



Game Changers in Offshore Wind



Renewable support scheme/Feed-in tariffs ...

are changing, leading to lower budgets and changing into concession tendering systems.

Large Energy Companies ...

buy market shares and have more significance. Simultaneously, oil and gas industry players with a stronger risk appetite are entering the renewable market.

OEMs ...

providing long term contracts with limited possibilities to adopt market changes.

Who has the right answer to all this changes?

Strong Partnerships ...

for development and construction

Clustering of Projects ...

is noticeable at the Baltic sea and the North Sea.

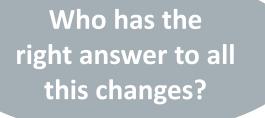
Offshore Wind Investors ...

are looking for alternative solutions to make their investments viable and ensure a lower but solid return on investment.





Game Changers in Offshore Wind





Development phase

Co-operations with strong partners have been established, especially for concession tendering.

Construction phases

Sucessful co-operations will be contracted for next offshore projects.

Operations phases

Multi contracting and mixed team is the current standard. Scattered O&M strategies (inhouse, mixed teams and multi contracting).

What are the opportunities in the Operations Phase?





Opportunities in the Operations Phase



Common Practice

Until Taking Over

EPC-Contractor

- Engineering
- Procurement
- Construction
- Installation
- Commissioning
- Coordination and Execution of Certification for 1st – 3rd BSH Release

Owner's Engineer

- Project Management
- Implementation of management systems
- Schedule monitoring
- Commercial monitoring
- Provision of relevant risks to Owner
- Advisory on claims towards Owner
- Provision of commercial information towards
 Owner
- Permit & Consenting
- Coordination and Communication with EPC-Contractor
- Review of and provision towards Owner of documents
- QA/QC
- Manufacturing supervision
- Offshore installation supervision
- Commissioning Monitoring
- HSE Monitoring
- Monitoring of EPC-Contractor's HSE system
- Onshore/Offshore HSE inspections and audits
- Provision of HSE reports

Owner / AM

- Permit & Consenting (single point of contact towards authorities)
- External Grid
 Connection
- Coordination of Certification for Operations Release
- Overall RiskManagement
- Legal & Contract
 Management
- Commercial
 Management
- Overall Project
 Steering
- Overall HSE Supervision
- Overall Document
 Management
- Communication with Authorities (i.e. BSH, TenneT, BNetzA)
- Reporting (Banks,

\$

PPA

Mandatory Direct
 Marketing of Energy
 at least during Feed In-Tariff Period

Operations man.*

- Provision of Central Control Station
- Commercial
 Operations
 Management
- Contract management
- Performance compliance
- Remote Site

 Management
- Technical DataManagement
- > IT-Infrastructure
- Technical Operations
 Management
- Management of Service Operations
- Management of Maintenance
 Operations and Technical Controlling
- HSE Management
- Operational
 Documentation and
 Reporting

SMA BoP

- Scheduled Service and Maintenance Services for:
- Foundations
- Offshore Substation
- Inner Array Grid
- Supply and Waste
 Disposal Services

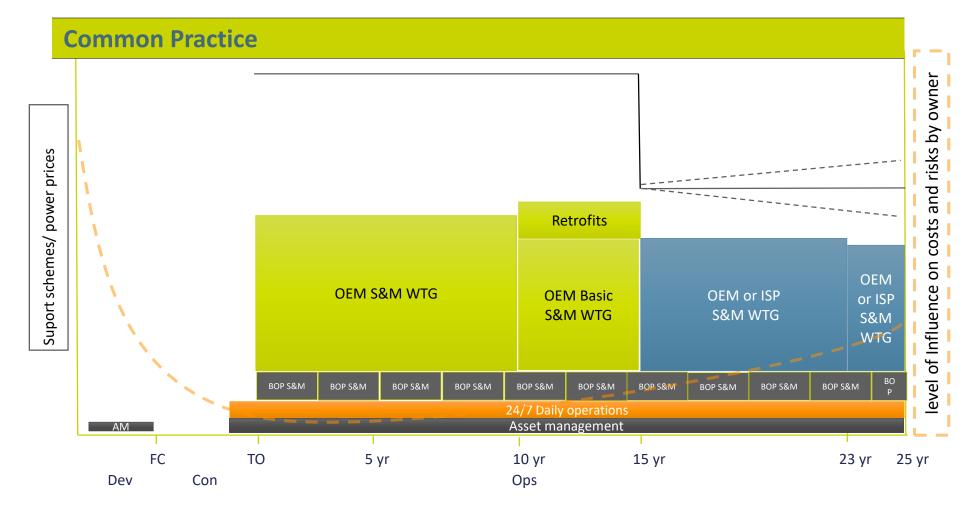
SMA WEC

- Full Service and Maintenance of Wind Energy Converters
- Provision and Storage of Spare and Wear
 Parts
- Supply and Waste Disposal





Opportunities in the Operations Phase



The main driver is to cover design, construction, and technology risks during the first 15 year period of operations. This risk mitigation comes with a price.

Are these OEMs aligned to achieve maximum power plant utilization or transparent about the alternative models?

Are these risk mitigations leading to minimized levelized cost of energy?



Opportunities in the Operations Phase

Common Practice

After the commissioning phase, the operations starts, warranties will be delivered by the wind turbine manufacturer and balance of plant contractors for a period of 1, 2 or 5 years.

It's common practice that these parties take care of the **service and maintenance activities** for the owner during the warranty period, for **the first 5, 10 or 15 operational years.**

The main driver is to cover design, construction, and technology risks during **the first period of operations.** This risk mitigation comes with a price.

Are these
risk mitigations
leading to minimized
levelized cost
of energy?

Are these maintenance contractors aligned to achieve maximum power plant utilization?







Asset Management Drivers

Determine the technical conduct/integrity by keeping a detailed life cycle record

Predict and prevent technology specific performance killers and cost drivers

Determine the optimum logistic setup

Fine tune OPEX projections and mitigation of major components risks

Operations and Maintenance Drivers

Increase first time right (FTR) and decrease time to repair (TTR)

more efficient logistical movements (combining activities and cluster synergies)

lower HSE risks due to less offshore work hours

maximum utilization of the power plant (*Increase IRR and lower LCOE*)

close loop to the power market by integrating the assets in power trading strategy (*decrease imbalance positions*)

Make, Buy or Join Discussion

Organize and/or provide guarantees for residual risks

Full transparent of asset integrity, compliancy and service activities in the teams





To harvest the optimization potential, the prerequisites of a balanced O&M model are:

Operational Readiness

after start operations or at least two year before defect notification period ends

Guarantees from Partner



Reliability

Reliability centred maintenance approach

Cluster Synergies

pooling of resources (logistics and teams)

multi-wind farm coordination

Pooling of Risks

dedicated engineering capacity

full transparancy

knowledge sharing





Achieving Minimized Levelized Cost of Energy (LCOE) in Offshore Environment

Technology

Failure rates

Predictability

Integrity

Flexibility

Logistic Processes

Vessel utilization

Weather windows

SOV - CTV - Helicopter



Operations Processes

24/7 monitoring

HSE and logistic coordination

Condition based analyses/inspections

Power nomitation

Imbalance price driven curtailment

Power Trading

Day ahead market position

Imbalance position

Intraday opportunities

OTC

Direct offtaker



Maintenance Processes

First time right

Availability planning

Improvement Engineering

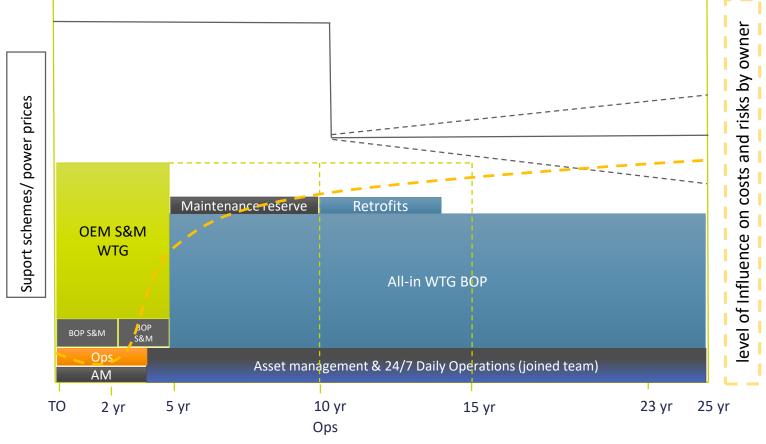
Supply chain

Combining of tasks



Example of alternative and balanced O&M model

(existing wind farms)



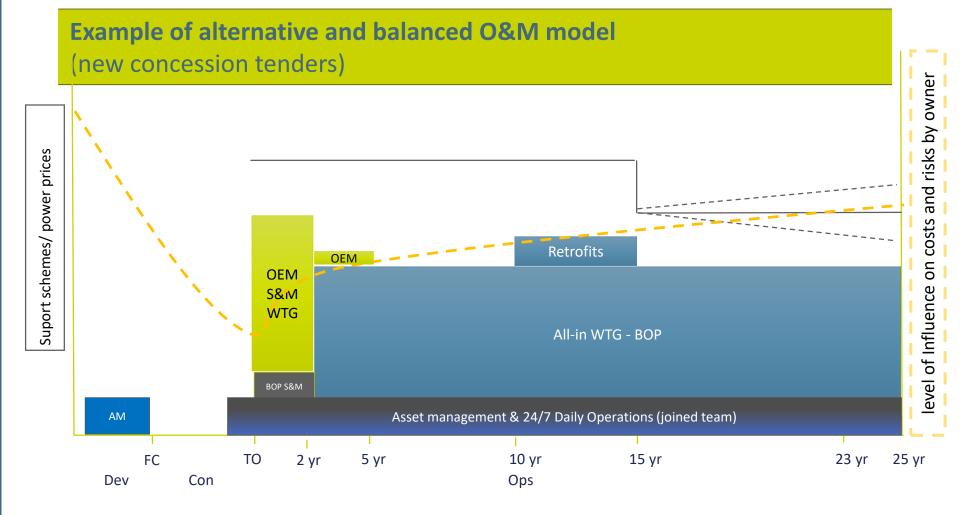
The main driver is to cover the dropping power prices:

Preparation for new phase to be ready

Use engineering capacity to reduce unexpected major events (reliability centered maintenance)

Significant cost savings due to integrated solutions and cluster synergies





The main driver is to cover design and construction risks during the first 2 years of operations, hereafter:

Synergies in coordination and planning of offshore operations and maintenance activities

Long term commitment to ensure continuous improvement and required engineering capacity

Significant cost savings due to integrated solutions and cluster synergies



Example of alternative and balanced O&M model

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O&M coverage

Operations man.*

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Minimized LCEO together with strong, dedicated and trusted partner



Commitment and aligned to wind farm business case:

Energy based guarantees

Euro / MWh pricing

Sharing cluster synergies

Sharing knowhow and engineering capacity

Willing to invest in operational excellence / local presence / new technologies

Transparent co-operation with owner's operations team:

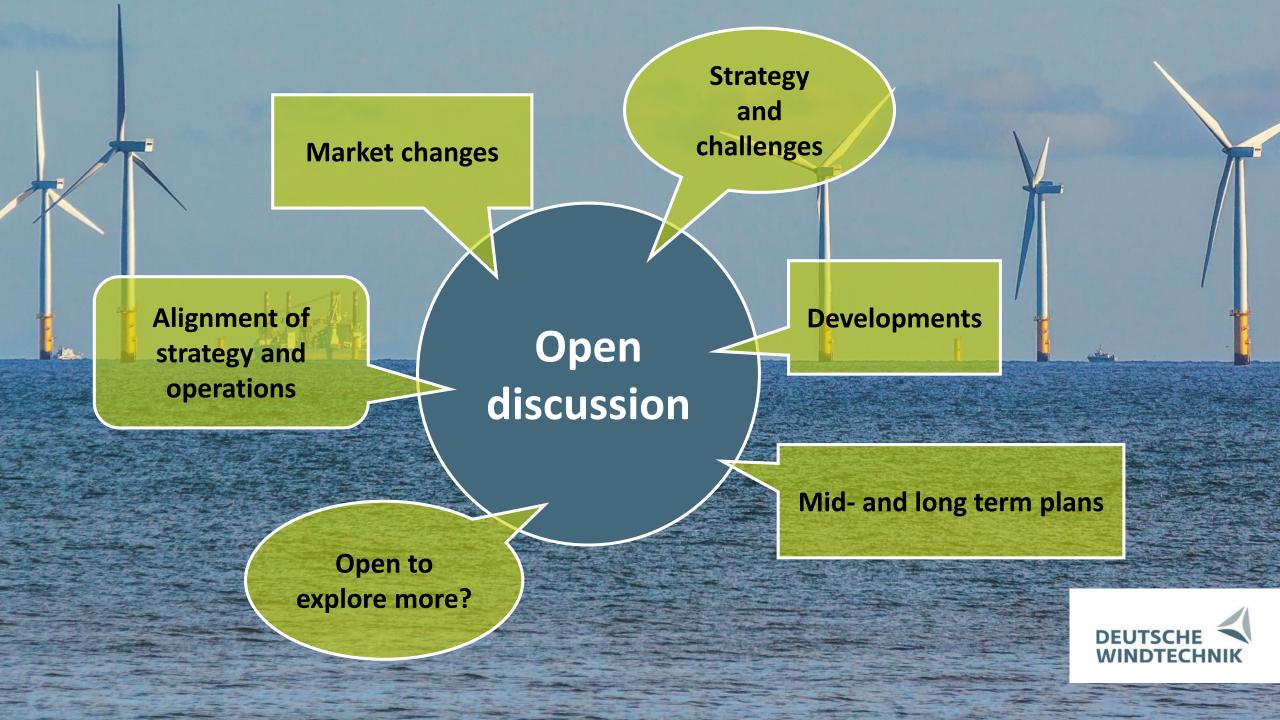
Web-based QHSE, monitoring, workflow- and asset integrity system

Single point / one stop shop for owner's operations team

Acting as partner, joined interest

Reporting of detailed KPIs to support open improvement discussions.

Alignment with experienced asset owners (second time buyers)



Co-Operations Model – Road map



Common understanding

Road map

LOI

Inventory

O & M Model

Roles and responsibilities

Partnership model

KPIs and Pricing

Guarantees

Together minimized LCOE achievement





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Offshore Cluster Approach

- Service
- Subsea Service
- Full Service
- Cluster Management



Offshore Services

1 Wind turbine

- Turbine service (Siemens, Vestas, Senvion)
- Repairs, improvement, inspection, maintenance
- Safety technology
- Troubleshooting
- Rotor blade service

2 Foundations incl. Transition Piece

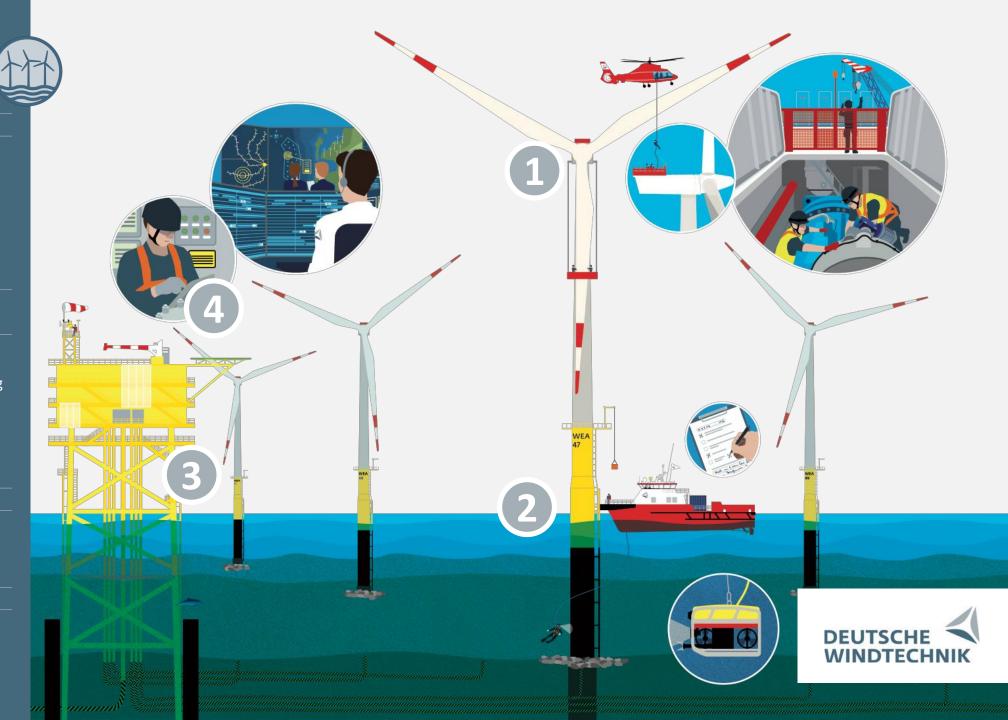
- Maintenance under/above water
- Corrosion protection
- Inspection, exchange and retrofitting of e.g. cranes, stairways
- Safety technology
- Subsea specific sea bottom inspections (scour) and cables

3 Offshore Substation OSS

 Inspection, maintenance, repairs, transmission of high- and medium voltage power

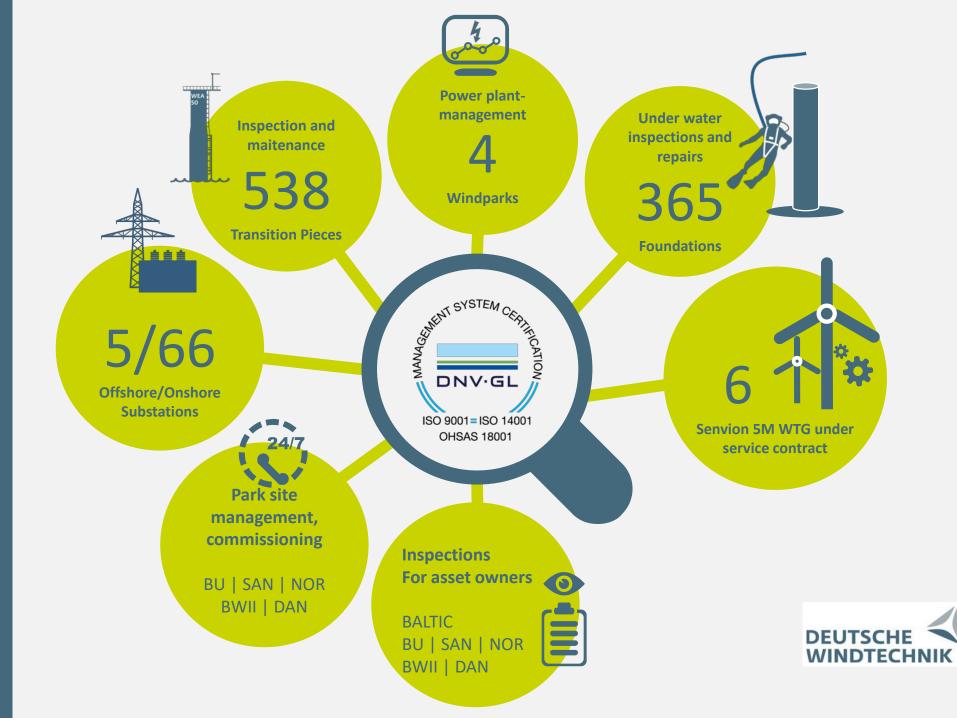
4 Wind farm Management

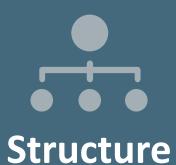
- Technical management
- Operational overview
- Marine coordination
- Site Management
- Power offtake coordination





Facts



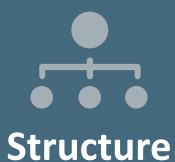




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Land	Einheit	Standort
Deutschland	AG	Bremen
	Offshore und Consulting	Bremen
	Repowering	Bremen
	Rotor und Turm	Bremen
	X-Service	Osnabrück
	Service	Ostenfeld
	Steuerung	Viöl
	Umspannwerke	Kiel
Dänemark	Aps	Havneby
Schweden	AB	Varberg
Polen	Sp. z o. o.	Posen
Großbritannien	LTD	Edinburgh
Niederlande	B.V.	Utrecht
	Outsmart	Velp
Frankreich	SARL	Châlons-en- Champagne
Spanien	S.L.	Zaragoza







Onshore Services

Full maintenance and basic maintenance

Remote data monitoring

Tower and foundation

Rotor blades

Substations



Offshore Services

Wind turbines

Foundation

Substations

Wind farm management



Additional Services

Research and development

Upgrades

Expertise and Consulting

Quality management and safety at work

Training Center

Control electronics

Safety engineering

Repowering

Spare part sales

