



Space weather and power grids: findings and outlook

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The impact of space weather on the power grid is a tangible and recurring threat with potentially serious consequences on society. Of particular concern is the long-distance high-voltage power grid, which is vulnerable to the effects of geomagnetic storms that can damage or destroy equipment or lead to grid collapse.

In order to launch a dialogue on the topic and encourage authorities, regulators and operators in European countries and North America to learn from each other, the European Commission's Joint Research Centre, the Swedish Civil Contingencies Agency, and NOAA's Space Weather Prediction Centre, with the contribution of the UK Civil Contingencies Secretariat, jointly organised a workshop on the impact of extreme space weather on the power grid on 29-30 October 2013. Being structured into 6 sessions, the topics addressed were space-weather phenomena and the dynamics of their impact on the grid, experiences with prediction and now-casting in the USA and in Europe, risk assessment and preparedness, as well as policy implications arising from increased awareness of the space-weather hazard. The main workshop conclusions are:

- There is increasing awareness of the risk of space-weather impact among power-grid operators and regulators and some countries consider it a priority risk to be addressed.
- The predictability of space-weather phenomena is still limited and relies, in part, on data from ageing satellites. NOAA is working with NASA to launch the DSCOVR solar wind spacecraft, the replacement for the ACE satellite, in early 2015.
- In some countries, models and tools for GIC prediction and grid impact assessment have been developed in collaboration with national power grids but equipment vulnerability models are scarce.
- Some countries have successfully hardened their transmission grids to space-weather impact and sustained relatively little or no damage due to currents induced by past moderate space-weather events.
- While there is preparedness in industry against moderate space weather, the vulnerability of the power grid with respect to Carrington-type events is less conclusive and needs to be assessed.
- The assessment of space-weather impact on society needs to consider possible interdependencies between critical infrastructures. These interdependencies are not routinely assessed.
- Effective risk communication is required to bridge the gap between science and policy and to convey the significance of scientific results to decision makers.
- Emergency-response planning for a severe space-weather event needs to consider the full range of potential impacts on critical infrastructure.
- For a severe geomagnetic storm inter-institutional and probably international emergency planning efforts are required as response capabilities of individual countries might be overloaded.
- In the USA work is in progress to augment the existing regulatory requirements for power-grid operations by introducing new standards to better meet the challenges posed by space-weather risk.