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The Kintyre Advancement Programme

George Gauci

The Kintyre Uranium Project in Western Australia was placed on hold following a pre-feasibility study which was completed in 1991. A decision was taken then by Canning Resources Pty Ltd to cease expenditure on technical developments, but to continue with efforts to reduce or remove the social / political barriers to the project's development. These barriers included the location of the project within the boundary of a national park, land tenure, and the Labor Party's Three Mine Policy.

The state government of Western Australia excised the project from the national park in 1994, and the company's relations with the aboriginal communities have continued to improve. However, the major change that has significantly improved the prospects for the project was the election in March 1996 of a new Australian federal government formed by the conservative coalition of the Liberal and National Parties. This means that the Three Mine Policy is currently a non-issue and will remain so whilst the conservatives are in government.

The Kintyre Advancement Programme (KAP) was initiated in September 1995, to advance the project to a full feasibility study for completion in late 1997.

The Kintyre project has been described at a previous Uranium Institute Symposium,[1] so only a brief reference will be made here to its origins, history and geology. This paper will discuss the progress and findings to date of the KAP, which addresses technical issues, the environment, native title and market strategy.

The Kintyre Project

The Kintyre deposits, located about 500 km from Port Hedland in Western Australia (see Figure 1), were discovered in 1985. Over the next four years a comprehensive drilling and metallurgical test programme was completed. Sufficient resources were identified to plan a project to produce 1000 t U_3O_8 over a period of ten years, which appeared viable under the then prevailing prices.

However, because of the social and political barriers, the evaluation programme was terminated in 1989 with the mineralisation open at both ends and at depth. Project management began to focus on the reduction or removal of non-technical barriers to the project. Since then, progress has been made on the elimination or reduction of the social and political barriers, as described below.

The Three Mine Policy

The Australian Labor Party's restrictive policy on uranium exports while in government limited the number of uranium mines in Australia to a specified three. Extensive lobbying by the mining industry was unsuccessful in securing a change to this policy, although some senior ministers in the party viewed the policy as an embarrassment. It was always a close vote, but the left wing of the party was able to use its numbers and bargaining power to maintain the status quo.

The March 1996 federal election saw the defeat of the Labor Party, with the conservative Liberal / National coalition elected to government. The new government immediately announced that it would not discriminate against uranium mining and that each project would be assessed on its merits and be required to meet strict environmental standards.

The National Park

The Kintyre deposits lay about 400 metres inside the original northern boundary of the Rudall River National Park. The park was created in 1975 to

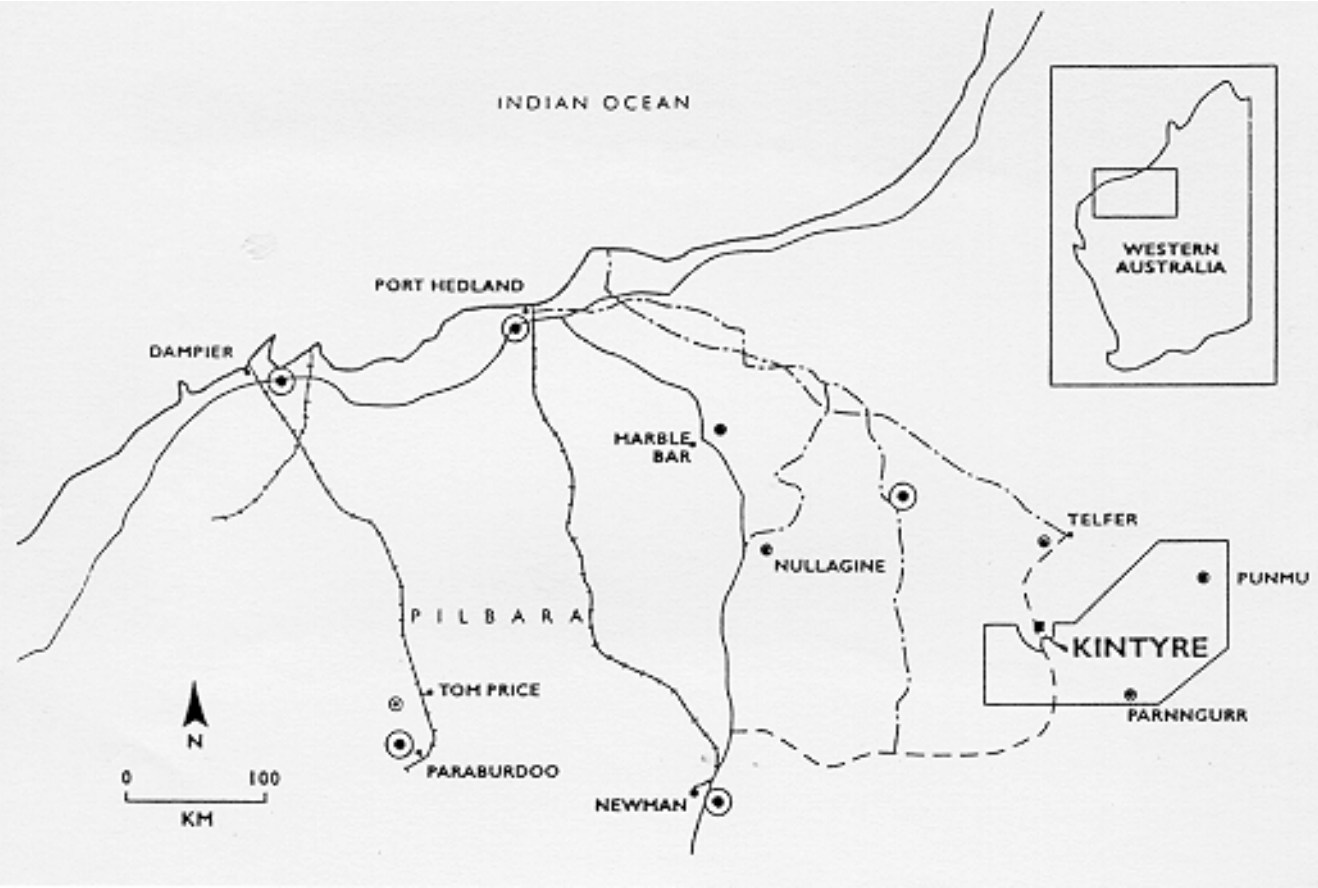

Figure 1. Location of the Kintyre deposit in Western Australia.

protect an arid region river system and covers an area of some 15 000 km^2. In discussions with the state government it was agreed that the project area did not play a part in the ecosystem that the park was designed to protect. Approximately 150 km^2, covering the project area, was excised from the park in 1993 and an area of similar size added to the western end.

Native Title

Canning Resources triggered the native title process in July 1996 by seeking a conversion of the exploration leases to mining tenements. Three different aboriginal groups applied for native title over the project area. Canning Resources is currently negotiating with these groups to secure an accommodation with their interests. Negotiations to date have been encouraging.

The Kintyre Advancement Programme (KAP)

In anticipation of a change in government, preparatory work commenced in September 1995 to revisit the project. In May 1996 approval was granted to progress the project to a full feasibility status, sufficient to seek approval from the company's board of directors to proceed to the production stage. This work is now underway, and includes:

- Reviewing the technical parameters and completing a full engineering study and financial analysis.
- Obtaining environmental approval from both state and federal governments.
- Achieving an accommodation with aboriginal traditional owners and neighbouring communities.
- Seeking indications from potential customers for the purchase of the product.

Technical Issues

The Resource

The primary mineralisation at Kintyre does not outcrop. The mineral occurs in discrete veins, with minimal dissemination through the host rock (see Figure 2). Both of these factors make accurate definition of the resource, based on drilling data, difficult. In order to obtain more detailed information on the mineralisation, closer spaced drilling and an underground excavation was undertaken. The latter included a small shaft, a

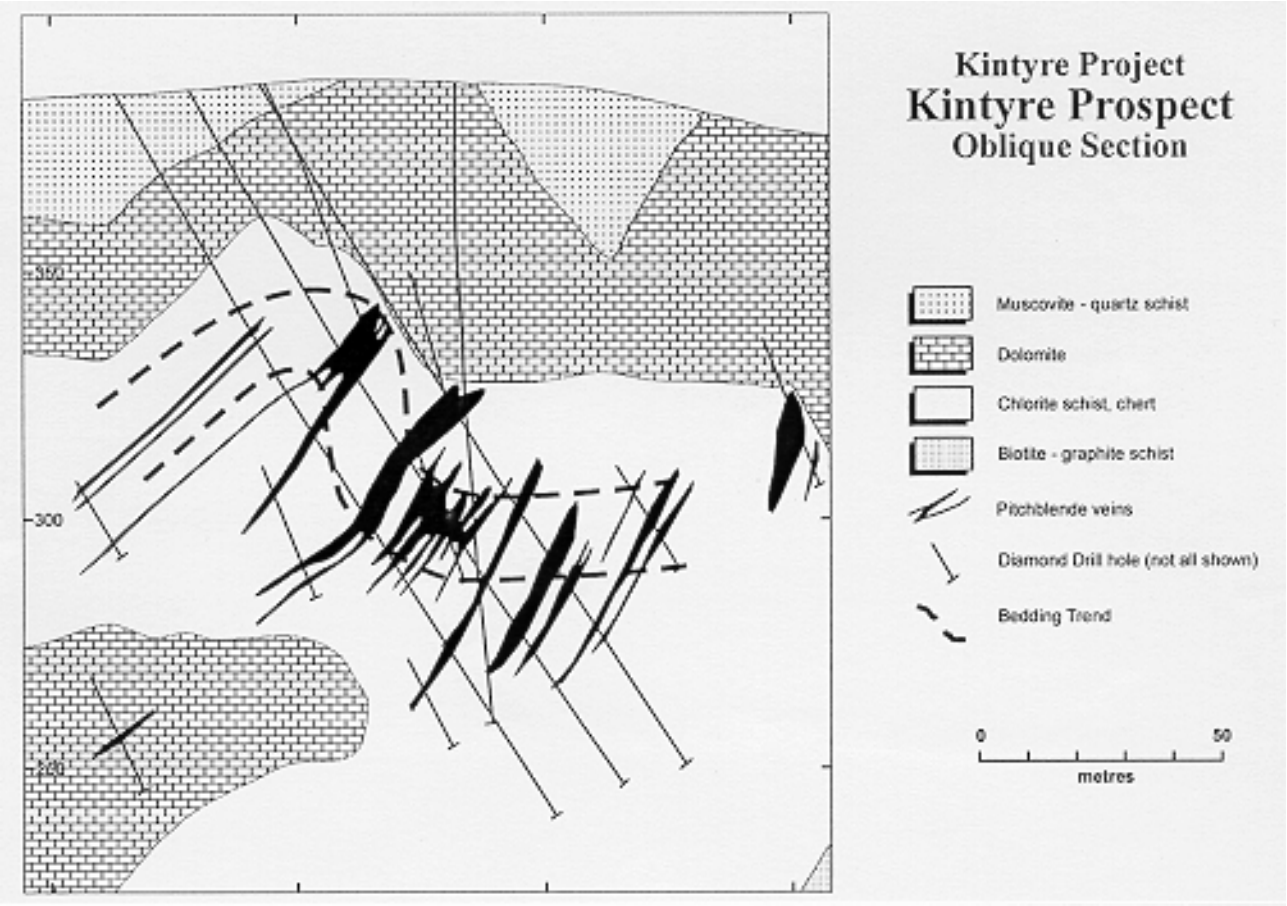

Figure 2. Cross-section of the Kintyre deposit.

drive and a crosscut to intersect the ore body. The objectives of this exercise were to:

- examine the mineralisation and assess its nature and continuity;
- establish the control on vein locations and density;
- investigate grade control procedures and amenability to selective mining;
- compare grade estimates from drill holes and bulk grades;
- provide data on close spaced grade variability to develop variograms for grade predictions;
- compare radiometric measurements with chemical assays;
- provide a bulk sample for metallurgical purposes.

A comprehensive programme of sampling the mined sections, channel sampling and sub-horizontal drilling was completed in the excavation. The walls were logged and photographed.

The data gained have resulted in a geological model which varies from the original and has assisted in gaining a more accurate picture of the mineralisation. This model has been tested with the previous drill data to better define the complex geology and has highlighted the extra data that are necessary to more accurately plan an efficient mining strategy.

Geochemical and geophysical data are being studied to define the parameters that could lead to better selection targets in existing resources and other potential sites, to improve the quality and quantity of the resource in the immediate vicinity of Kintyre. The study has indicated that part of the ore body may be more economically recovered by underground mining methods.

Mining Process

Whilst the vein type mineralisation at Kintyre is difficult to quantify with traditional exploration methods, the property provides opportunities to simplify the processing stage. The difference between a vein type deposit and a more common disseminated type is demonstrated in Figure 3. When a disseminated ore is broken down into smaller pieces, the pieces vary only marginally in uranium content from each other and from the original ore. However, in the case of a vein type deposit many barren pieces are produced and the uranium is concentrated into a smaller volume of ore. By using the properties of the uranium mineral which differ from the host rock, these uranium-

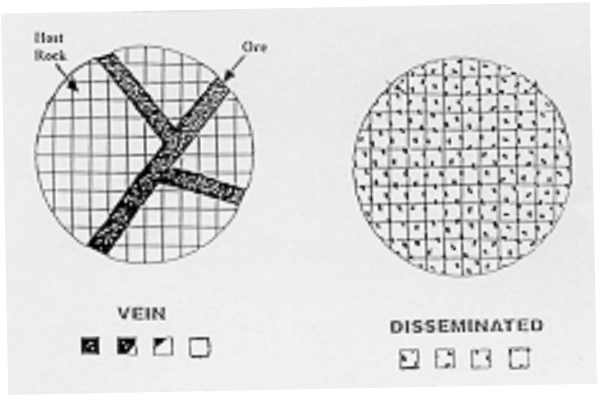

Figure 3. Differences between vein and disseminated types of ore mineralisation.

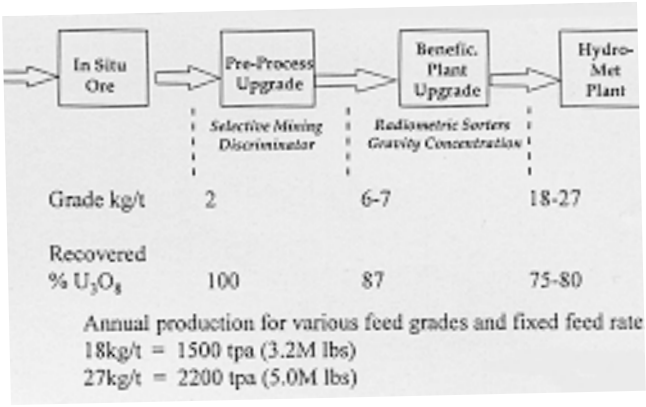

Figure 4. Upgrading of ore feed to the hydro-metallurgical plant.

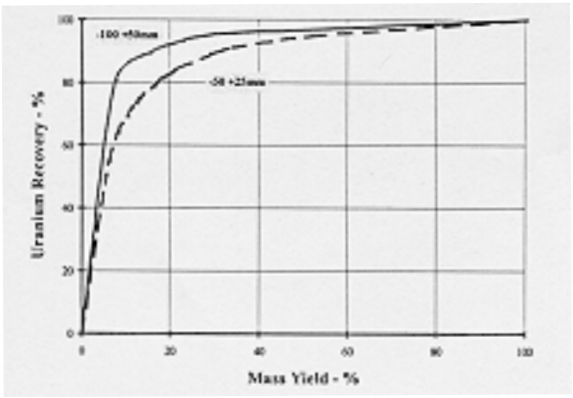

Figure 5. Predicted performance curve for radiometric sorter at Kintyre.

rich pieces can be separated out to produce an upgraded product.

The properties used to sequentially upgrade the ore at Kintyre are its radioactivity and relatively high density. The processes used to achieve this

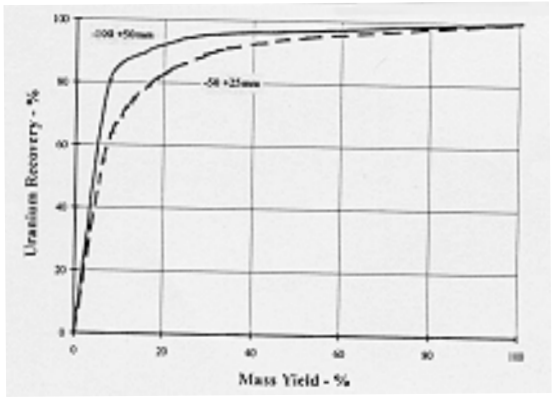

Figure 6. Predicted performance curve for HMS plant at Kintyre.

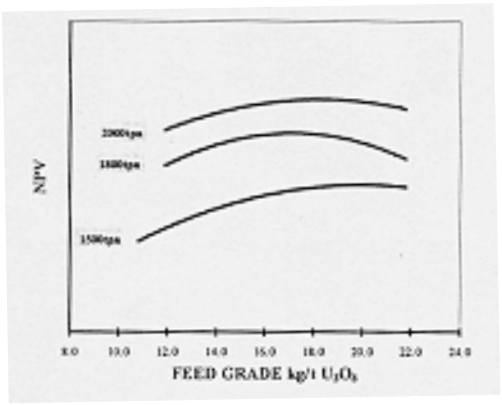

Figure 7. Optimum hydro-metallurgical plant feed grade.

are radiometric sorting and gravimetric separation. A simplified flow of ore using these techniques is shown in Figure 4. The figure also shows how the ore can be sequentially upgraded prior to it entering the hydro-metallurgical section of the process, with minimal loss in contained metal. Significant savings in capital cost result from the smaller processing plant which is required, with additional savings from reduced reagent consumption and the minimisation of the volume of solid tailings.

The bulk sample produced from the trial excavation was the subject of a series a pilot scale trials, comprising crushing and screening, ore sorting, heavy media separation, and hydro-metallurgical processing. The first three of these trials were conducted on site, whilst the wet processing pilot scale testing was conducted at the Australian Nuclear Scientific Organisation's facility at Lucas Heights. The trials confirmed expectations from previous work and the preferred flow-sheet.

The radiometric sorter and heavy media separation

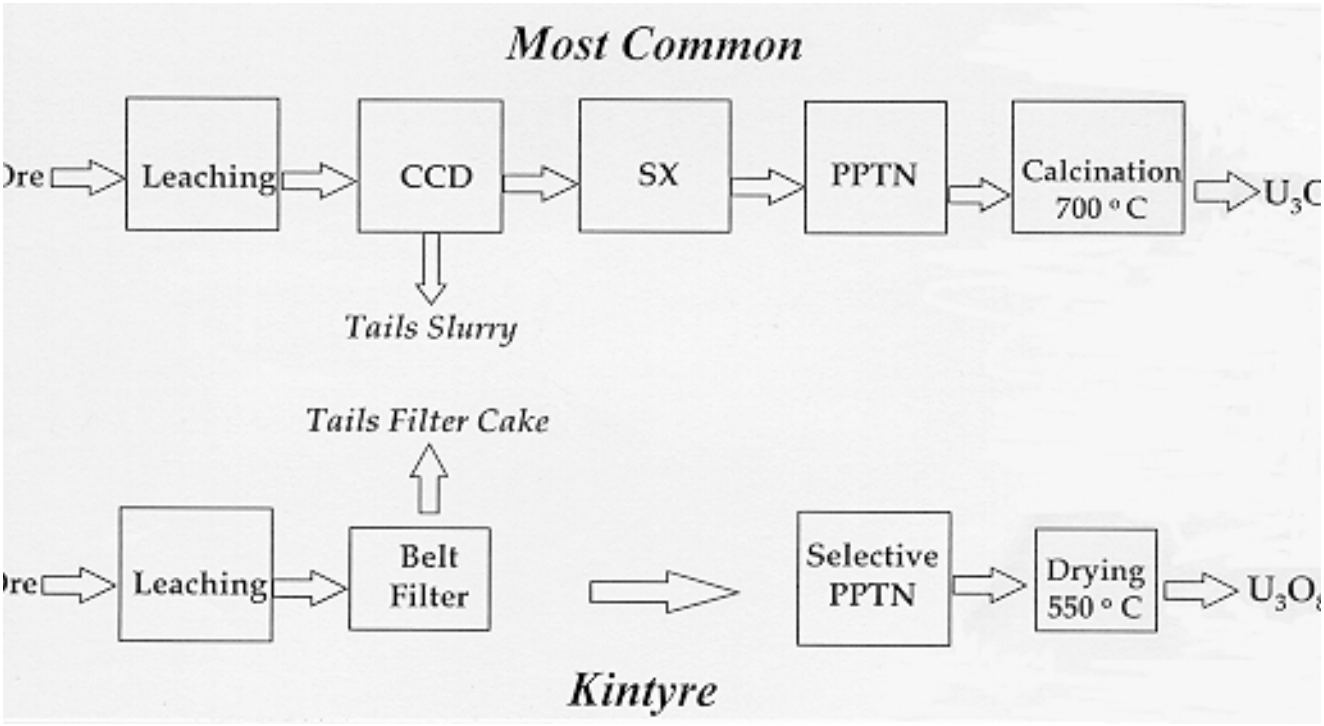

Figure 8. Simplified flowsheet for ore processing at Kintyre.

(HMS) trials confirmed the earlier test results. Typical results from these trials are shown in Figures 5 and 6. Other information from the tests enabled the project team to develop models to assess the economic benefit of the pre-concentration phase and establish a design envelope of optimum feed grades to the hydro-metallurgical process. Optimum feed grades to the hydro-metallurgical plant were developed at various production rates as shown in Figure 7. Design data such as process flows, rheology and reagent addition rates were also established.

Also of major importance was the successful application of the selective precipitation step, which will allow the project team to proceed with a flow-sheet design which may permit the exclusion of the solvent extraction step. The preferred flow-sheet for the processing of the Kintyre ore, shown in Figure 8, was successfully trialed.

Environmental Approvals

The environmental approval process was triggered in June 1996, with the application to the federal and state governments for project designation. As expected, the highest levels of assessment for a resource project, an Environmental Review and Management Programme (ERMP) for the state and an Environmental Impact Statement (EIS) at the federal level, were required. Guidelines for these submissions have been approved at both levels. The major issues to be addressed are the disposal of solid and liquid wastes, occupational health and safety, and site rehabilitation.

Canning Resources has been gathering the data required for the completion of the submissions since the early exploration. Further analysis and testing in the hydro-metallurgical pilot plant has provided further data on waste disposal options and radiometric criteria. The finalisation of mining strategy and process design will allow the draft documents to be completed early in 1998. A further period of 9–12 months is expected before the final approval from both governments is obtained.

Native Title

Negotiations are continuing with a team representing the three aboriginal claimant groups. These discussions are being conducted in a friendly and cooperative atmosphere. Overall relationships with the aboriginal people remain cordial. A Social Impact Study initiated by Canning Resources is also being carried out.

Market Strategy

Canning Resources' parent company, CRA, merged with RTZ in 1996 to form a dual listed company. The merged group was restructured earlier in 1997 and the name of the merged company was changed to Rio Tinto. Canning Resources now reports through the global Rio Tinto Energy group, along with Rössing Uranium Limited (RUL) and Rio Tinto Mineral Services Limited (Minserve). This arrangement will provide stronger market support through Minserve's expertise in marketing the product.

The development of the Kintyre project has the potential to offer Rio Tinto's customers a more diverse and reliable supply from a broader base in two separate countries.

Conclusion

The Kintyre uranium project has an opportunity to achieve production status by the turn of the century, some 15 years after its discovery. The removal of the Three Mine Policy by the Australian government elected in March 1996 has given renewed hope for its revival.

The Kintyre Advancement Programme has confirmed a number of favourable aspects of the project, particularly in the processing stage, which ensure that the project can be developed using a low cost, compact and flexible plant.

Nevertheless the most significant factor affecting the future of the Kintyre project, and I suspect many other potential projects, is the market conditions. The Kintyre project is waiting for the proper market conditions to justify the necessary investment to bring this project into production.

Reference

1. Gauci G & Cunningham BC, *A holistic approach to project design for cost-effective yellowcake production at Kintyre*. Uranium and Nuclear Energy: 1992, Proceedings of the Seventeenth Uranium Institute Annual Symposium, The Uranium Institute, London, 1992.