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# Risk Informed Decision Support – Experiences and Further Prospects

## Meeting the challenges of the future with the knowledge of the past

*Prof. Michael Havbro Faber*

Risk informed decision making builds on a probabilistic representation of what is known and what on this basis can be known. With such a representation of the best available knowledge, including associated uncertainties, the Bayesian decision analysis is then utilized as a normative rationale for how we may identify decisions that most optimally fulfill our preferences. Indeed, risk informed decision making has been utilized successfully since more than 70 years across application domains spanning from medicine over aeronautical engineering to finances.

In civil engineering, maybe especially in offshore engineering, risk informed decision support has been applied widely in practice since the 1980'ies. Most prominently in the context of modeling of extreme load events acting on offshore structures and in setting up a rationale for designing offshore structures with an adequate level of safety. In addition, probabilistic modeling and risk informed decision making has been utilized with a high level of success and impact on best practices, as a means to optimize strategies for integrity management of structures subject to fatigue crack growth and corrosion.

It was with this starting point that the Danish Offshore and Technology Center decided to launch two major research and development activities addressing i) risk informed integrity management of well systems subject to corrosion and scaling (CTR2), and ii) probabilistic modeling of the offshore load environment, the development of methods and tools for the probabilistic analysis of offshore structures under extreme loads and utilization of structural health monitoring as a means to enhance risk based inspection and maintenance planning. The overall objective of these research and development activities was to ensure a safe and cost efficient continued utilization of the existing oil and gas infrastructure in the Danish part of the North-Sea for a limited but sufficient period of time, allowing for the exploitation of the remaining oil and gas resources in already existing wells – and thereby facilitate a transition to renewable energies with a minimum environmental impact.

The present lecture starts out with an overview of the theories, methods and prototypes that have been developed within the research and development activities CTR2 and CTR3, but also highlight the potentials of these at a more generic level – as contributions to the general body of knowledge. Thereafter, a view will be provided on the global and national challenges relating to climate change, embedded emissions from the built environment and provision of reliable, resilient and sustainable energy provision systems. Finally, based on the knowledge and insights gained through the presented research and development activities a vision on how these may be utilized to help ensure that the massive investments of shared societal resources into forthcoming expansions of offshore renewable energies will provide the maximum value to both the present and future generations.

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