



**RAMBOLL**

## OPERATIONS & MAINTENANCE

**Efficient operations and maintenance (O&M) enables clean, cost-effective electricity from on- and offshore wind resources.**

Onshore and offshore wind energy is in a phase of rapid growth, contributing significantly to the current and future global electricity supply. Optimal planning, execution and control of O&M activities are essential to accommodate the demands of the market.

Ramboll's asset management group offers a wide range of services aimed at a techno-economic optimisation of our client's asset performance. Our service portfolio extends from high level strategic planning and asset management to hands-on inspection of on- and offshore wind assets.

We are your partner during all project phases; from planning a new facility to optimising assets in operation or end-of-life considerations. With the ability to draw on the experience of more than 13.000 consulting engineers, designers and management consultants, we approach projects from many different angles, thereby respecting the complexity of the

full picture; a unique setup which is highly valued by our clients.

Our main fields of wind expertise are:

- Strategy
- Risk & optimisation
- Integrity
- Digitalisation & documentation
- Engineering & marine operations
- Competence development

One of our main principles is to deliver workable solutions that are deeply rooted in the individual corporate culture of our clients. For that purpose, we often conduct our projects at client facilities, to involve all required expertise from top management to shop-floor personnel.

### **Our experience and competences**

We build a strong multidisciplinary team for your O&M project from a pool of some 230 dedicated specialists across our relevant divisions: Energy, Transport and Buildings. We combine our domain knowledge and extensive

technical experience in the on- and offshore wind industry with the methodological knowledge of our core O&M team, enabling efficient project execution of excellent technical quality.

In the energy sector singlehandedly, we have worked on more than 50 projects during the past eight years. In the Ramboll Maintenance Academy (RMA), we have trained more than 800 technicians and managers since it was founded in 2005.

In all our assignments, we truly act independently of any external interests.

For further information, please visit [www.ramboll.com](http://www.ramboll.com) or contact us directly:

### **CONTACT**

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### Strategy

Ramboll has extensive experience in designing maintenance strategies, systems and plans. Aligned with corporate objectives and the technical and organisational capabilities of our client, we offer a wide range of services. These include:

- O&M gap assessment, strategy and roadmap
- ISO 55000 certification preparation
- Life cycle costing (LCC) and due diligence
- Key performance indicators (KPI) design
- Operational readiness programmes (lifecyle operational plans, CAPEX/OPEX, business cases)
- Availability analysis and performance optimisation
- Continuous improvements

We help our clients by transforming the great amount of data collected in modern wind farms into usable information when we assess the applicability of maintenance systems – one of the main challenges in the field.

### Risk & optimisation

Maintenance optimisation is among the greatest demands of the wind energy industry today. Especially in the relatively young offshore wind sector, there are significant benefits to be gained through risk informed maintenance optimisation.

We focus on a selected number of methodologies with high relevance specifically for the wind industry:

- Risk management and risk assessment (ISO 31000)
- Failure mode effects and criticality analysis (FMECA)
- Reliability centred maintenance (RCM) strategies
- Availability analysis (reliability, maintainability, supportability)
- Fault tree analysis (FTA), event tree analysis (ETA), reliability block diagrams (RBD), hazard identification (HAZID), hazard and operability studies (HAZOP), design risk assessment (DRA)
- Overall equipment effectiveness (OEE) design and implementation.

### Competence development

Regardless of whether our client is an experienced operator or completely new to the business – Ramboll is the most capable partner to develop the right competence and skill-set of the staff that is necessary to deliver O&M activities at the required level of performance. We offer open courses, as well as tailor-made programmes specifically designed for our client’s individual needs.

Our current programme offers the following topics:

- Risk, reliability engineering and maintenance
- Introduction to maintenance
- Asset management
- Spare part management
- Reliability centred maintenance
- Strategic maintenance
- Life cycle costs & risk management
- Maintenance optimisation

Specifically, for the offshore wind sector, we provide on-site training in the field of coatings and cathodic protection. A team of senior experts supports our clients in developing new capabilities or strengthening existing skills.



#### PROJECT RISK MANAGEMENT FOR FLOATING OFFSHORE WIND PROJECT

**CLIENT**

Confidential

**LOCATION**

Europe

**PERIOD**

2017–2018

**SERVICE PROVIDED**

Risk assessment and risk management for all lifecycle stages of a floating offshore wind turbine demonstrator project in European waters.

#### RISK-BASED MAINTENANCE PLANNING OF OFFSHORE WIND HIGH VOLTAGE STATION

**CLIENT**

Global Tech I Offshore Wind GmbH

**LOCATION**

German North Sea

**PERIOD**

2016

**SERVICE PROVIDED**

Maintenance optimisation (FMECA/RCM) for all systems on offshore high voltage station.

#### PREPARATION OF OPERATIONS OF AN OFFSHORE WIND FARM

**CLIENT**

Vattenfall

**LOCATION**

German North Sea

**PERIOD**

2013–2014

**SERVICE PROVIDED**

Maintenance preparation: development of inspection plan, substructure O&M manual and working procedures.