Background
BGS has supplied geomagnetic monitoring and forecasting data to Scottish Power plc from 1999. Data were used in the grid control to warn of GIC risk. We identified that more advanced warning, through solar wind shock monitor, and a whole-grid GIC calculator would add value to the service. ESA supported the development and all data were packaged as a web service (see right).

User Requirements
Opinions on the ideas behind SWIMIC were sought by means of a power industry questionnaire. We wanted to know the levels of accuracy that were necessary for a valid product, as well as update rates. The end-product meets most requirements, certainly in terms of the monitoring, forecast and GIC analysis tools. The solar wind monitor does not meet expectations (e.g. 90% shock detection requested) and therefore needs further development. Given the user responses it was decided early on to provide service accuracy statistics with the real-time data, for reference, to describe what is currently scientifically possible.

Improvements to SWIMIC?
Some specific changes and additions were suggested by the UK power company engineers: 1. A forensic analysis function, i.e., the analysis of recent storms, with data rapidly stored online for reference. 2. More educational material. 3. Prediction of geomagnetic field variations, on time scales of hours ahead, to predict GIC levels in the grid. Getting advanced and accurate warning is regarded as very important, much for atmospheric weather forecasting.

A Market for GIC Services?
The UK electricity market changed in April 2005. National Grid now has full grid authority for the UK. SWIMIC will be used wherever possible to demonstrate capability for the UK market. SWIMIC will also be modified and adjusted as necessary during this first year of service, taking into account SWENET developments. The future market, because of the perception of costs, is probably at a European level, possibly to a consortium of European power utilities, each of which will benefit from the joint system. That way costs will be spread.

Power grids are increasingly interconnected, across national boundaries, potentially spreading GIC risk from country to country. It is therefore believed that partnerships between national and international institutes will be necessary to develop European GIC services. ESA initiatives in developing space weather services have therefore been particularly useful in fostering collaboration across the continent and instigating an even wider international dialogue.

Acknowledgments
ScottishPower and ScottishPower’s management and support. We would like to thank the Knowledge Space Environment Center (NOAA/SEC) for access to ACE satellite data. Thanks are due to Esa/Estec for encouraging this service development activity through the Space Weather Pilot Project.