



Vulnerability of electricity transmission infrastructure to natural hazards

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Electricity transmission system is a very complex system, which consists of several elements, such as overhead lines, substations and transformers, covers wide areas, is interconnected with several networks with numerous inter-dependencies. This highly integrated system is exposed to several hazards, leading to interruption of power supply. Natural hazards, such as an increased frequency of extreme weather events, including storms, icing, wet snow deposits, lightning, floods, avalanches, rock falls and landslides or changing air temperature have effects on transmission and lead to destruction of this infrastructure, which is also critical for society as it guarantees functioning of vital for society services.

The reliability of critical electricity transmission infrastructure depends on its ability to ensure normal operation, to limit number of incidents and to avoid major incidents and to limit consequences of major incidents. The concept of reliability is closely connected with the concept of resilience, which is understood, in general, as the ability of a system to react and recover from anticipated disturbances and events. In regards to electricity transmission resilience is the ability of the power system to adapt, self-organize and recover or achieve the level even higher than those before the shock.

This paper reviews three major natural hazards disasters, which resulted in significant blackouts in Europe. The first one is the 2003 blackout in Italy, which was caused by flash-over from trees. The second one is the 2003 blackout in Sweden, which was caused by rainstorms. The third one is the 2005 blackout in Germany, which was caused by wet snow. The inter-comparative analysis of these events allowed us to develop recommendations on electricity transmission network resilience.