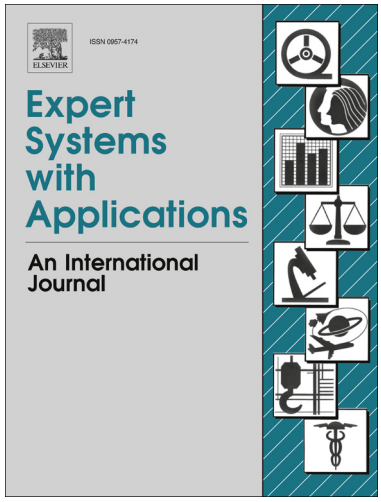

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A Fuzzy Analytic Network Process Model to Mitigate the Risks associated with Offshore Wind Farms

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ABSTRACT

In the offshore renewable energy industry, it is extremely important to reduce the likelihood as well as the magnitude of potential risk events during system's actual operation. Operational risks (either risk of system failures or environmental risks) may cause catastrophic damages to personnel or infrastructure and result in substantial costs in terms of lost production and emergency maintenance operations. Selection of a suitable strategy for mitigation of the risks associated with offshore renewable energy projects is a very complex and critical task. The aim of this paper is to propose a fuzzy analytic network process (FANP) approach, based on Chang's extent analysis, in order to select the "most appropriate risk mitigation strategy" for offshore wind farms. Our proposed model consists of four possible alternatives (variation of offshore site layout, improvement of maintenance services, upgrading the monitoring systems, and modification in design of wind turbines) among which the decision maker has to select the best strategy according to four comparison criteria: safety, added value, cost and feasibility. The model is then applied to determine a suitable risk mitigation strategy for an offshore wind farm consisting of 30 wind turbines of 2MW. Finally, the results are compared with those obtained using the crisp AHP and ANP models.

Key Words: Risk mitigation; Offshore wind farm; multiple-criteria decision analysis (MCDA); Fuzzy analytic network process (FANP); Operation and maintenance (O&M).

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