ID: Type: **Oral**

2.3-O5. Seismic vibrations from wind turbines and their effects on the IMS seismometer array EKA at Eskdalemuir, Scotland

The UK/Scottish Governments and wind energy industry commissioned research to determine the seismic vibration generated by modern wind turbines. Seismic measurements were made at three separate wind farms with different turbine types. Wind velocity data from the turbines were kindly made available by the farm operators. Turbines generate seismic energy not only at spectral peaks associated with multiples of the blade-pass frequency, but also at natural resonance modes of the structure. A scaling law is verified from measurements based on the kinetic wind energy at a given hub-height, and the area swept by the blade. A "worst-case" turbine spectrum is constructed that accounts for seismic vibration from both blade-pass and structural resonances. A "sensitivity curve" dependent on frequency and distance is developed for EKA considering the performance of an optimal detector for seismic signals from small underground explosions. Finally, a model is constructed that predicts the effective cumulative seismic vibration at EKA from wind turbines, given the distance, the hub-height, and blade diameter (all parameters required for planning approval). The cumulative seismic vibration from existing, consented, and future wind farm developments in the vicinity of EKA can be assessed by authorities against an agreed threshold to safeguard the IMS station.

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Track Classification: 2. Events and their characterization