Assessing the Impact of Geomagnetic Induced Currents in the Mexican Power Grid

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Abstract

The effects related to space weather have attracted increasing attention from several countries in Latin America. One of the best known effects, related to extreme solar activity, is the geomagnetically induced currents, (GIC). Rapid variations in the earth's magnetic field induces currents in all systems of earthed conductors. These currents cause various types of undesirable effects in the normal operation of the power grids. Depending on their intensity, can cause from transformer's overheating, reactive power losses to harmonics generation and relay large area blackouts (e.g., the Quebec Blackout in 1989).

We have started a project for the study and monitoring of the GIC on the Mexican 400 kV power grid. This project is being carried out in collaboration between UNAM and the Federal Electricity Commission (CFE), the main electricity operator in Mexico. Since 2019 we started to install an array of GIC sensors at some 400 kV substations, and the development of a numerical model of the whole power grid which permit estimate the grid's response under several conditions. This will provide more accuracy in the GIC estimates at each node of the power network. The aim of this project is to build a real-time study platform for the monitoring and forecasting of the GIC.

Currently, we have a year of continuous measurements and estimates. Our first results, points that GIC is significant in the Mexican HV grid even at the solar minimum, and suggest the necessity of a thorough monitoring and study in order to provide feedback for the design of mitigation strategies. In this occasion, we are presenting to the ALAGE community our first research advances made between 2019-2021.

Keywords: Space Weather, Electromagnetic Induction, Geomagnetically Induced Currents

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References:

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