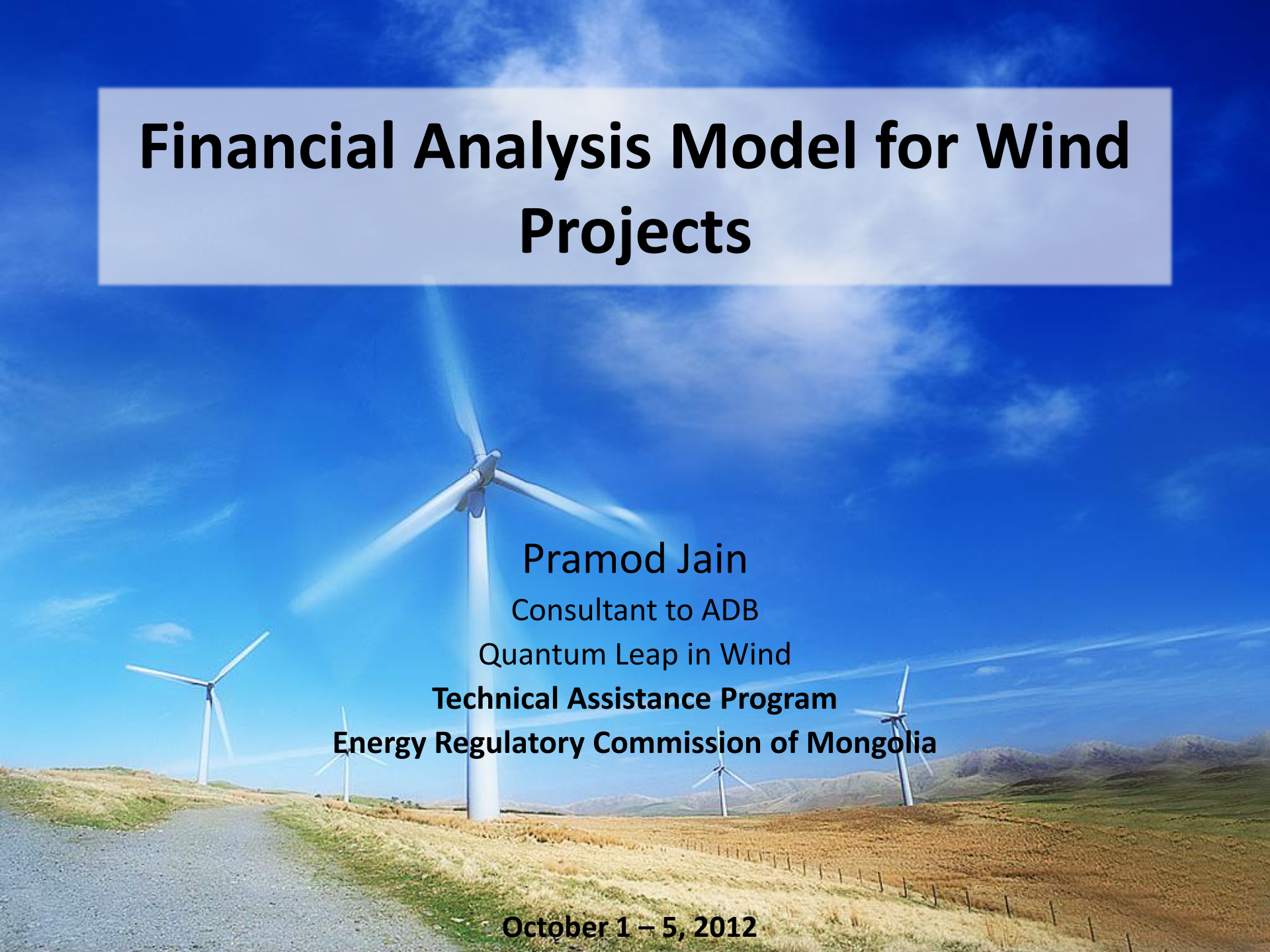
Financial Analysis Model for Wind Projects



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Quantum Leap in Wind

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Agenda

- Goals of the financial analysis model
- Input parameters
- Results
- Demonstration of the Excel model

Goals of the Financial Analysis Model

- Evaluate wind energy projects submitted to ERC
- Ensure that input parameters are within range
- Ensure that the financial results as computed by model match the results submitted in the license application

Conventions in the Model

Label
User Input requested
Formula
Output of Model

Input Parameters

Item	Data
Name of the Project	Choir wind park
Name of the Developer	Aydiner Global LLC
Location of project (lat/long)	
Name of town/village	
Name of province	Choir
Size of land (Hectares)	
Number of turbines	24
Rated Capacity of turbines (MW)	2.1
Total Size of Wind farm (MW)	50.4

Item	Data
Hub height (m)	80
Rotor diameter (m)	80
Turbine manufacturer	Suzlon
Turbine model	Suzlon S88-2.1 MW
Plant capacity factor (gross)	33.06%
Plant losses	0%
Plant capacity factor (net)	**33.06%**
Average Annual Energy Production (MWh)	**145,961**

Input Parameters

REVENUE	
Tariff ($/kWh)	$ 0.0950
Annual increase in tariff (%)	0%
Renewable Energy Credits + Carbon Credits ($/kWh)	0
Annual increase in value of credits (%)	0%
Production tax credit ($/kWh)	0
Duration of PTC (yrs)	0
Annual increase of PTC (%)	0%
Investment tax credit (%)	0%
Duration of ITC (yrs)	0

TOTAL CAPITAL COST	
Total installed cost ($/kW)	$ 1,849
TOTAL RECURRING COST	
Total Operations & Maintenance cost ($/kWh)	$ 0.0090
Annual increase in O&M cost	0%
FINANCIAL PARAMETERS	
Debt (%)	62.3%
Interest rate (%)	7.50%
Duration of loan (years)	13
Equity (%)	37.7%
Expected Equity rate of return (%)	12.50%

Input Parameters

Discount rate of NPV	10%
Inflation	3%
Tax rate	10%
Method of depreciation	Straight line
Years of depreciation	20
Expected life of wind project	20
Modified IRR finance rate	8%
Modified IRR reinvest rate	4%

Results of the Model

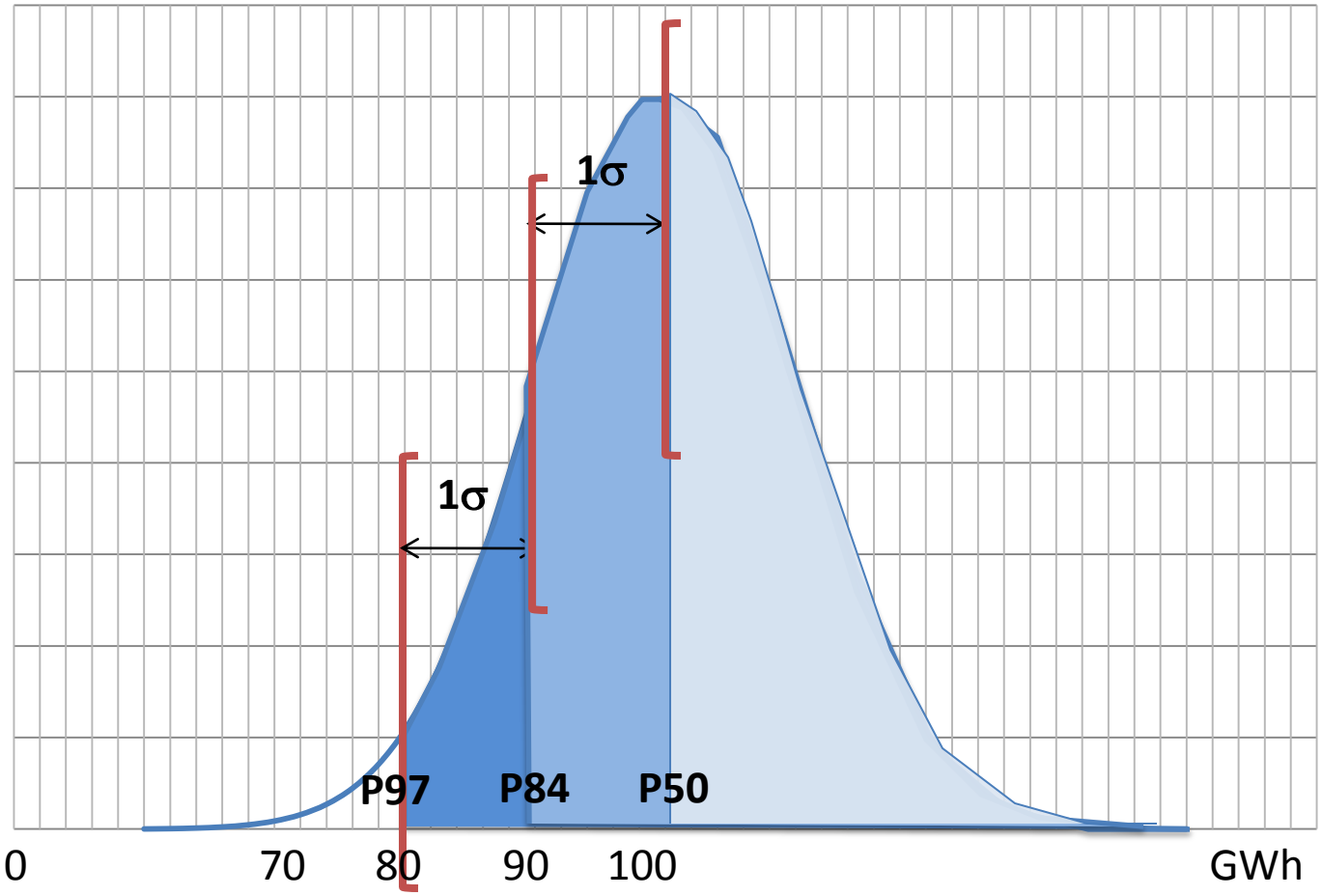
Item	Output
Total average annual energy production (MWh)	145,961
Total average annual revenue	$ 13,866
Total installed cost (in '000)	$ 93,170
Total annual O&M cost (year 1)	$ 1,307
Total annual principal + interest payment	$ 7,143
Total annual depreciation (year 1)	$ 4,658
Levelized cost of energy (20 years)	$ 0.1196
Equity Internal rate of return (20 years)	15.20%
Equity Simple payback period (years)	8
Net Present Value (20 years)	$15,021
Minimum Debt Service Coverage Ratio (DSCR)	1.655
Average DSCR	1.685

Demonstration

Uncertainty Analysis for Wind

Component of Uncertainty	Sensitivity Factor	Amount of Uncertainty (%)	Net Uncertainty of AEP Because of Component (%)
Wind speed measurement	1.5	5	7.5
Wind speed spatial extrapolation	1.5	3	4.5
Wind speed long-term correction	1.5	3	4.5
Wind shear, height extrapolation	1.5	2	3
Air density	1	0.3	0.3
Power curve	1	0.6	0.6
Wake losses in wind farm	1	1.7	1.7
Unaccounted for Loss	1	1	1
Total uncertainty of AEP assuming components are uncorrelated is square root of sum of squares			**10.5%**

Illustration of P50, P84, P90



P84 is an Annual Energy Production number with the following property: There is a 84% likelihood (probability) that energy production will be at least 80GWh.

Assuming: Average AEP=100GWh, uncertainty is 10%

Uncertainty Analysis

Item	P50	P84	P90	P95
Total average annual energy production (MWh)	145,961	116,769	108,595	97,940
Total average annual revenue	$ 13,866	$ 11,093	$ 10,317	$ 9,304
Total annual depreciation (year 1)	$ 4,658	$ 4,658	$ 4,658	$ 4,658
Levelized cost of energy (20 years)	$ 0.0802	$ 0.1003	$ 0.1078	$ 0.1196
Equity Internal rate of return (20 years)	15.20%	8.51%	6.61%	4.11%
Equity Simple payback period (years)	8	14	15	17
Net Present Value (20 years)	$15,021	($4,296)	($9,705)	($16,756)
Minimum Debt Service Coverage Ratio (DSCR)	1.655	1.305	1.207	1.080
Average DSCR	1.685	1.336	1.238	1.110

Methodology for submitting cost data

- Current methodology for submitting cost data to ERC:
  - Developer makes the annual O&M cost + interest expense + depreciation to be equal to $0.095/kWh.
    - Typically this is done by arbitrarily increasing depreciation per unit to match the required total of 0.095
    - There is no reason other than to match 0.095—the maximum tariff
- Correct methodology:
  - Accurately account for all costs (install and annual)
  - Compute the P50 Levelized Cost of Energy (LCOE) using realistic parameters like return expected by equity investors
  - Compute P84 and P90 LCOE
  - Decide on P84 or P90 LCOE as the cost-based tariff standard
- Developers must be trained in this methodology