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Windstorm Risk Assessment for Offshore Wind Farms in the North Sea

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Abstract : In 2017 there will be about 38 wind farms in the North Sea belonging to 5 different countries. The North Sea is ideal for offshore wind power generation and is thus attractive to offshore wind energy developers and investors. With concerns about the potential for offshore wind turbines to sustain substantial damage as a result of extreme weather conditions, particularly windstorms, this poses a unique challenge to insurers and reinsurers as to adequately quantify the risk and offer appropriate insurance cover for these assets. The need to manage this risk also concerns regulators, who provide the oversight needed to ensure that if a windstorm or a series of storms occur in this area over a one-year time frame, the insurers of these assets in the EU remain solvent even after meeting consequent damage costs. In this paper, using available European windstorm data for the past 33 years and actual wind farm locations together with information pertaining to each of the wind farms (number of turbines, total capacity and financial value), we present a Monte Carlo simulation approach to assess the number of turbines that would be buckled in each of the wind farms using maximum wind speeds reaching each of them. These wind speeds are drawn from historical windstorm data. From the number of turbines buckled, associated financial loss and output capacity can be deduced. The results presented in this paper are targeted towards offshore wind energy developers, insurance and reinsurance companies and regulators.

Keywords : catastrophe modeling, North Sea wind farms, offshore wind power, risk analysis
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