A JOINT APPROACH TO SAFETY, SECURITY AND RESILIENCE USING THE FUNCTIONAL RESONANCE ANALYSIS METHOD

***Corinna Köpke*[1]**
***Jan Schäfer-Frey*[2]**
***Evelin Engler*[3]**
***Carl Philipp Wrede*[1]**
***Jennifer Mielniczek*[4,1]**

[1)] *German Aerospace Centre, Institute for the Protection of Maritime Infrastructures, Germany*
[2)] *FICHTNER GmbH & Co. KG, Germany*
[3)] *German Aerospace Centre, Institute for Communications and Navigation, Germany*
[4)] *Jade University, Germany*

Abstract
The protection of Offshore Wind Farms (OWF), a critical part of maritime infrastructure, faces new challenges due to the continually increasing share of renewable power generation (planned to reach 65% until 2030 in Germany). This is especially due to the large size of individual OWF (centralized generation units) and new threats such as climate change and their potential as targets for terrorism. It is no longer sufficient to simply optimize the performance of energy generation; the infrastructure also needs to be kept resilient when facing these new threats. To improve resilience, safety and security measures have to be taken into account and therefore safety, security and resilience (SSR) need to be addressed collectively.

To this end, SSR goals are identified for a generic OWF by analyzing stakeholder needs and expectations. These goals include not only safe energy generation but also environmental protection, compliance with regulations, hazard defense and security. The SSR goals are classified and detailed in (i) who/what needs protection, (ii) hazards, and (iii) measures with available sensors. A common modeling tool in resilience research, the Functional Resonance Analysis Method (FRAM) is employed to visualize and model interrelations/interactions between SSR goals. The feasibility to model SSR goals as functions and the respective expected variabilities with FRAM are also studied. Further, the possibility to identify critical paths in the FRAM model which allows the introduction of cascade effects is assessed. Critical SSR goals are identified that need further measures to increase the level of fulfillment and to keep the infrastructure protected.

Keywords: Infrastructure protection, Offshore Wind, FRAM

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