Wind Value

An Opportunity for Climate Action and for Energy Communities

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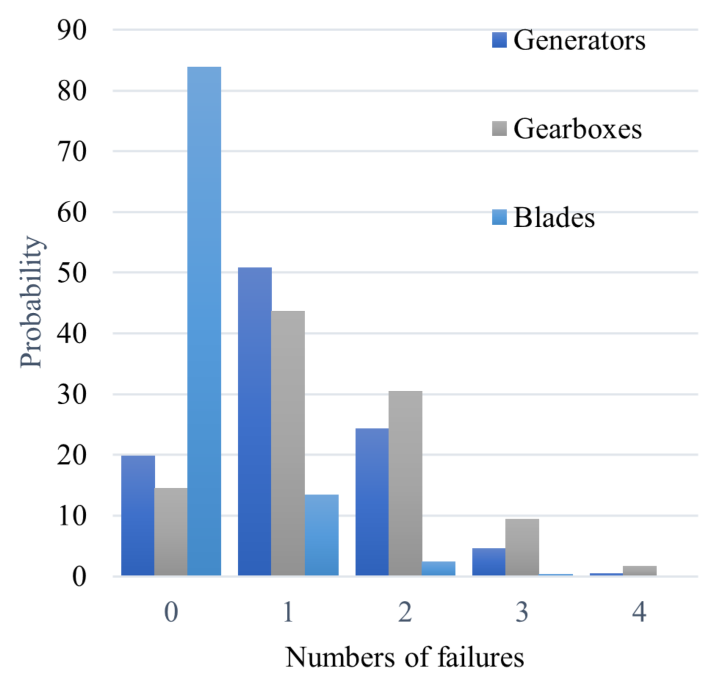
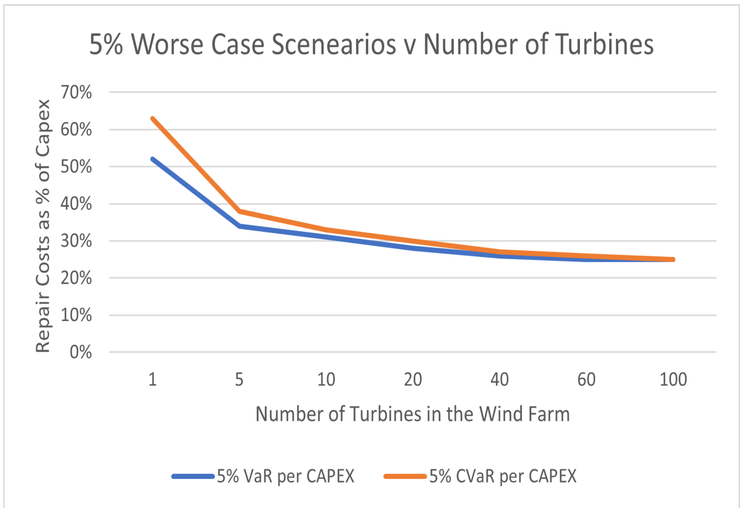
The Wind Value project examines financial risks in wind farms with particular emphasis on end-of-life decision making, and community investment opportunities. The project will produce three academic papers, it has conducted community and industry engagement, and will deliver two decision support tools.

Proposed First Paper

Financial Risk from Component Failure and Windfarm Size



Using annual failure rates for blades, generators and gearboxes for ten years, a Weibull distribution was calibrated and used to estimate the probability of the number of failures over the lifetime of the wind farm.
It is quite likely that blades will not fail at all, and quite likely that gearboxes and generators will fail once or twice.
This model for a single turbine is used to simulate the failure rates for multiple turbines on a windfarm, and therefore to test how financial risk changes with the number of turbines on a farm. The model takes into account the net present value of expenditure and lost production costs.



No of Turbines	1	5	10	20	40	60	100
5% VaR per CAPEX	52%	34%	31%	28%	26%	25%	25%
5% CVaR per CAPEX	63%	38%	33%	30%	27%	26%	25%

Modelling Assumptions

Failures on different turbines are independent.

Modelling Outcomes

The failure rates per year indicate the following:
We have a greater risk of failure for gearboxes and generators due to wear and tear.
The failure risk for blades is highest at the beginning due to construction and installation faults.

Results

The 5% worst case scenarios show what would be a likely cost of repairs to blades, gearboxes and generators during a 20-year lifespan of a wind farm.
The results are shown as a percentage of the CAPEX so that comparisons between windfarms may be made.
The more turbines, the lower the risk, this is a significant reduction with even 5 turbines. See table and graph

Proposed Second Paper

Electricity Price and its Effect on End-of-Life Decisions; Renewable Energy Policies

Proposed Third Paper

Community Investment in Windfarms – Appetite for Risk and Actual Risk

Community and Industry Engagement Events

End-of-Life Issues for Onshore Windfarms – Conference in UCC, May 2022

Discussed the scale and timing of wind farm decommissioning.
Recycling options for turbine blades
How to incorporate wind energy more fully into a circular economy.

Wave and Wind Energy Day – Donegal, Ireland (with X-Rotor and SafeWave) June 2023

Risk aversion scores were stronger than risk loving scores, there was no significant difference between men and women. See table

	Female	Male
N	6	10
Risk Aversion		
Mean	7.5	7.5
Standard Deviation	2.17	2.17
Risk Loving		
Mean	3.8	4.2
Standard Deviation	3.06	1.87

Table 2: Risk Aversion and Risk Loving Scores by Gender - Note that there was no statistically significant difference.

Industry Meets Academia Summer Seminar (with H-Wind), in UCC August 2023

The use of hydrogen as a fuel by Benoit Mayol. The use of compliance bonds to finance sustainable end-of-life processing by Kevin Campbell.

Project Deliverables

Decision Support Tool for Wind Farm Owners

Expected income from repowering, life extension and cost of decommissioning and associated financial risks.

Decision Support Tool for Community Ownership

Expected value of a wind farm as it approaches end-of-life
Financial risks of ownership
Some consideration of risk in the permitting process

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Questions Welcome
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