



# Blade Throw Risk Analysis

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# SgurrEnergy

- Established in 2002
- Leading independent consultancy specialising in renewables
- Based in Glasgow and Beijing
- 40 experienced professionals
- Broad range of experience
- Experience in over 20 countries

# Multi-disciplinary technical experts



Wind



Marine



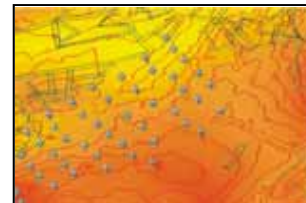
Hydro



Micro-generation



Bio-energy



Due Diligence



Project Management



Noise & Vibration



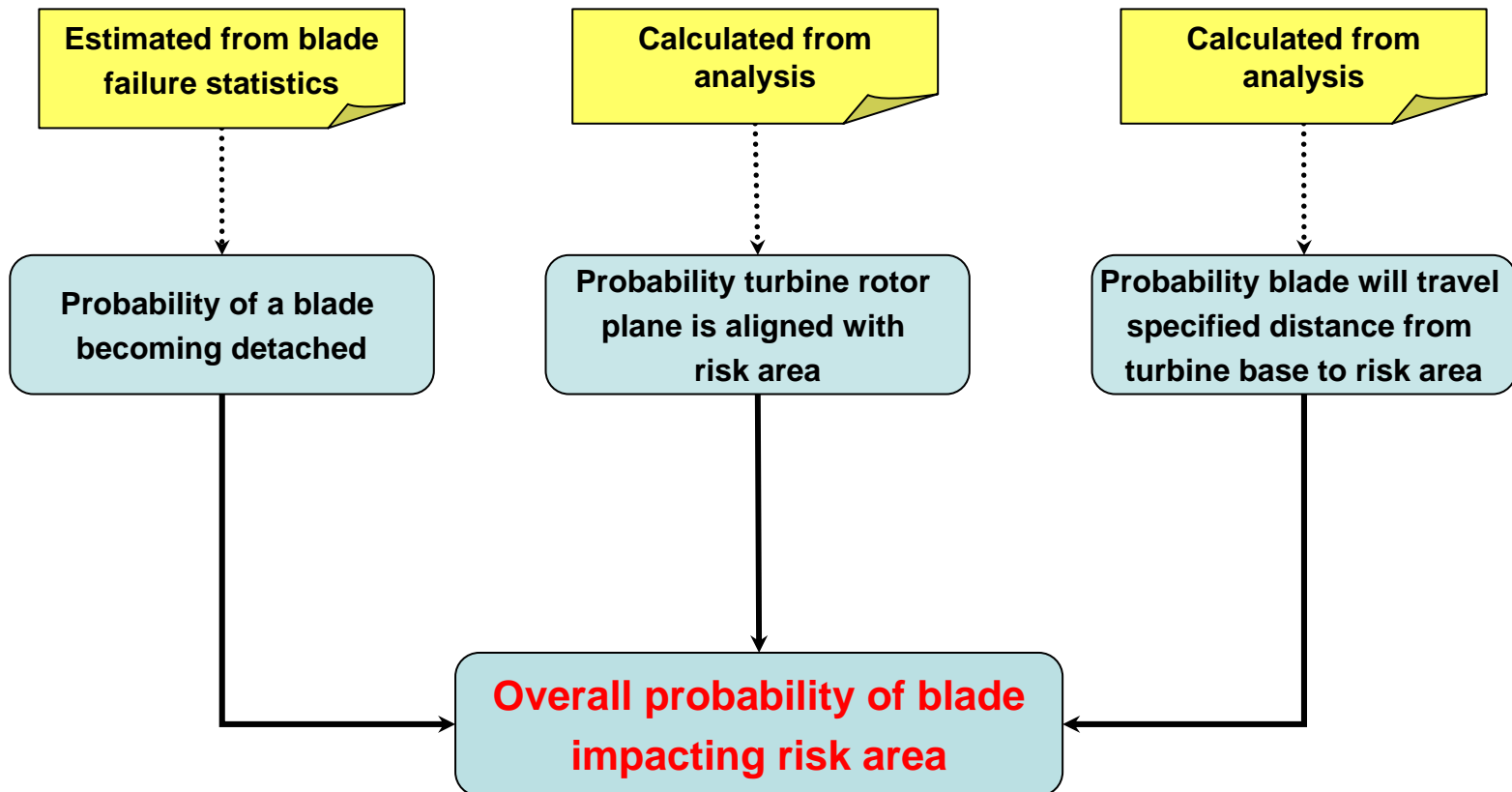
# Introduction

- Blade Throw Risk Analysis
  - Analysing the probability of a blade becoming detached from a wind turbine and landing at a specified risk area.
- Why?
  - Growing concern over safety.
  - Wind farms relatively close to industrial & residential properties, walkways, busy roads and potentially hazardous areas.

# Blade Throw Analysis

- It focuses on;
  - Overall probability of blade impacting a risk area.
- It does not;
  - Analyse the severity of an impact.

# Overall Probability



# Blade Throw Probability

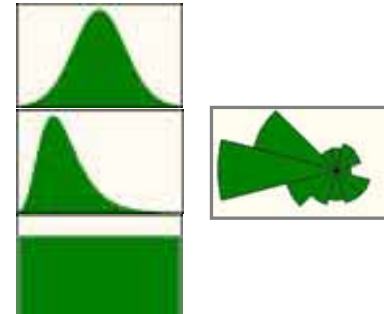
- Sources of information:
  - Turbine manufacturers
  - Wind farm operators
  - Internet sites compiling negative information about wind farms
  - Wind energy magazine articles
  - Technical reports

# Analysis

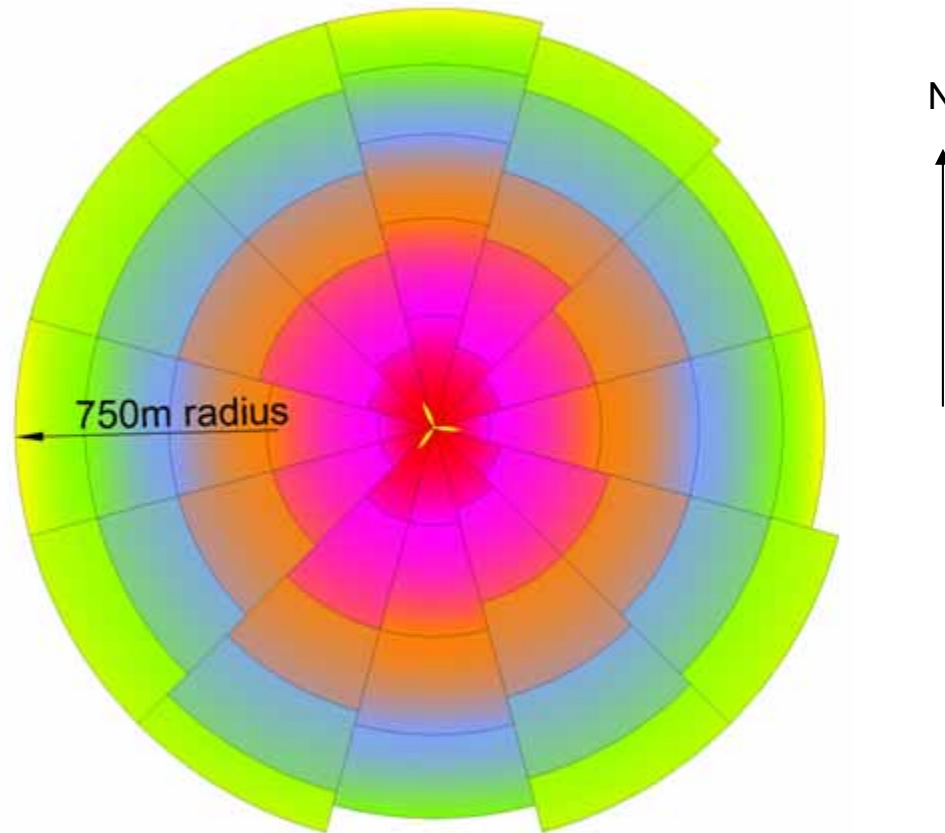
- The blade's motion after detachment is modelled using simple point particle Newtonian mechanics. (*Worst Case*)
- Certain assumptions are applied to the blade failure model:
  - The whole blade sheds instantaneously and cleanly.
  - Gliding is not considered.

# Analysis

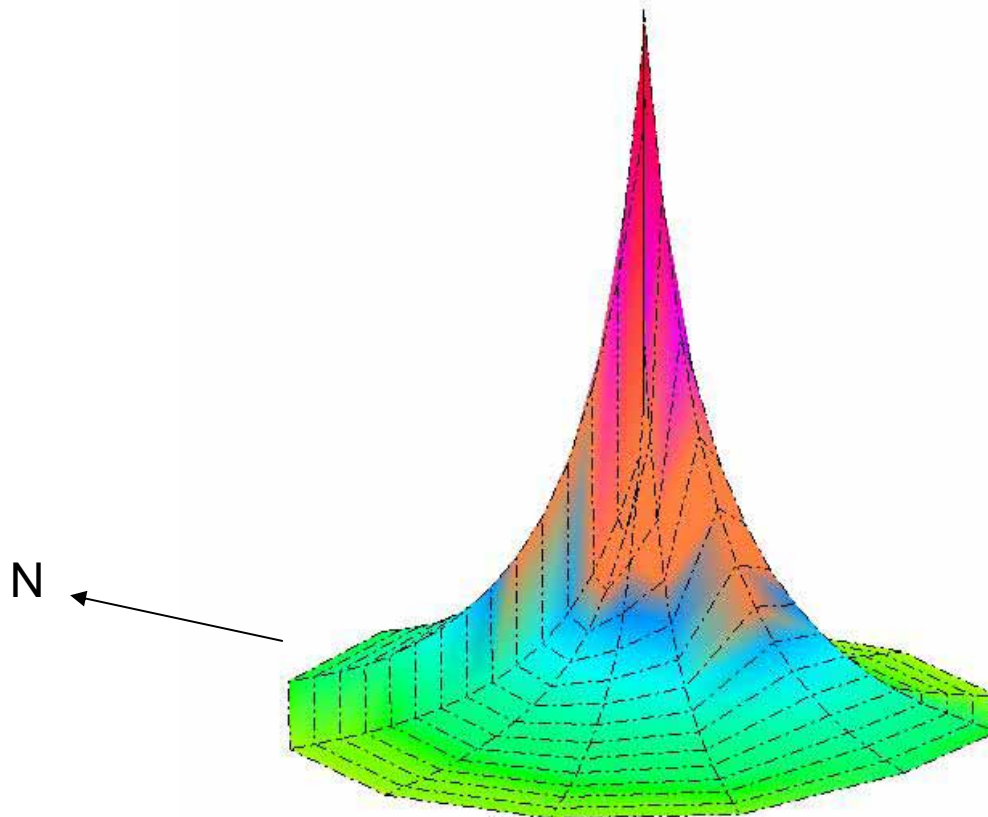
- The Monte Carlo method is used to calculate probabilities.
- Input parameters
  - Rotational Speed
  - Site Wind Speed & Direction
  - Blade Release Angle
  - Turbine Type



# Result



# Result



# Initiating Failure Probability

- Difficulties:
  - Lack of documented cases.
- Possible Solutions:
  - Create a detailed database of blade failures.
- Why?
  - Demonstrate that wind turbines are one of the safest forms of power generation.

# Conclusion

- Blade throw analysis is needed.
- Through simple mechanics the worst case impact probability can be obtained.
- There is a need for a blade throw/failure database.
- Given the constraints on wind farms and using current information the probability of a turbine blade impacting a residential property is very small.

# Questions?

- If you have any questions please feel free to ask, alternatively you can email any queries to:

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