Abstract

Wind turbines are designed for a specific lifetime of 20 years. Extension of the operating life can be highly interesting for operators, investors and manufacturers in order to maximize the profitability of their wind farm. What needs to be done to extend the operational life of a turbine or a wind farm?


Objectives

Extending the lifetime of a turbine is a complex engineering task, as wind turbines are subject to high dynamic stresses. The assessment for lifetime extension primarily focuses on all fatigue-related issues - all load transferring components of the turbine need to be evaluated in this regard. Today’s design practice needs to be taken into account for the assessment, as knowledge has significantly increased over the years.

Experience shows that the database for the evaluation of a turbine’s potential to extend its lifetime can be very different. Site-specific information, turbine-type related experience, accessibility of design documentation are important aspects affecting the quality and quantity of information and are influencing the approach.

Based on these constraints and taking into account the different perspective and needs of operators, manufacturers and energy suppliers, DNV GL has developed different methods to extend the lifetime of a wind farm.

Methods

4 methods have been developed as a basis for lifetime extension assessment.

All methods evaluate the suitability of the turbine for the life time extension, but they have different level of detail.

Within a ‘lifetime extension inspection’ the turbine is assessed, whether it is fit for an operation beyond the original design lifetime, it evaluates technical condition without quantification of the remaining service life.

Results

Combining analytical calculations with inspections taking into account the operational experience that has been gained over the years is the key to a safe operation beyond the original design lifetime.

While the ‘Simplified approach’ is directed mainly to operators of onshore wind farms, the ‘Detailed approach’ is a good solution for manufacturers.

The needs of operators of offshore wind farms are met by the ‘Probabilistic approach’, where more sophisticated solutions will be required.

Conclusions

Different methods to extend turbines’ lifetime are available since publication of DNV GL’s new Standard DNVGL-ST-0262.

It is important to mention that the assessment can be performed not only at the end of the design lifetime. Thinking about it early enables operators and investors to collect required information for the assessment. Knowing how long an asset can be operated is a very important information also with regard to financial planning.

References

3. PES Power and Energy Solutions, Issue 1, 2016; ‘To dismantle or to extend?’, Klaus Georg Hansen