New pre-competitive data for energy exploration in Western Australia

by N Stolz[1]

Onshore Energy Security Program

In 2006 the Commonwealth Government announced the Onshore Energy Security Program (OESP), which will spend $59 million over five years on providing pre-competitive geoscience data for energy exploration. Geoscience Australia is using these funds to implement a scientific program designed to enhance the prospectivity for hydrocarbons, uranium, thorium, and geothermal energy on the Australian continent.

Geologists at Geoscience Australia reviewed existing datasets and scientific information for their impact on energy prospectivity in Australia at national, regional, and province scale. Based on this examination, new surveys to extend or improve existing data coverage, acquisition of new data-types such as airborne EM, and new scientific research were proposed to further enhance energy exploration potential. These data, predictive products, and scientific publications will highlight Australia as a data-rich destination for energy explorers and, by reducing risk, will increase the probability of a significant energy discovery in Australia.

New Radiometric Map of Australia

Geoscience Australia and State Government Geological Surveys have been collecting airborne radiometric data over Australia for the past 40 years. These data are normally acquired simultaneously with aeromagnetics, and the surveys have employed a wide variety of flying heights, sensor types, and calibration datum. These variations present major difficulties to geophysicists attempting to merge data into consistent regional-scale images.

Radiometric data are a major consideration when targeting for uranium and mapping hot granites for geothermal energy. The data are widely used for mapping bedrock geology, regolith, and soil formations, and for assessing radiation hazards. Providing regionally and nationally consistent airborne radiometric data will reduce risk in energy exploration, and improve geoscientific understanding of the continent.

As part of the OESP, Geoscience Australia commissioned the Australia Wide Airborne Geophysical Survey (AWAGS), which acquired 145 000 line-km of airborne radiometric and magnetic data on 75 km spaced north–south lines and 400 km spaced tie lines across the Australian continent and Tasmania. In terms of area, this is the largest single airborne geophysical survey ever flown, and the first time an entire continent has been covered by a single survey.

AWAGS provides a set of tie lines for levelling of all existing and future airborne radiometric surveys to the International Atomic Energy Association (IAEA) datum. State-of-the-art calibration procedures were implemented for the AWAGS, and new grid-merging algorithms were developed for combining hundreds of existing datasets into single nationwide grids of potassium, uranium, and thorium concentrations. A preliminary ternary image of the new Radiometric Map of Australia is presented in Figure 1.

Geoscience Australia scientists have applied expertise in surface regolith processes to extract key geological signatures from the new radiometric map. The science of interpreting airborne radiometric data has not been widely practised by industry because of the lull in uranium exploration for the past twenty years. With the re-emergence of uranium as an important energy commodity, radiometric interpretation skills need to be quickly transferred from R&D to explorers.

Paterson airborne EM project

As part of the OESP, Geoscience Australia is flying airborne electromagnetic (AEM) surveys over selected regions around

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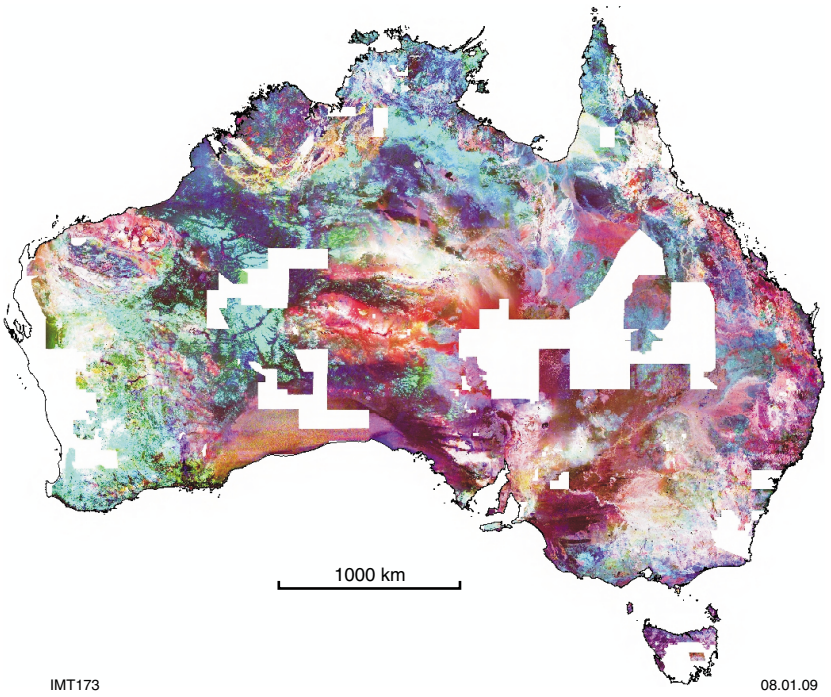

Figure 1. Ternary image of uranium (blue), thorium (green), and potassium (red) radioelement concentrations for Australia derived using the AWAGS results (after Minty et al., 2008)

Australia that are considered to be prospective for uranium. The Paterson AEM survey in northwest Western Australia is the first such dataset to be acquired. The survey data cover 29 200 line-km over 49 000 km^2 flown on east–west lines spaced 1 km, 2 km, and 6 km apart in a region that encompasses the Kintyre uranium deposit, the Nifty copper mine, and Telfer gold mine (Fig. 2). The Paterson AEM survey includes 5000 line-km of infill flight-lines funded by mining and exploration companies. The data funded by industry will remain confidential for a period of 12 months before being released to the public.

AEM surveys work by transmitting an electromagnetic signal from a wire loop attached to a plane or helicopter. The signal induces electric currents in the ground that are detected by receiver coils towed below and behind the aircraft. Depending on the system used and the subsurface conditions, AEM can detect variations in the electrical conductivity of the ground to a depth of around 300 m. Geological features that can be mapped using AEM include: the thickness of weathered cover material; the depth to a geological unconformity; clay- and graphite-rich sediments; paleochannel systems; and fresh or saline aquifers. Although pre-competitive gravity and magnetic data have been provided by governments to the mining industry for many years, the Paterson survey is the first time a regional-scale pre-competitive AEM survey has been flown by an Australian government to encourage mineral exploration.

The contractor-supplied data from the Paterson South AEM survey were released to the mining and exploration industry in January 2009 through the Geoscience Australia website and sales centre <http://www.ga.gov.au/>.

The Geoscience Australia scientists will process and interpret the AEM results to identify geological features that may impact on the uranium prospectivity of the Paterson Province.

Canning Basin seismic survey

A major component of the OESP includes deep-reflection seismic traverses across selected sedimentary basins and geological provinces around Australia that have potential for hydrocarbons, uranium, and geothermal energy. The southern onshore Canning Basin and Kidson Sub-basin have been identified as under-explored frontier areas with potential to host significant resources of oil and gas. A deep-reflection seismic traverse spanning this region is planned for 2010, and a possible route is shown in Figure 2. The exact location and length of the line will depend upon land access issues as well as funding. Mobilization of a full seismic crew to such a remote area is likely to be a major cost component of the survey. If funding permits, the line may be extended to the southwest across the Paterson Province and could provide valuable insights into the Paterson's large-scale structural and geodynamic setting.

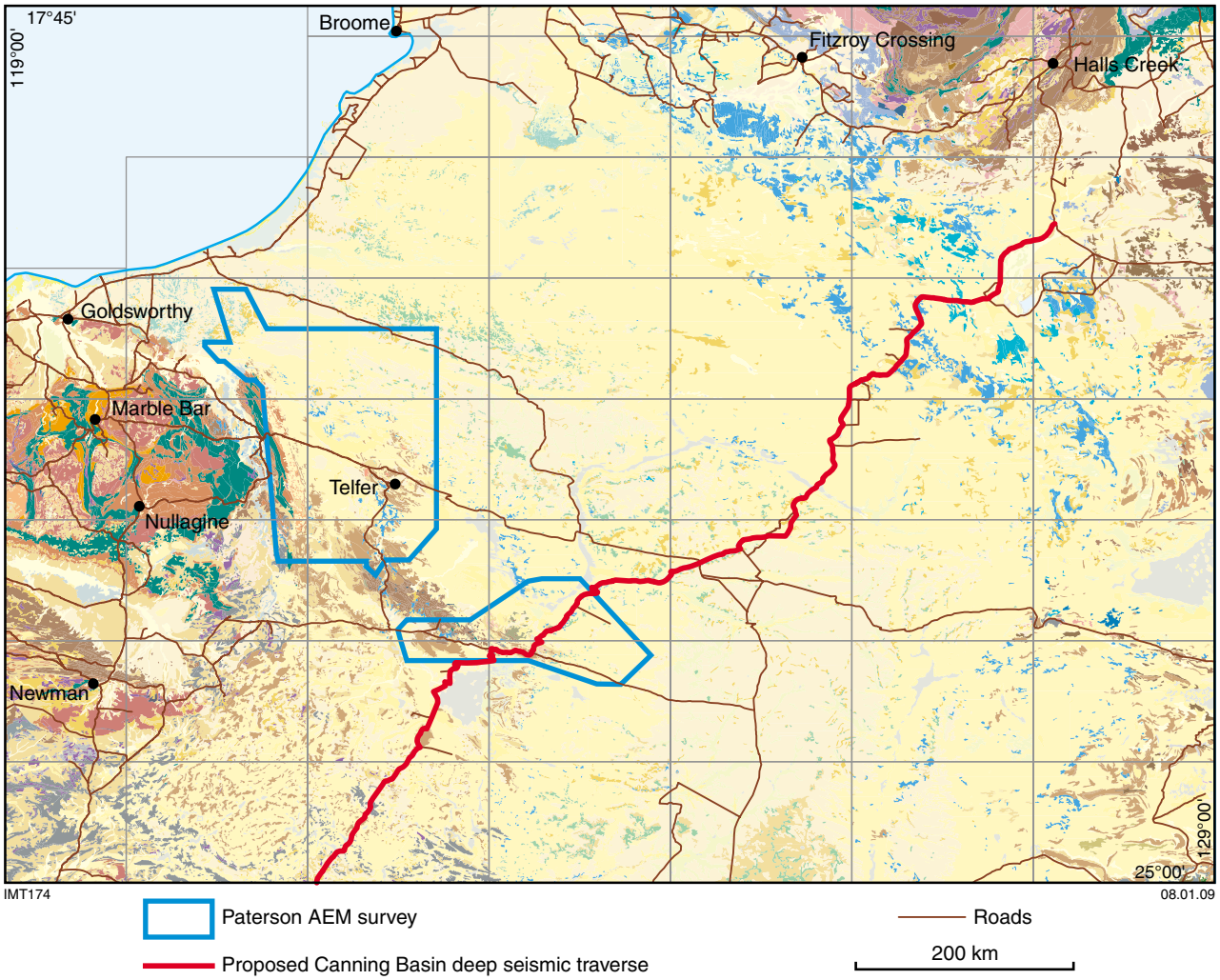

Figure 2. **Location of the Paterson AEM survey (blue) and a possible route for the proposed Canning Basin deep-reflection seismic traverse (red) displayed over outcropping geology, part of the recently released 1:1 000 000-scale Surface Geology Map of Australia (Geoscience Australia, 2008). The exact location and length of the seismic traverse are yet to be decided. Black gridlines denote the boundaries of 1:250 000-scale map sheets. Access tracks are marked in brown**

Conclusion

The Onshore Energy Security Program is the latest embodiment of Geoscience Australia's ongoing mission to provide the highest quality pre-competitive exploration data for the Australian continent. This body of science and information will be a strategic asset, one which ensures that over the longer term industry has the strongest opportunity to discover and develop the nation's mineral and energy resources for the benefit of all Australians.

References

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Minty, BRS, Franklin, R, Milligan, PR, Richardson LM, and Wilford, J, 2008, Radiometric Map of Australia, 1:5 000 000 scale (first edition): Geoscience Australia, Canberra.