MA - Methodology Areas | Abstract (and subsequent Paper)

OC - (26246) - A FRAMEWORK FOR DESIGNING SECURITY ZONES IN OFFSHORE WIND FARMS

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Offshore Wind Farms (OWFs) are critical maritime infrastructures and play a key role in the transition to renewable energy by generating sustainable power. Unlike onshore facilities, OWFs lack physical barriers such as fences, making conventional security measures ineffective or impractical. Therefore, defining appropriate security zones is essential to mitigate security risks.

This paper proposes a probabilistic time-based framework to model attack and intervention times for determining both the temporal and spatial dimensions of OWF security zones. The framework integrates a vulnerability analysis to identify critical and exposed components of the infrastructure, which forms the basis for determining the recommended locations and size of security zones. Within this framework, a way-time diagram represents the potential attack–intervention process and considers the attack vector. Based on these phases, attack and intervention times are estimated using kinematic equations. To capture the inherent variability and uncertainties in attack speeds, Monte Carlo simulation is employed. This approach generates numerous random samples of kinematic parameters within realistic bounds, producing a distribution of possible intervention times rather than a single deterministic value. By analyzing these distributions, the framework probabilistically estimates required intervention times under different attack scenarios and uses these results to dimension corresponding security zones.

This methodology represents an initial step toward defining dynamic security zones for offshore environments. Future research will extend this model by integrating different types of physical barriers, their stopping capabilities, and how this influence required reaction and attack times.

Palavras-chave : Offshore Wind Farm, Attack and Intervention time, Monte Carlo, Security zones, Framework