Thunderstorm warning systems (TWS) are widely used to prevent lightning related accidents.

A reliable and efficient lightning warning is crucial because of the risk of human and assets losses.

This study aims at measuring the efficiency of a TWS based on the lightning locating system (LLS) operated by "Euclid", by taking into account the specific practices of wind energy operators in case of approaching thunderstorms.

Objectives

This study aims providing some reliable information to wind farms operators, regarding the ability to prevent the lightning risk during their operations.

We have evaluated the capacity of a TWS based on LLS to provide 2 specific early warnings:

- More than 20’ in advance for the 1st level in order to evacuate.
- More than 5’ in advance for the 2nd level, as some thunderstorms can develop locally, in order to confine.

Methods

We have randomly selected 139 wind farms all over western Europe.

For each site, we have analyzed all the lightning related events detected on a 10 years’ period ranging from 2007 to 2016 and checked whether it would have been possible to warn the site before a cloud-to-ground (CG) lightning occurrence in the target area.

Moreover, we have calculated the time interval between warnings and CG occurrences in the target area to determine the mean lead time for operators.

We have calculated the metrics in compliance with the IEC 62793 standard.

Results

We have obtained some convincing results, showing that it is possible to detect a thunderstorm before a strike in the vicinity with an average efficiency higher than 96%.

Moreover, the early warning messages can allow a 20 minutes period prior a strike in the target in more than 92% of the analyzed cases.

Some variation between different countries have been noticed and future works could consist in taking into account more data for these cases or to analyze in details the thunderstorm behavior in these countries.

Conclusions

These results clearly point out the fact that it is possible to efficiently prevent the lightning risk on wind farms, but also to deliver a specific information depending on the thunderstorm configuration in order the crew to take the best decision to be protected.

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References

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