Risk Assessment and command staff exercises as method to reduce vulnerability of offshore wind farms

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Summary
Offshore wind farms are part of critical infrastructure. Therefore, their operators are requested to minimize vulnerabilities. A common method to determine and analyse hazards is risk assessment. It allows taking preventive measures. Command staff exercises usually known to improve personal competence are also suitable for determining measures reducing the damage. In context with the research project OWiSS both methods were applied relating to offshore wind farms and their subsystem. The procedures and results of risk assessment and the ability of command staff exercises to determine reactive measures are described.

1. Introduction

Offshore wind farms are part of critical infrastructure [1]. Operators are requested to reduce risks that can lead to disruption. Comparing to onshore offshore wind farms are faced with several special threats. Higher wind speed and waves in combination with long distances as well as human attacks can lead to disruption and unplanned shutdowns [2]. Therefore, German Federal Ministry of Science and Education decided in 2015 to support a research project named OWiSS - “Offshore wind energy - safety and security” to investigate the vulnerability of offshore wind farms systematically [3]. The scientists decided to conduct risk assessment and command-staff exercises to deduce proactive and reactive measures.

2. Risk assessment

According to ISO 31000 risk assessment consists of risk identification, risk analysis and risk evaluation [4]. Figure 1 shows the model developed by project team.

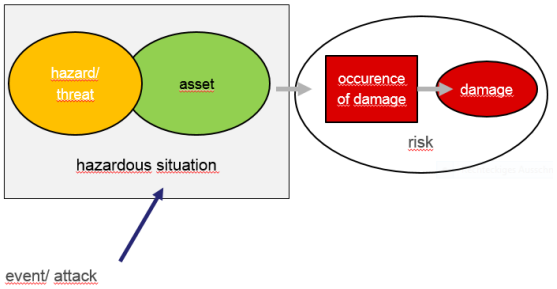

Figure 1: Model of damage

According to figure 1 the procedure is

1. Definition of assets
   Critical assets of offshore wind farms are transformation compounds and underground cable.
2. Identifying hazards and threats including possible events and attacks.
3. Developing possible scenarios (ETA);
   Event tree analysis (ETA) is a suitable tool to develop scenarios. In case of offshore wind farms about 220 scenarios are possible.
4. Estimate the likelihood and the extent of damage;
5. Evaluation of unacceptable scenarios.
   More than 100 scenarios are unacceptable.

As result of risk assessment, it is necessary to improve measures regarding protection and inspection.

2. Command staff exercises

Command staff exercises are usually used to improve personal competence of members. By creating special scenarios, they are able to determine measures that help to reduce damage after occurrence (reactive measures). Besides improvement of technical equipment, standardization of crisis management is necessary.

3. References

[1] COUNCIL DIRECTIVE 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection
[2] BMWi. 2015. Die Energiewende – ein gutes Stück Arbeit Offshore-Windenergie Ein Überblick über die Aktivitäten in Deutschland. [Broschüre] Berlin: s. n., 2015. P 4 – 5.
[3] BMBF 2018. https://www.sifo.de/de/bewilligte-projekte-aus-der-bekanntmachung-maritime-sicherheit-1760.html Abruf 25.04.2018
[4] ISO 31000: 2009 (E). Risk management - Principles and guidelines.