

ENERGY

Onshore wind projects in France and Germany

**Influence of technical and meteorological risks
on the financing of projects**

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12 November 2019



DNV GL – An independent global classification / certification & technical assurance / advisory company

DNV·GL



150 years – 100 countries – 350 offices – 12,000 employees – 2 bn €

Technical Due Diligence (TDD) = A review of risk

Due Diligence = a thorough and independent investigation of an “asset” to help ensure that an interested party gets what it believes it is paying for

**Common themes
of review:**

- **Reliability**
- **Productivity**
- **Performance**
- **Interfaces**
- **Compliance**



Who takes an interest in a Technical Due Diligence?

General

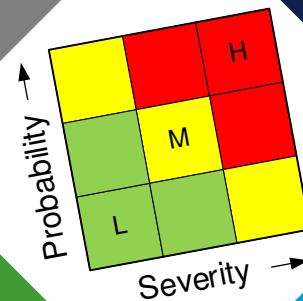
- Potential strengths and weaknesses in the project identified by an independent 3rd party
- Comparison to wind industry benchmarks

Investor

- Identification of technical opportunities and risks for overall investment strategy
- Verification and evaluation of information provided by Vendor

Vendor / Sponsor

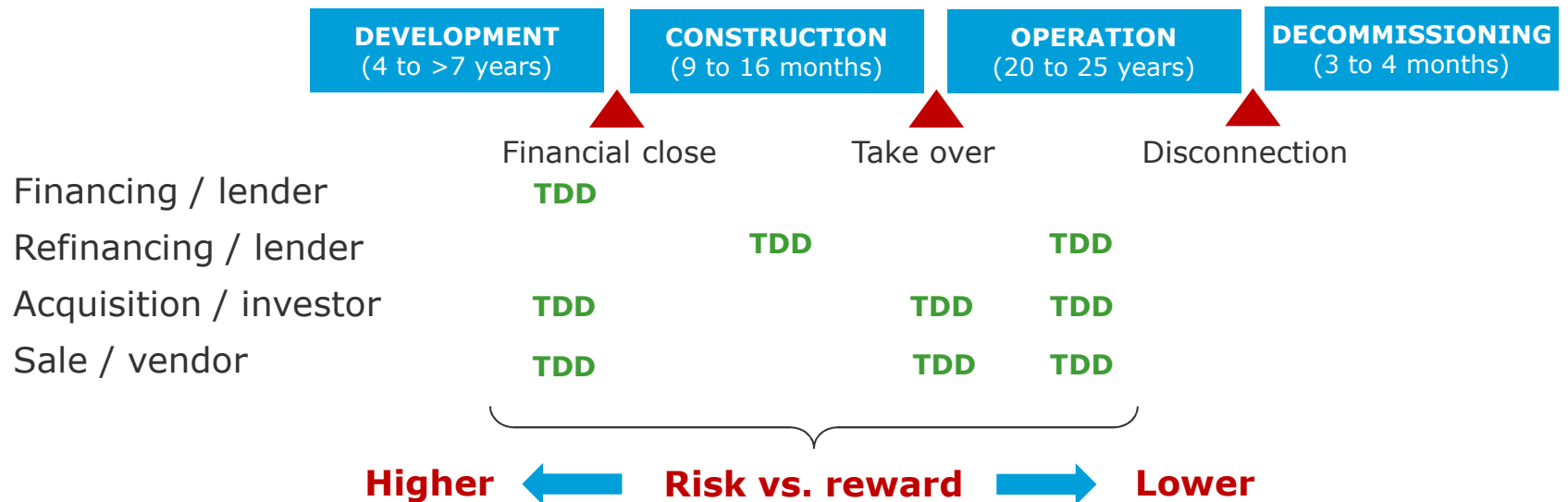
- Technically viable presentation of project to potential investors
- Identification of potential threats by independent third party before start of selling process



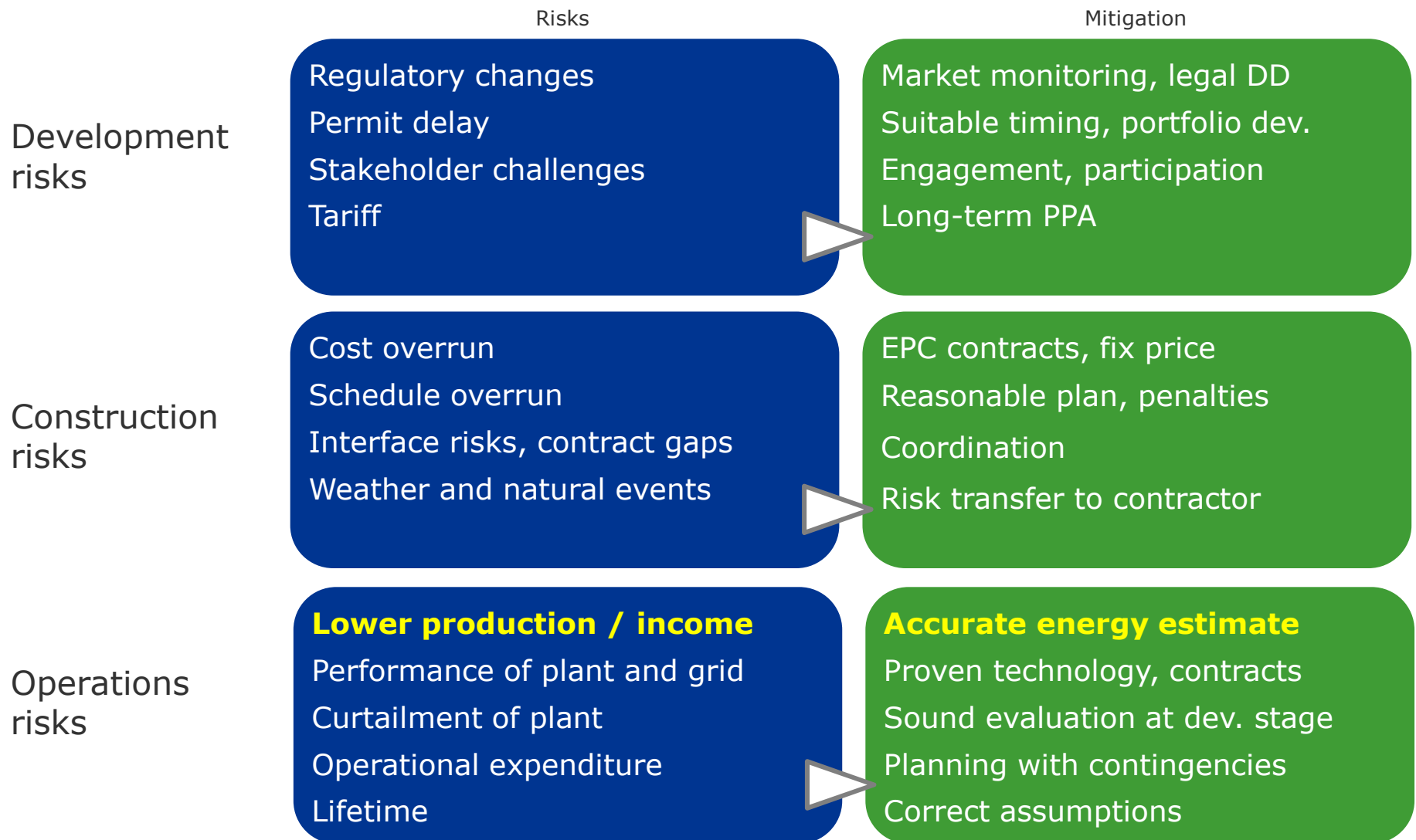
Lender

- Identification of loan risks
- Decision support on whether loan can be granted and if yes, under which conditions

When is Technical Due Diligence used?



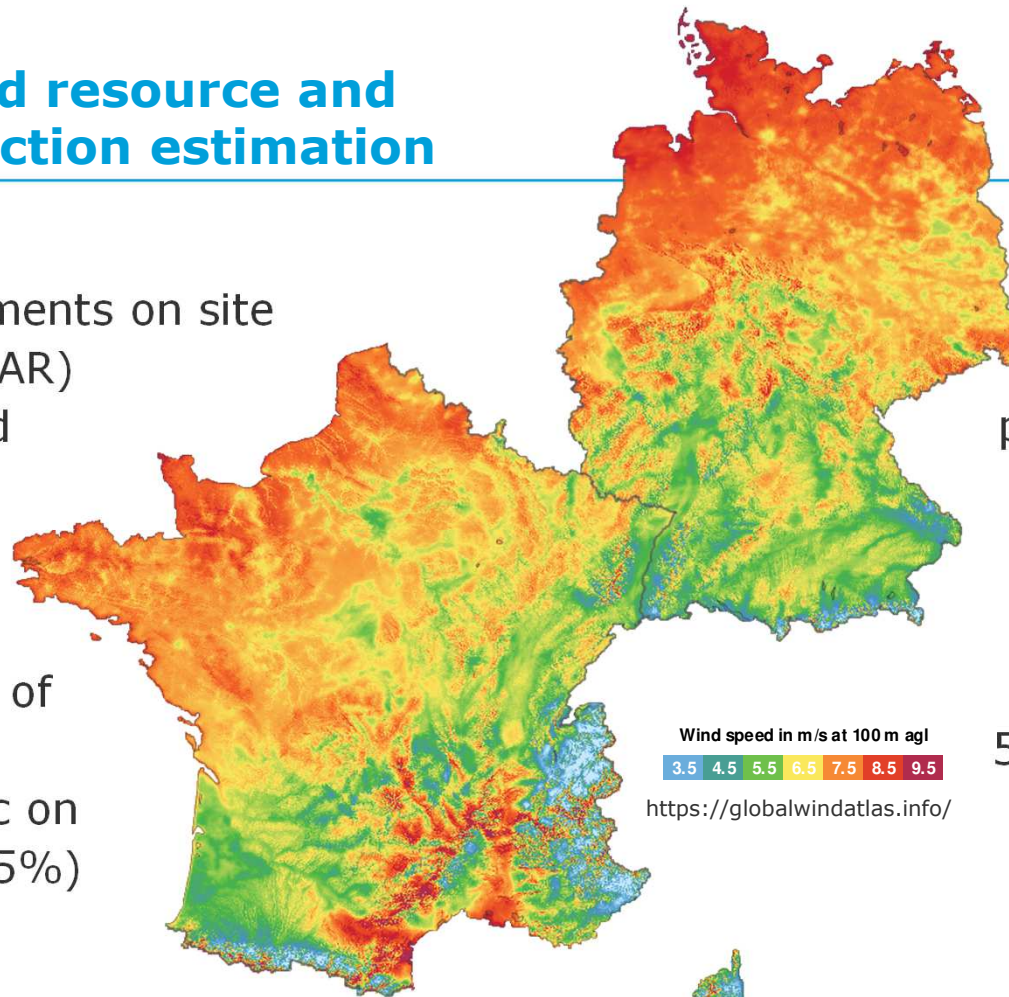
Changing risk over project lifecycle – A technical perspective



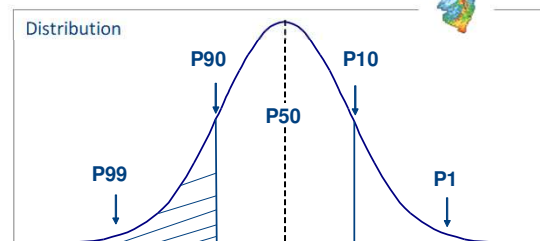
Key risk: Wind resource and energy production estimation



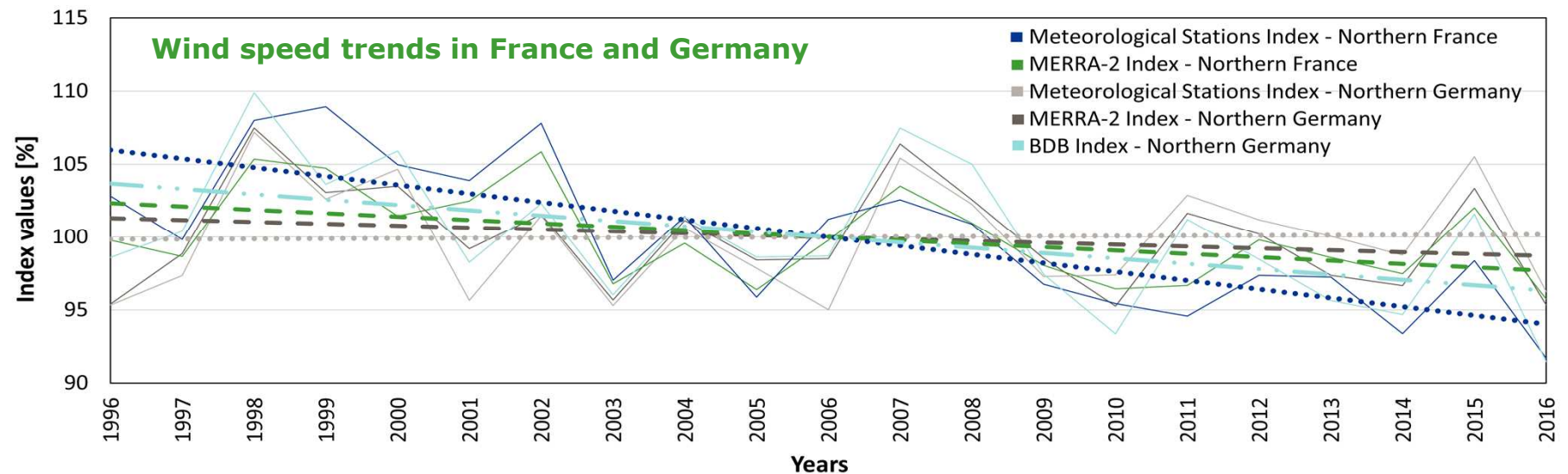
- Wind measurements on site (met mast, LiDAR) commonly used
- More costly, higher accuracy
- DNV GL review of own studies: 1.8% optimistic on P50 (market >5%)
- Common concern: wind farm noise
→ study to NFS
→ frequent curtailment



- TR6 guideline by FGW: Fleet production data used
 - Inexpensive, lower accuracy
- Market discussion: 5 ... >10% optimistic on P50
- Occasional concern: birds & bats
→ some curtailment



Energy production (yield) assessment



Gross Energy Output (P50)	GWh/annum	Important: Data basis / long-term
- Wake effect	%	Wind farm size dependent; new: blockage
- System availability	%	WTG, balance of plant, grid
- Electrical efficiency	%	WTG to metering point, relatively high
- Turbine performance	%	Degradation over time
- Environmental	%	Icing, etc.
- Curtailment	%	Site dependent, highly relevant
= Net Energy Output (P50)	GWh/annum	

Review of financial model – Focus areas for TDD

Energy production

Energy Production		
Size	100 MW	
P50	45.4%	C.F.
P75	43.0%	C.F.
P90	39.7%	C.F.
P99	34.0%	C.F.
Energy Production Case	P90 Select case	
Annual energy production	347,772 MWh	
Financing		
Equity	35%	43,750,000
Debt	65%	81,250,000
Interest rate	8.0%	
Term	16 years	

Design, contracts, schedule, contingency

Useful life		
Useful life	20 years	
Capex		
Capex (EUR/MW)	1,250,000	
Capex (EUR)	125,000,000	
Contingency	3%	
Reserves	500,000	
Opex		
	EUR/MW	Increase factor
Opex Year 1-2	22,500	1.00
Opex Year 3-5	37,000	1.00
Opex Year 6-10	40,000	1.00
Opex Year 11-15	43,500	1.00
Opex Year 16-20	50,000	1.00
Opex Year 21-25	65,000	1.00
Opex Year 26-30	80,000	1.00

O&M contract, land, insurance contingency

Performance warranties and operational monitoring

Tariff		Energy (EUR/MWh)	Tariff, PPA
Year 1-5		45.0	
Year 6-10		45.0	
Year 11-15		45.0	
Year 16-20		45.0	
Year 21-25		0.0	
Year 26-30		0.0	
Inflation		3%	
Availability			
Warranted availability		97%	
Project availability		97%	
Project IRR	Equity IRR	DSCR (min)	
10.70%	13.84%	1.43	



Long-term predictable cash flows? → Resource assessment is of paramount importance!
Better data & analysis = less uncertainty = more reliable predictions = less risk = bigger loan

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TO SAFEGUARD LIFE, PROPERTY AND THE ENVIRONMENT



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