Chapter 15
Risks and Uncertainties in the Planning Phase of Offshore Wind Projects

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ABSTRACT
Megaprojects are large and complex projects that entail multi-actor management, non-standard technology and processes. This chapter aims to explore offshore wind projects (OWPs) as megaprojects, particular in the planning phase. Based on interviews with 26 experts from a variety of backgrounds in the offshore wind industry in The Netherlands, the risks and uncertainties in the planning phase of OWPs and key factors in the decision making process are explored. A framework is presented that depicts the planning phase of an OWP, as well as ten risks and seven uncertainties that are most common in an OWP. The role of the government and the project structure are further highlighted. The findings of this research allow practitioners to gain a better overview of the planning process of an OWP and can help to improve asset management decision making.

INTRODUCTION
In 2014 the total capacity of wind energy grew with 10.2% in the European Union (Euroobserver, 2014). This rapid growth is driven by the ambitious goals that are set by a large group of countries to increase the use of wind energy by 2020. EWEA (2011) predicts that 14% of the total European electricity demand can be covered with wind power in 2030. The largest part of that wind energy will come from offshore wind farms (EWEA, 2009). Although investment costs are considerably higher compared to...
onshore wind farms, offshore wind farms generate a greater amount of electricity due to higher wind speeds above sea (Bilgili, Yasarn & Simsek, 2010). The rapid development and deployment of this type of engineering construction is risky, which underlines a strong need for building experience, and a dedicated focus on innovation to optimize the delivery of this type of renewable energy through engineering constructions (Koch, 2012).

Offshore wind projects (OWPs) are frequently described as large and complex projects, and are often referred to as ‘megaprojects’. Flyvbjerg, Bruzelius and Rothengatter (2003) describe a megaproject as a project that consists of complex engineering constructions, complex time schedules, high building costs and complicated performance measurements. Megaprojects cover all phases of the asset lifecycle until operations and maintenance, and include the delivery of, for instance, bridges, power plants and public transportation projects (Priemus, Flyvbjerg & Wee, 2008). Due to its size and complexity megaprojects often lead to cost and schedule overruns and are sometimes not finished at all (Flyvbjerg et al., 2003). Although megaprojects become more common, it seems that in practice they are still treated as standalone projects so that the knowledge and lessons learned from one project to another does not take place regularly. Successful megaprojects are therefore copied frequently and implemented in other countries with only minor adaptations to local or project-specific situations (Priemus et al., 2008). For these kinds of reasons, PM Network (2014) stresses the importance of understanding and standardizing project management practices. However, anecdotal evidence suggests that there is a lack of knowledge transfer between megaproject stakeholders after project delivery. Consequently, knowledge is available in the industry but is not generally applied. In the literature, research on standardized project management practice or procedures that can be applied to OWPs or megaprojects is lacking. Therefore, exploratory research into these issues seems essential.

The success of asset delivery is generally measured against the well-known performance measures of project management: cost, time and quality (Cooke-Davies, 2002; Thi & Swierczek, 2010; Lopez del Puerto & Shane, 2014). The first offshore wind turbine was installed about 25 years ago. Since then offshore wind has been frequently described in research, focusing mostly on cost and quality aspects of installation, construction logistics, operations and maintenance (O&M) or commissioning. Investigations into the time aspect of these kinds of megaprojects are rare. Proper project planning is crucial for safeguarding all three performance dimensions (Zwikael & Globerson, 2006). Planning provides a project with the bigger picture of deadlines, allowing to distinguish between short-term and long-term goals over time for the sake of project control. An OWP involves a series of reciprocal actions, decision making and phases that include planning with the authorities, engineers, the public and other stakeholders. Each phase in an OWP can influence successful project deployment as the interaction and decision making between the different stakeholders create complexity, uncertainties and risks (Koch, 2012). Puddicombe (2006) highlights that planning is nothing more than an ongoing process of assessing, restoring and preventing uncertainties and risks in the project. Alessandri, Ford, Lander, Leggio and Taylor (2004) state that managers need to address the critical nature of risk and uncertainty in the decision making process of a project. Without identifying and assessing the risks and uncertainties, decisions made for the project are likely to be sub-optimal (Alessandri et al., 2004). Zwikaël and Sadeh (2007) add to Alessandri et al. (2004) and state that risks must be managed throughout the entire lifecycle of the project; starting with the planning phase, when risks must be identified and analyzed. According to Giezen (2012) a better overview of the risks and uncertainties will result in making a project and planning more manageable.

Surprisingly little research has been conducted on megaprojects in general or OWPs when it comes to planning, risks and uncertainties. It is expected that offshore wind energy will play a significant role