Challenges in using Risk Assessments in Offshore Wind Asset Management

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ABSTRACT

The necessity of improving the risk-return-balance for lifecycle decision making in the offshore wind energy industry, which is required to enhance competitiveness of this form of power generation, has been investigated and results are presented in this paper. All activities were carried out in the course of work package 6 “Uncertainty and risk management” of the EU H2020 LIFES50+ project, focusing on development of next generation industry scale floating substructure-supported solutions.

An introduction to the main ideas behind the general asset management theory is provided and supplemented by practical examples from the offshore wind industry. The link of asset and risk management is made in order to establish the right context for embedding risk assessment in an asset management chain. Challenges involved with implementing risk assessment in asset management are highlighted by practical examples and results are summarized and discussed in a concluding section at the end of the presented work.

KEY WORDS: Asset Management; Decision Making; ISO 55000; ISO 31000; Risk Budget; Risk Assessment; Risk Management; Operations and Maintenance; Offshore Wind Energy.

INTRODUCTION

The offshore wind energy industry is growing rapidly in many European countries that have access to suitable sites. Large areas are under development in the Baltic Sea, the North Sea and the East Coast of the North Atlantic Ocean. Ambitious targets have been set by the European Union, demanding the industry to install, commission and connect 40 GW (Gigawatts) of offshore wind capacity by 2020 to national electricity grids.

Until now, investments have been mainly financed directly by the utility companies developing a wind farm. They perceive the potential profits to be gained by investing in large scale offshore wind energy projects to be an attractive alternative to conventional fossil-fuelled or nuclear power plants. They therefore actively finance a significant proportion of the investment from their own capital. However, a report recently published by the Boston Consulting Group (Rubel, 2013) points out that utilities will not be able to finance future investments of approximately €3 billion per GW in the same manner as it has been done up to now. Such investments tend to be high risk, considering all major unfavourable events that could potentially materialise during the various lifecycle phases from planning to decommissioning. Such events could, e.g., be an unexpected increase of manufacturing costs, exceedance of planned installation times due to adverse weather conditions, major component breakdowns during operation or large expenditures during decommissioning due to new environmental regulations. The different risk sources to be taken into consideration are elaborated in details in a publication by Proskovics (2016).

The risk for the company is in all cases defined as the probability of occurrence of an event combined with the severity of the consequences involved. Consequences can be of a different nature, but are typically relevant if they contain impacts on health and safety of involved personnel, if they jeopardize economic performance by lost production and / or high direct costs (e.g. for a repair or replacement activity), if they have a negative effect on the environment, or if they potentially harm the reputation of the involved institutions – the latter being endangered to a large extent by events influencing the before mentioned factors (Wilson, 2002).

In order to be able to control these risks and to make informed decisions throughout an assets’ lifecycle, multiple different kinds of risk assessments are usually used during the different project phases by different stakeholders involved. The presented research raises challenges involved in using risk assessments in the development phase of an offshore wind farm, using the example of deep water floating substructure concepts. Implications for the overall risk management process are described in the context of general asset management, whereas the focus lies on practical implementation of developed solutions.

ASSET MANAGEMENT AT A GLANCE

Asset-intensive organizations (referring to those organizations possessing a large amount of physical asset value), such as utilities developing offshore wind farms, are using professional asset