Financing wind projects in changing subsidy environment
Total return insurance as solution ?

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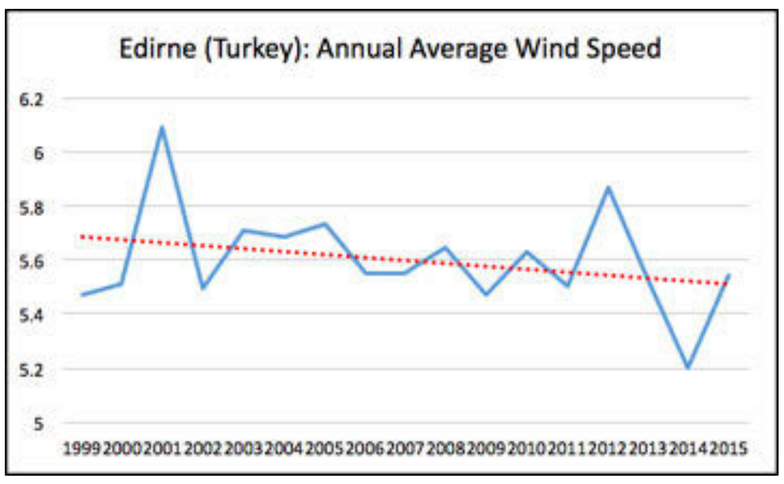
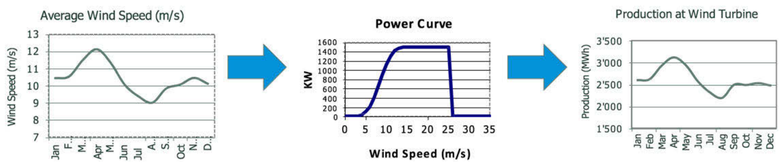
Abstract

- Traditional Finance Structure of Wind Projects: 80% Debt + 20% Equity AND investors want to make sure to get their money back.
- Most important influence factor for cash flow is wind speed with its well known natural volatility.
- This creates uncertainty about cash flow from power sales and thus a very conservative evaluation approach of lenders.



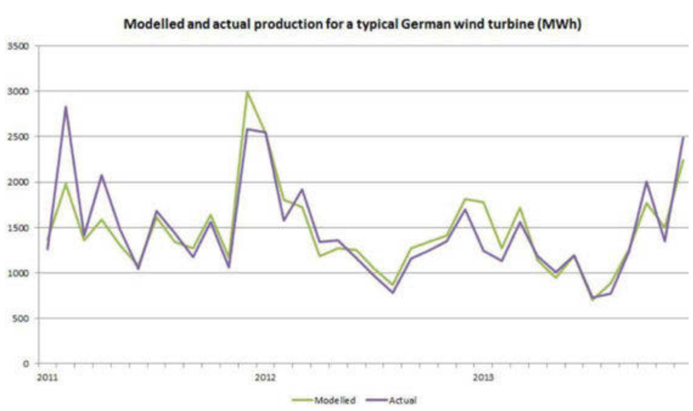


- Traditional risk mitigation approach are weather derivatives which are based on measured wind speed and theoretical power curve. The Wind Production Index (WPI) created thereof is calibrated towards historical production (if available) and provides a proxy for actual production.

- Put and collar type derivatives on the wind index hedge out risk of not enough wind but leave client with basis risk.

Objectives

BASIS RISK is the risk that the WPI deviates from the actual measured production and the hedge does not work at it is expected to.



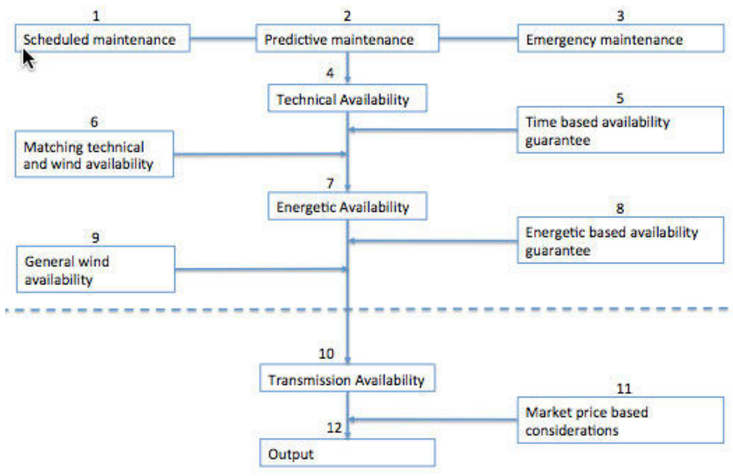
MAIN CAUSES for basis risk are
- Turbine availabilities (see below).
- Variations in power curves through production tolerances.
- Quality of Operation and Maintenance.
- Wind direction and turbulences.
- Interdependencies between single causes, e.g. availabilities and maintenance policy.

MARKET DEVELOPMENT

- More and more markets transfer their fixed feed-in tariffs into more market oriented compensation schemes.
- With the EEG 2016 Germany establishes an annual auction system with limited maximum capacity and a system of reduced regional different subsidy factors.
- In a much more competitive environment basis risk becomes even more important.
- As it directly affects the cash flow and the cushion of high feed-in tariffs is diminished investors will become even more cautious.

Methods

The world of availabilities



BASIS RISK

- Finally all risk which is not covered elsewhere is with the investor.
- Even in case investor tries to hedge the largest remaining risk (weather) the current hedging tools do not allow basis risk removal.
- As wind power index derivatives already reduce the margin whilst providing only a proxy hedge many investors shy away from using them.
- An index trying to consider all single basis risk parameters would be indefinitely complex and not accepted by the investor community.

TOTAL BASIS RISK MANAGEMENT

- Basis risk should be transferred to a risk taker who understands all its parts individually as well as in total.
- The reinsurance industry owns wind assets, has operators under contract, insures wind parks against weather and all other perils and also has a deep understanding of finance.

Results

THE SOLUTION

- Energy Risk Solutions together with Munich Re Group currently develops a total return hedge for the global wind power industry.
- This hedge will create a win / win situation as it transfers the risk to the one who is able to handle it and allows others to focus on their core competences.
- Example for a production put term sheet:

Structure Type	Put Option on power generation	Payout Calculation	
Underlying	Power generated at Wind Park XXX	Power Production Index PPI [MWh]	PPI = PA/AT
Wind Park	XXX / Germany		whereby
Longitude	53° 11' 41" N		PA = PP + FIM
Latitude	10° 46' 43" E		PP = Power Production as measured by the grid operator [MWh]
Buyer	YYY		FIM = Feed in Management volume granted because non-availability of grid [MWh]
Seller	ZZZ	Power Production Index Strike [MWh]	PPIS = 70'000
Risk Period	October 1, 2016 until September 30, 2017	Tick Size	90 [€/MWh]
Turbine Type	20 x Vestas V90-1.8/ (2 MW)	Monthly payout formula	MAX(0; (Strike - PPI) x Tick Size) subject to Limit
Park wake factor	0.957	Limit	[to be discussed]
		Non binding indication	[to be discussed]
Power Production Data		**Additional Information**	**Requested for Pricing and modelling**
Grid Operator	E.ON Westfalen Weser AG		
Power Data Source	Monthly invoices of Grid Operator	Turbines Power Curve	[to be provided in electronic format]
Power Data Provider	Buyer	Turbine Axis height	[to be provided]
Power Production Data	PP= Monthly Power produced according to Power Data Source		
		Weather Data	Reanalysed data in hourly resolution for location and Turbine Axis Height
Availability Data			
Availability Data Source	Wind turbine's Scada Data on 10 min basis	Weather Data Provider	Speedwell
Availability determination	Hourly average of the 6 x 10 min data sets	Weather Index	Wind speed at Turbine Axis Height in [m/s] on a 10 min basis
Availability Data Provider	Third party to be announced		
		Production and Availability Data	
Availability Definition		PA	since beginn of production
Technical Availability AT	AT = TA/TB	FIM	since beginn of production
	TA = TO + TS	TA	since beginn of production
	TB = TA + TNA	TO	since beginn of production
		TS	since beginn of production
	whereby	TB	since beginn of production
	AT = Technical Availability [%]	TNA	since beginn of production
	TA = Time Available (Time in which turbine is available and able to produce) [h]	Availability Classes and Status Codes to be provided by Buyer	[to be provided by Buyer]
	TO = Operating Time (Time in which turbine is generating power) [h]	Theoretical Energetic Availability AET	f(AT; prevailing wind speed, wake factor)
	TS = Stand By Time (Time in which turbine is available but does not produce) [h]		
	TB = Basis Time (8760 h/a)		
	TNA = Time Not Available [h]		

Conclusions

CONCLUSION

- Financing wind projects leaves still room for optimization, ideally with a total return insurance.
- The key is in the hand of risk takers whom are able and prepared to take the whole spectrum of risk and offer 'easy to understand' solutions to the lender and investor community.
- In a market environment with competition between projects the demand for such a product will increase significantly.