Offshore O&M in the age of zero subsidy projects

WindDays, Rotterdam

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14.06.2018
Founded 10 years ago, since 2016 part of Deutsche Windtechnik

45+ people
What we do

- Direct Offtake Agreements
- Power Plant Management
- Expertise Sharing

Facilitate
Operate
Optimize

Renewable energy assets
OutSmart - Expertise

288 WTG OFFSHORE
159 WTG ONSHORE

Wind turbines

Adwen: 40
Enercon: 90
GE: 4
Lagerwey: 8
Nordex: 11
Senvion: 18
Siemens: 230
Vestas: 46

+1.800 MW

MW8+ generation know-how
state-of-the-art IT systems
reliable market intelligence
future-proof O&M models
30+ off-the-shelf concepts
Zero subsidy offshore wind projects have arrived.

European offshore wind: levelized auction prices

Source: Bloomberg New Energy Finance. Notes: Figures refer to an estimated project LCOE, taking into account tariff, inflation, merchant tail, and a project lifetime. Horizontal axis refers to commissioning year.

Power Market Transformation: the Race for Flexibility
How is this possible?

- Major lever is achieving low capital costs in comparison to non-recourse financing. Winning consortia found a way to reduce the weighted average cost of capital (WACC) to 5% or lower.
- The amount of steel needed for the same energy produced under the same water depth conditions is heavily reduced when moving to larger turbines with larger rotor diameters using XL monopiles.
- Future turbines (2025) with capacity of between 13MW and 15MW.
- Extension operational period (consent & technology) from 20 to 25-30 years.
- Bigger wind parks result in economy of scale.
- Grid connection provided by TSO like in The Netherlands.
- Moving from 33kV to 66kV inter array cables results in lower electrical losses and fewer cables needed to be connected between the turbines and the offshore substation.
- Speculation that market price for electricity will increase in the future.
- No subsidy => merchant risk, trend direct offtake agreement to establish a floor price.

Operational Expenditures (OPEX) determines 20-30% of LCoE
Installing the latest & greatest wind turbine

• Larger WTGs are the most important factor in LCOE reduction
• OPEX component of LCOE is roughly 20%
• 2/3 of OPEX is roughly WTG service and maintenance costs
• WTG maintenance costs do not linear increase with WTG size
• Latest and greatest WTG means less proven technology
• Time based maintenance is still dominant, predictive maintenance can reduce costs with 20% (excluding production losses)
• Commercialisation next generations:
  • 10 MW turbines in the 2020s
  • 15 MW turbines in the 2030s

Availability of WTGs is increasing after 5 years => immature technology

Fig A2: Impact of age on WF availability

WTG maintenance – dominant factor in O&M costs

Across the SPARTA population the mean monthly repair rate trend is illustrated in Figure C1. As expected, many more repairs are carried out in the summer months. Taking the average over the period considered here, the average monthly repair rate is 1.32 repairs per turbine per month.

Monthly average of 1,32 repair per WTG is not good enough
=> Need for continuous improvement!

WTG maintenance - costs increase over the lifetime. This is for 80% determined during the design stage.

Developments over time:
- Warranty period
- Mid term refurbishment
- Cost reduction during last years
- No experience with operating offshore WTGs for 25 to 30 years

Improve logistics (25% of O&M costs) by pooling

Current setup: service and maintenance agreements (WTG, BOP) per project, logistics included.

Effect: suboptimal utilisation of CTV and SOV capacity

Solution: pooling of vessels and helicopters to improve asset utilisation

Requirement: intelligent dispatch on WP cluster level, logistics costs versus downtime costs

Addition remarks:
- Within the wind park between WTG and BOP service teams.
- Other wind parks: accommodation vessels (maintenance campaigns), subsea surveys and jack-up vessels for major component exchange.
- Pooling also applies for service technicians (troubleshooting, maintenance campaigns).
- Lean logistics by means of prognostics:
  - First time right approach, one visit with the right skills and materials
  - More efficient logistics by advanced planning.
Operational excellence requires intelligent IT solutions

Challenges:

• Dealing with many different protocols to connect WTG’s, substations, metering and offtakers.
• Increased complexity of Power Offtake Agreements: several milestones per WTG, curtailment procedures, checking of monthly invoices (per PTU for each WTG).
• Increased complexity of service and maintenance agreements, especially contractual availability definitions and exclusions.
• Bigger wind parks with more data per wind turbine.
• Standardisation with a fast growing portfolio.
• Cyber security.

From stand-alone solutions towards a fully integrated platform
OutSmart partnership with Kongsberg Digital

• OutSmart is working with Kongsberg Digital on a fully integrated Wind Farm Management System for offshore on onshore operations.

• The new system is developed in the new Kognifai platform which is an open eco system for third party applications (https://www.kognif.ai).

• Features:
  • Modular applications using a shared data layer in a cloud environment which fulfils the highest IT security requirements.
  • Covers all our existing functionality with an improved user interface.
  • Additional capabilities like condition monitoring and digital twins for prognostics.
Integrated Windfarm Management System (WFMS) for intelligent operations

- Top level SCADA alarm handling
downtime allocation
availability plan board

- Condition Monitoring Prognostics (RUL)

- Asset Mgt. System
  - asset register
  - life cycle record
  - contract mgt.

- HSE suite
  - Permit to Work
  - Incident management
  - Induction manager

- PPA tooling

- Realtime map

- Editor

- Reporting

- Field Service Management
  - WTG
  - BOP
Closing remarks

• Latest and greatest WTG required to win the tender, however it creates an O&M challenge for the lifetime of the project.

• Early O&M involvement
  • 80% of maintenance costs is determined by design
  • Transparency: do not accept black boxes, focus on win-win solutions

• Cluster synergies: pooling of resources and logistics.

• Operational Excellence requires intelligent IT solutions.

Continuous Improvement
Questions?