

### Introduction

The drive to increase the generation of renewable energy is leading to a marked increase in wind turbine construction. The amount of energy produced by wind power has doubled over the last three years and now constitutes 2% of global electricity usage. Although wind turbines are generally considered a safe and environmentally friendly method of generating electricity, there are some risks associated with their operation. Extreme cases might include collapse of the turbine tower, as well as turbine failure, which could lead to blades being thrown away from the unit.



Wind turbine in normal operation  
(picture reproduced with permission from  
[www.nawindpower.com](http://www.nawindpower.com))

### Assessing Risk

The Health and Safety Executive (HSE) has some responsibility for scrutinising risk management with regard to both worker and public safety. Since the Planning Act of 2008, they are statutory consultees for all developments greater than 50 MW. In order to responsibly assess risks with regard to wind power generation, the HSE has identified a need to produce a database of onshore wind turbine failures, as well as a methodology to enable risks to be accurately assessed.

One of the major difficulties in assessing risk in this area is the lack of a publicly available database of wind turbine failures. Databases compiled by research organisations, trade associations, public forums and pressure groups are in existence, but the reliability of the data is not always high. Information in databases is often proprietary or confidential, sometimes databases are only partially complete, and often data is based on estimates and unvalidated reports.

### MMI Expertise

As an authority on wind power, MMI has been appointed to identify, consider and assess any emerging issues that could influence risk management. MMI already offers a full range of design and analysis services to support both onshore and offshore wind power generation. These range from conceptual development, to analyses of technology and costs, power generation reliability assessments and CFD modelling of wind dispersion patterns. We have also worked with the American Wind Energy Association (AWEA) and the National Renewables Energy Laboratory (NREL) to develop structural reliability standards.



Turbine failure at Searsburg wind facility, Searsburg VT. Due to high wind conditions, a turbine blade hit the tower base causing the tower to buckle and the rotor assembly to crash to the ground (picture reproduced with permission from [www.windaction.org](http://www.windaction.org))

To develop the risk assessment methodology for the HSE project, MMI safety engineers are producing:

- A database of wind turbine failures. This will underpin the risk assessment methodology by defining the risk sources and failure frequencies
- A harm transmission model to determine how debris from a turbine failure can be carried from the turbine
- A human vulnerability model to determine the risk to persons resulting from turbine failure
- A probability distribution analysis to define a risk footprint around the wind turbine of Location Specific Individual Risk (LSIR) contours