

## Space Weather Service for Pipeline Operators

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Gas and oil pipelines are made from steel covered with layers of special isolating coating. Through defects in the coating, the pipeline steel comes in contact with the soil, water or moist air and becomes subject to corrosion. Corrosion is the oxidation reaction dependent on the electrochemical condition at the surface of the steel. A cathodic protection system keeps the pipeline potential with respect to the soil in a safe range from  $-0.85\text{V}$  to  $-1.35\text{V}$  to inhibit the oxidation reaction of pipeline steel.

Fluctuations of pipe-to-soil potential (PSP) on oil and gas pipelines due to geomagnetic activity have been observed by corrosion control personnel when conducting routine control surveys. The common practice was to discontinue the survey until the geomagnetic storm finished. Provision of on-line information on the current and expected geomagnetic conditions will benefit the planning and performance of cathodic protection surveys.

PSP fluctuations due to the telluric currents constantly affect the accuracy of pipe-to soil potential measurements. Temporary surveys shutdowns cannot satisfy the more important concerns of pipeline engineers on the quality and accuracy of cathodic protection. Modelled pipe-to-soil potential difference for the pipeline measuring sites at the time of cathodic protection surveys will help in interpretation of PSP data.

Conditions favorable for corrosion exist, when pipe-to-soil potential difference is more positive than  $-0.85\text{ V}$ , but excessively negative (less than  $-1.35\text{ V}$ ) pipe-to- soil potential causes coating damage. Cumulative time when PSP at certain sites of pipeline was out of the cathodically-protected range will contribute to the proper evaluation of pipeline performance and expected lifetime.