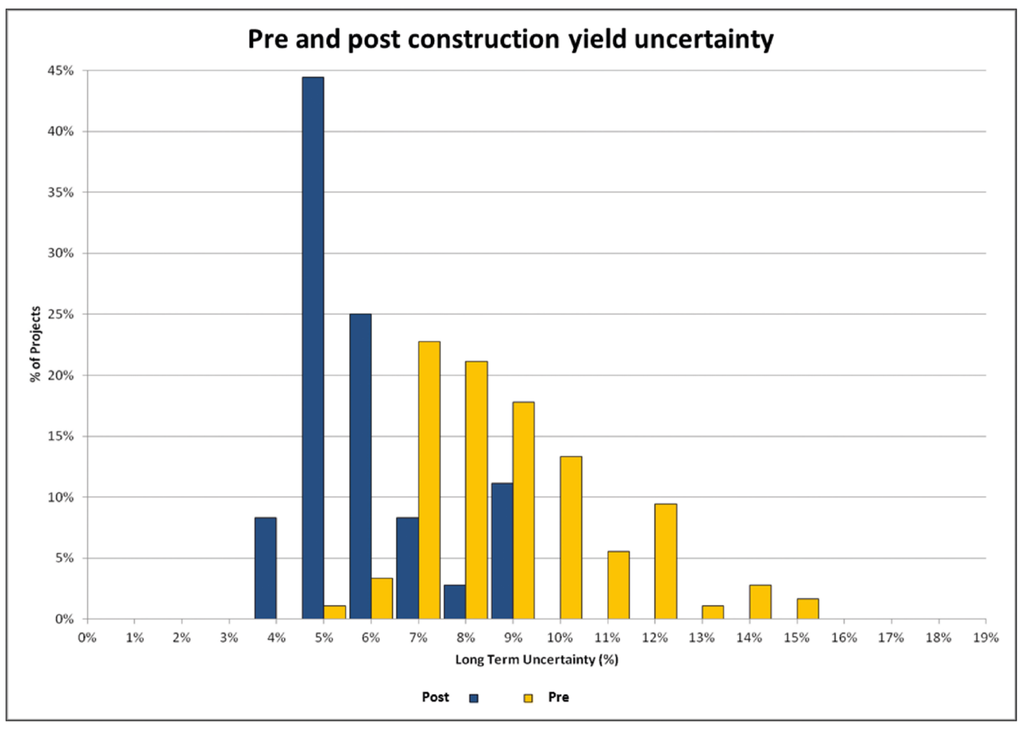
Therefore, plant production can be obtained as a function of wind speed, that can be used to derive the long-term gross energy production estimate. One of the most important factors determining the success of MCP is the adequate choice of reference wind speed data, particularly the quality of the relationship with the target site (with a high correlation coefficient) and the consistency and length of the reference data records.



Uncertainties of that process will be much lower than in pre-construction, since many uncertainty sources are already included in the input data.



Typically, post-construction yield uncertainty is reduced between two thirds to one half of the pre-construction energy estimate.



In case of owning a portfolio of wind projects, this allows to balance local resource fluctuations and reduce the volatility of the revenue stream, which may translate into lower uncertainty when performing the operational yield assessment of the plants.

Conclusions

Using operational data to assess long-term energy production produces more accurate results than pre-construction estimates. Uncertainty can be even more reduced if the assessment is performed by a portfolio of plants, which may translate into lower risk to the net income for the owner.

References

1. Michael C. Brower (ed.) 2012. Wind Resource Assessment: A Practical Guide to Developing a Wind Project. Wiley.
2. Taylor, Mark, et al., "An Analysis of Wind Resource Uncertainty in Energy Production Estimates," Proceedings of the European Wind Energy Conference, November 2004.