What makes a wind resource assessment bankable?

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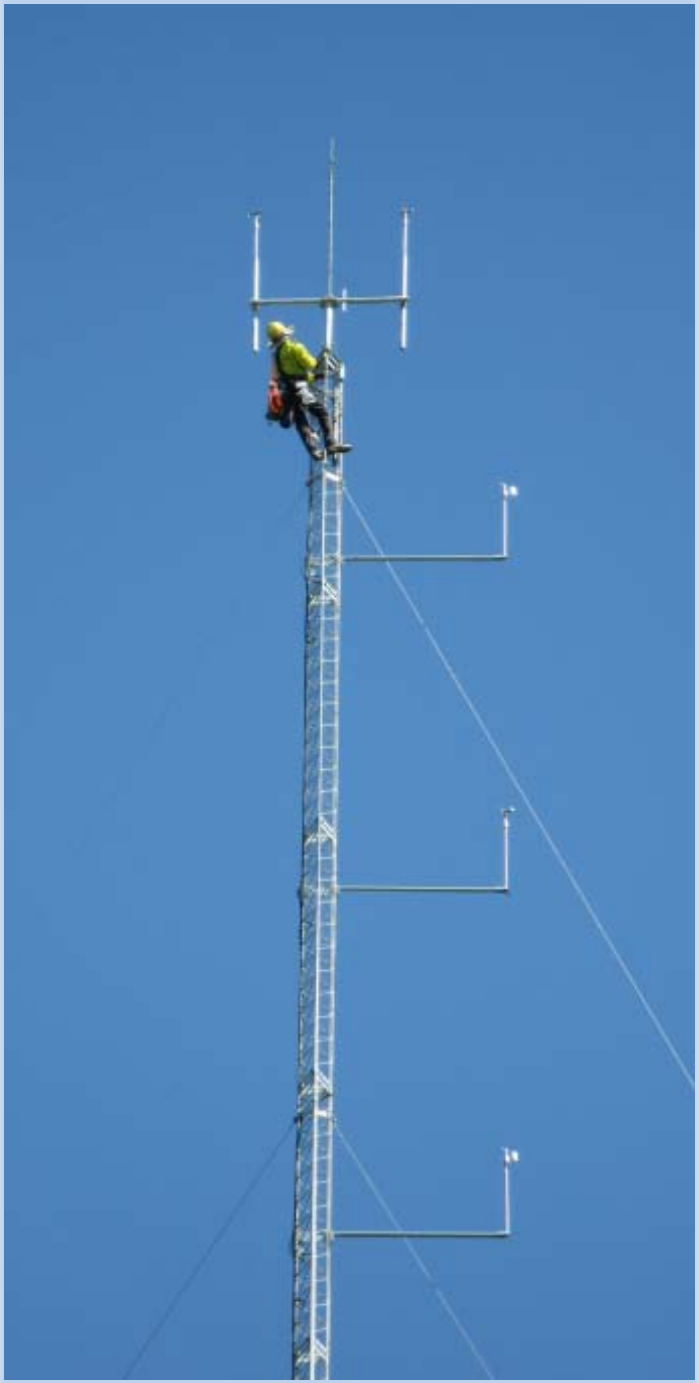

Overview

A bankable wind resource assessment is one that is based on data of sufficient quality, quantity and duration to support a financial transaction.

How good does it need to be, i.e. how much needs to be spent?

How low does the uncertainty need to be?

How to minimise uncertainty for least cost?

What makes a WRA bankable?

Uncertainty is quantifiable and 10 yr P90 / P50 ratio > 80%

Source of uncertainty	Wind speed		Energy output[1]	
	[%]	[m/s]	[%]	[GWh/annum]
Anemometer	3.0	0.24		
Period representative of long-term	1.7	0.14		
Correction to long-term using wind index	1.3	0.11		
Correlation from Mast WW to Mast WC	0.7	0.06		
Extrapolation to hub height	2.6	0.21		
Overall historical wind speed		**0.37**		**8.26**
Substation metering			0.3	0.33
Wake and topographic calculation			9.0	9.86
Wind rose representative of long-term			0.0	0.00
Energy loss factor assumptions			2.0	2.19
Future wind variability (1 year)	6.0	0.48		10.83
Future wind variability (10 years)	1.9	0.15		3.43
Future wind variability (20 years)	1.3	0.11		2.42
Overall energy uncertainty (1 year)				**16.96**
Overall energy uncertainty (10 years)				**13.50**
Overall energy uncertainty (20 years)				**13.28**

Notes: 1. Sensitivity of net production to wind speed is calculated to be 22.49 GWh/annum.(m/s)

Guidelines for bankable WRA…

1. Develop a monitoring campaign to minimise uncertainty
2. At least one hub height mast
3. At least one mast in every distinct turbine cluster

   (2 to 3 km separation in simple terrain, 1 km in complex terrain)
4. Use high quality anemometers with redundant sensors
5. Ensure IEC 61400-12-1 compliance
6. Measure temperature and pressure on site
7. Pay attention to every small detail on masts
8. Prioritise data management and mast maintenance
9. Measure for at least one year (at least two if no LT reference)
10. Obtain high quality topographic data (minimum 10 m resolution, ideally 1 m)
11. Use robust, transparent methodology

What can be done to accelerate wind development in Asia?

Quality WRAs will support the rapid growth of the wind industry and build long-term confidence from financiers

Quality WRA need the following:

1. **Long-term reference stations** urgently need improving
2. **Supply chain** for wind monitoring needs to be developed
3. **Developers** need to understand WRA requirements and uncertainty analysis
4. **Data management** and maintenance needs to be prioritised