Geomagnetic data for the power transmission and offshore drilling industries

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A b s t r a c t: The scientific benefits of data from the world-wide magnetic observatory network to studies of the Earth's interior and near-space environment are appreciated by the geophysics community. However, many institutions operating magnetic observatories are required to demonstrate practical benefits of continuously monitoring the geomagnetic field. We describe applications of magnetic observatory data in and around the British Isles in the power transmission and oil industries.

The effects of geomagnetic storms on power grid systems have been extensively studied since the Hydro-Quebec blackout in March 1989. Scottish Power, aware of the approach of the peak of solar cycle 23, has commissioned a geomagnetic forecast and monitoring service from BGS. Each working day, a forecast of geomagnetic activity for the next three days, based on current solar observations combined with numerical predictions using linear and non-linear methods is issued. Also, each hour, the standard deviations of the horizontal components recorded at the three UK observatories are transmitted to the Scottish Power grid control room.

The electricity industry only requires variometer data. The oil industry needs near real-time estimates of the absolute geomagnetic field vector at drilling locations to provide a directional reference for well-bore surveys conducted using magnetic survey tools, enabling the drill bit to be navigated towards the reservoir target. BGS has pioneered a technique combining a main field model, absolute measurements of the local field, and observatory data to provide local geomagnetic field estimates with accuracy approaching ±0.1° in direction and ±50 nT in intensity. Comparison of results from surveys carried out using this technique with accurate, but expensive, gyro surveys of the same well paths, has demonstrated the success of this approach.

In both these applications data are required in near real-time, and the experience gained from participating in the Intermagnet programme has contributed to the success of the projects.

Key words: magnetic observatories, geomagnetically induced currents, directional drilling

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