Using the geomagnetic records of Ebre (EBR) geomagnetic observatory and taking the plane wave assumption for the external current source and a homogeneous Earth conductivity, a prediction of the effects of the geomagnetic activity on the Catalan (Northeastern Spain) power transmission system is being developed. Although the area is located at mid-latitudes, determination of the geoelectric field on the occasion of the largest geomagnetic storms during the last three solar cycles indicates amplitudes which are higher than those recorded in Southern Africa, where some transformer failures on large transmission systems have been reported. A DC network model of the grid is currently under construction and the geomagnetically induced current (GIC) flows in the power network will be calculated for such extreme events. In addition, GICs will be measured at some transformer neutral earths in the grid, so that there the accuracy of the model will be assessed when measuring new periods of high geomagnetic activity. This might represent the first attempt to study and measure GICs in Southern European power grids, a region considered to have low GIC-risk up to the present.