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Editorial: Innovation in Wind Energy

Federico Fioretti

By the end of 2015, globally installed wind power capacity reached an impressive figure of about 433 GW; newly installed capacity deployed in 2015 alone was 63 GW, which is the highest annual figure ever in the history of wind technology (figures from Global Wind Energy Council). This fast growing pace is widely expected to be maintained in the coming years, while the electricity-generation scenario is rapidly evolving in a way that will continue to impact the business and reshape the energy industry, with renewable energies continuing to have the lion's share of investments and opportunities.[more...]

Fundamentals about the development of the electricity supply in Germany - Challenges to a municipal power company

Dietrich Graf

The roles of the different types of operators are described and particularly pointed out the duties of a municipal system operator to various examples. The implementation of the energy transition will require a fundamental change in behaviour of the customers. The possibilities of the network operator will be essentially limited to the stimulation of this change in behaviour through information and transparency. Attention is drawn to the unique, publicly accessible portal that the production and consumption situation in Hamburg is transparent in real time showing at district level.

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Maintenance strategies for power plants: Drafting adapted contracts - Assumption of risk and liability

Bettina Geisseler

There exist numerous types of Maintenance Agreements with different pricing models and providing for different contract durations reflecting the variety of maintenance works to be done or strategies chosen by the owners/operators of power plants. Since operators more often decide to

outsource their maintenance activities to third parties and at the same time to engage Independent Service Providers instead of OEMs, the drafting of adapted contracts is essential. It is crucial to define in a very precise way the Scope of Works and the risk allocation between the parties.

Preservation of power plants

Jörg Sperling and Frank Udo Leidich

Due to deregulation of the energy market and the increase in fuel price, many power plants in Europe are unable to operate economically in base load. They therefore only run with frequent stand-stills of variable lay-up time. Some plants are out of service for the entire summer period. To assure that the intended lifetime of the power plant is not negatively impacted during the lay-up time, to avoid corrosion reactions or any other kind of degradation of plant components during lay-up, avoid performance degradation and all that at reasonable costs for investment and maintenance, a tailor made, plant specific preservation concept needs to be elaborated. Principle preservation methods are discussed to be applied to various systems and components with special focus on a system and not component approach. Some examples are highlighted to demonstrate that system thinking is more complicated as even expected.

Successful erection and commissioning of a dry lignite firing system with plasma-induced ignition

Günter Heimann

The German “Energiewende” is characterised by a growth of wind farms and PV units. Caused by reduced operating times and decreased wholesale prices, conventional power plant operators can no longer operate their power stations profitably. “Being more flexible” is the new way to react to the altered market situation. Vattenfall Europe Generation AG started a programme in order to render their lignite-fired power plants more flexible and adapt to changing operation and market requirements. The plants affected have an installed power output of approximately 8 GW. One key issue of increased flexibility lies in an enlarged boiler operation range. Fuel oil-fired ignition burners have been replaced completely by a system operating with pre-dried lignite at a 815 t/h boiler in the power plant Jänschwalde. The boiler’s minimum load in mixed-fuel operation could be decreased and start-up costs of the plant were considerably cut.

Sound engineering of a coal power plant at the various stages starting with the feasibility study, the approval procedure up to detail planning and starting up

Reinhard Wunderlich and Michael Hofmann

The Moorburg power station is operating since 2015 and represents with an output of approximately 1.6 GWel one of the most modern coal-fired power plants worldwide. Premilary investigations in the course of clarifying a possible settlement at the site, started in 2005, already demonstrated that is particilar the noise control has to be paid high attention to. The different

sections of noise protection concept, of the approval procedure, the construction supervision and construction are described in terms of an example, based on relevant sound sources for the power plant. A special challenge has been the integration of the adapted cooling concept in 2009 with the construction of a hybrid cooling tower.

Combined heat and power units next to or within residential areas - Requirements on the acoustic planning and erection

Thorsten Neumann, Mirco Ebersold and Carl-Christian Hantschk

One of the main requirements of the “turnaround in energy policy” in Germany is the efficient use of energy sources. Therefore, the operation of decentralised combined heat and power units has increased due to their flexible operation and possible high efficiency when using combined heat and power generation. If the plants are to be erected in short distance to or within residential areas, the requirements on the acoustic planning increase significantly. Apart from general noise control requirements, an investigation of low frequency noise is particularly important for this type of plant. Experience with successfully realised projects prove that also under complex acoustic conditions an operation of plants even with a high installed power next to or within residential areas is possible.

Operation of wind farms under icy conditions - Challenges from the operator’s point of view

Thomas Burchhart and Rudolf Zauner

Operation of wind farms under icy conditions still presents a major challenge for operators. Measures put in practice by VERBUND are presented to ensure safe and efficient operation in this difficult environment. Starting from a site classification, two operation strategies are described in detail and various optimisation options - depending on the site - are shown. The paper concludes by outlining the optimisation potential that could be achieved by implementing an accurate icing forecast and the related R&D activities conducted by VERBUND in this field.

Innovations on ice detection

Wolfram Sommer

For various industries and different applications it is important to be able to detect and measure icing. Ice can jeopardise the safety, a smooth operation or the part itself once it covers buildings, machinery or other constructions exposed to weather and nature. Thus, in many situations it has to be removed manually or melted away by heating systems. Sommer Messtechnik developed the new ice detection sensor IDS as described in detail within this article. The innovative new sensor automatically detects icing on a real-time and reliable basis. Its measuring principle is to measure the complex impedances of the medium around the sensor. Possible fields of application as elaborated here are wind power stations, aviation and road traffic control, high-voltage power lines or other civil constructions like bridges, antennas, mast or buildings.

Evaluation of ice detection systems for wind turbines

Ulla Heikkilä, Saskia Bourgeois and René Cattin

Atmospheric icing has a significant impact on the operation of wind parks. An independent overview of ice detection systems commercially available is given. Technical details are described in the report the report “Evaluation of ice detection systems for wind turbines: Final report, VGB Research Project No. 392, 2016”. There are two different types of ice detection systems: nacelle-based and rotor blade-based systems. Nacelle-based systems measure instrumental icing and therefore do not represent the icing conditions on the rotor blade. Ten nacelle-based systems and five blade-based systems and methods respectively have been evaluated.

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Retrofitting of electric pitch systems - Retrofitting reduces downtimes and costs while increasing WTG availability and operating life

Helmut Reinke

A great many turbines still feature operating life cycles of more than a decade on the grid, making an important contribution to the energy supply based on renewable energies. The high availability of these turbines can only be ensured through targeted modernisation and retrofitting of the turbine technology. In this context, this contribution concentrates on the possibilities and potential of retrofits in the area of electric pitch systems within wind turbines (WTGs).

State of noise reduction technology for wind turbines

Oliver Bunk

In the planning and operation of wind turbines and wind farms the focus is on sound propagation. The wind turbines are becoming larger in size, resulting in higher sound power levels. This means that manufacturers have to take several measures in order to place the wind turbine also to sound critical locations. Here, the rotor of the wind turbine is mainly responsible for the sound generation. There have been implemented a number of measures in the past that have led to a reduction in the overall level. But even within the wind turbine possibilities of noise reduction exist.

New tools for asset management of offshore wind support structures

Wim Courage, Sander Dragt, Richard Pijpers, Johan Maljaars, Carey Walters and Gerard van der Weijde

Fatigue is a design driver for offshore wind turbine (OWT) support structures and towers. Design rules are and ought to be conservative. In particular, the prediction of the service life of a structure with respect to fatigue contains conservatism in several areas. This paper outlines three tools (models) to exploit these conser–vatisms to reduce cost of energy in offshore wind. The first tool is an improved prediction model for fatigue crack growth. The second tool addresses potential conservatism in the maximum allowable crack length. The third tool steps away from the fixed inspection intervals determined in the design phase of an OWT structure. The real structural response may be quite different than predicted. This difference between the expected and the observed response contains valuable information that can be used to update the fatigue crack growth model. With a probability-based technique, not only the end of life can be shifted, but the inspection intervals can also be optimised. When combined, the three tools amplify each other.