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Pre-study on the status of fire safety in offshore wind turbines

The interest in renewable energy sources have rendered political initiatives to support the development of, among other things, wind turbines. This has led to a rapid expansion of the wind energy market, including the development of both land based and offshore wind and wind farms, i.e., areas with multiple wind turbines. One consequence of the rapid increase of wind turbines is that reported wind turbine accidents have increased. After blade failure, fire has been shown to be the second most common cause, and past fires have demonstrated the catastrophic potential of such an incident, both to property and life (Solomon, 2013). It has, for example, been shown that in over 90% of the fires in land based wind turbines, in which a fire have originated in the nacelle, a total loss or severe structural damage to the wind turbine was caused. Furthermore, a cue of an unexplained fire in one turbine, which is part of a wind farm, typically causes an operator to switch off the rest of the farm while the cause is investigated. Thus, a fire in a wind turbine may cause large monetary losses, particularly due to the loss of energy production, but also due to replacement and retrofitting to address any issues which may have caused the fire. In addition, fires in wind turbines may also be devastating to life safety. As an example, in 2013 a fire in a wind turbine in the Netherlands claimed the lives of two people performing maintenance work. Typical causes of the fires have been related to electrical equipment malfunction, hot surface ignition, disc brake malfunction, maintenance and repair activities involving hot work, and lighting strikes (Solomon, 2013).

Due to the layout of a wind turbine, fire and life safety concepts differ much from traditional buildings on the ground. This is particular true for offshore constructions, and innovative solutions are required to provide cost effective fire safety solutions that can reduce the risk of damage to property as well as life safety. Yet, there is today an obvious lack of knowledge within the field. How big is, for example, the fire related risk to people and to property? Are current fire safety and fire protection installations and concepts in line with that risk? Are growing demands from insurance companies, i.e., requirements of active fire suppression systems, appropriate? If so, how should these systems be tested and verified in the lack of standardized procedures, guidelines and regulations? How can they be rationally compared, and what performance requirement should they meet?

These, and many other questions remain to be answered in order to facilitate the continued growth of offshore wind. However, before that, the status of fire safety in offshore wind turbines must be mapped. The goal of the proposed pre-study is, therefore, to produce a white paper on the status of fire safety in offshore wind turbines, including a clear and prioritized presentation of topics that future research will need to address. This will provide a basis that, in a longer perspective, can lead to cost effective fire safety solutions that are in line with the actual risk of fire in offshore wind turbines. The deliverables of the pre-study will be the white paper, which will be submitted to an open access peer-review journal, e.g., Fire Science Reviews, and a public seminar/workshop that will discuss the outcome of the project. To the seminar, stakeholders such as manufacturers, operators and maintenance companies will be

invited. Potential stakeholders that may benefit from the pre-study are members of the G9 Offshore Wind Health and Safety Association (comprising nine of the world's largest offshore wind developers), members of OffshoreVäst (comprising approximately 70 associated companies as well as universities and research institutes), as well as other owners and operators of offshore wind turbines and farms.

The project organization includes leading researchers in fire safety engineering, more specifically Karl Fridolf (project lead), David Lange, David Winberg and Michael Rahm. In total, the budget for the pre-study is estimated to 250 KSEK, off which 150 KSEK is applied from OffshoreVäst and 100 KSEK will be cofounded by strategic platform SP Sjöfart och Offshore. The total time to complete the pre-study is estimated to three months, with project start in the beginning of September and submission of the paper in the end of November.

Yours sincerely,

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References

Solomon, U. (2013). *Passive Fire Protection in Wind Turbines for Sustainable Energy*. (Master's thesis), University of Edinburgh, Edinburgh.