



Safety Indicators for the Marine Operations in the Installation and Operating Phase of an Offshore Wind Farm

EERA DeepWind'2016 - Helene Seyr & Michael Muskulus



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Agenda



- ❖ Introduction to Safety Indicators
- ❖ Methodology
- ❖ System “wind farm”
- ❖ Indicator analysis
- ❖ Incident data
- ❖ Conclusion and outlook

Introduction – Safety Indicators

- ❖ Measure of performance/system safety
- ❖ Enhance performance and productivity
- ❖ Ensure worker safety – Political discussions
- ❖ Complete, consistent, effective, traceable, minimal, improving, unbiased
- ❖ Drive improvement

Methodology

- ❖ System approach
- ❖ Review – Indicators
 - OWF analysis
 - Turbine analysis
 - Oil and Gas analysis
 - Risk of collision
- ❖ Review – Incidents
 - Incident data reports
 - Indicators

The system “wind farm”

❖ Phases

- Installation and Commissioning
- Operations and Maintenance

❖ System components

- Turbine
- Offshore Foundation (Monopile)
- External influences

The system “wind farm” – turbine subsystems

- ❖ Electrical systems
- ❖ Electronic control
- ❖ Hydraulics
- ❖ Yaw system
- ❖ Pitch control
- ❖ Mechanical break
- ❖ Support and housing
- ❖ Generator
- ❖ Gearbox
- ❖ Rotor and blades
- ❖ Main shaft
- ❖ Sensors

Indicator Review – Offshore wind industry specific

- ❖ System properties – Work tasks
- ❖ Work at heights
- ❖ Marine/helicopter operations
- ❖ Dangerous work environment
- ❖ External influences
- ❖ Collisions

Indicator Review – Turbine

- ❖ Electrical system
- ❖ Electronic control
- ❖ Rotor assembly
- ❖ Differences between publications for other subsystems
- ❖ More detailed investigation

Indicator Review – Oil and gas

- ❖ Organizational structure
- ❖ Industry specific indicators
- ❖ Shut down preparedness – Weather windows

Incidents and Indicators

- ❖ G9 incident data report 2013 and 2014
- ❖ Reporting increased: 616 - 994
Lost work days frequency decreased: by 34%
- ❖ Lifting operations: 9 LWD 2013, 3 in 2014
- ❖ Working at heights: 7%
- ❖ Falling objects: during lifting/work at heights
- ❖ Marine operations: over 20% of incidents

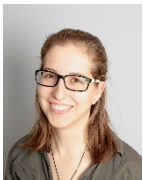
Incidents and Indicators

- ❖ Nacelle: 4 LWD, work activity
- ❖ Hub and blade assembly: 4%/2%
- ❖ Hazardous substances: 15/10 incidents - one category
- ❖ No incidents:
 - Organizational failures
 - Collisions
- ❖ No indicators:
 - Transition piece : 5% - 2 LWD
 - Substations: 3%

Conclusion

- ❖ Many useful indicators
- ❖ Merging of some indicators
- ❖ Grouping by area not favorable
- ❖ Focus on work process
- ❖ Future Research:
 - Validation by operators
 - Extend to additional structures (jackets, floating)
 - Continuous improvement

Thank you for your attention



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