CAN URANIUM MAKE A COME BACK?

Uranium enjoyed a boom time in the late seventies when the spot price reached US$40/lb (as U_3O_8). At the time, there was a rush to establish new mines and mills, and plants were built to recover uranium as a by-product from gold tailings, phosphoric acid and copper leach solutions. The writer recalls from personal experience that the engineering business was dominated by new uranium projects. One of these was the Rossing project in Namibia which was conceived when the price was under US$10/lb and came on stream in 1976 during the dramatic price surge – surely one of the most inspired feats of major project timing ever achieved! Since those heady days, however, it has been mostly down hill for uranium producers, with the price falling to US$7/lb in the early nineties, which was below the production cost for most mines. In 1996 there was a temporary surge to around US$16/lb. The recent price trend finally shows some improvement, with $US12/lb being attained in September. Further encouragement can be drawn from the forecast by the World Energy Council that electricity demand by 2020 is expected to be double the 1999 figure. Given the current concern over greenhouse gases, nuclear power could well account for a significant portion of the increase. The potential for new mines, however, will likely to be affected by the supply of uranium from secondary sources, such as ex-military material, from Russia in particular.

Current Uranium Production

The largest current suppliers of primary uranium are Canada and Australia, with about 32% and 19% of the world's production respectively (in 2002). Other countries making up the top five are Niger, Russia and Kazakhstan.

A variety of processes are used by the major current operating plants, including:

- Ore crushing and grinding, followed by sulphuric acid leaching and solvent extraction.
- Acid leaching of copper flotation concentrate and tailings, followed by sequential copper and uranium solvent extraction.
- Ore crushing and grinding, followed by sulphuric acid leaching, ion exchange and solvent extraction.
- Ore crushing and grinding, followed by strong sulphuric acid curing and solvent extraction.
- Acid leaching of gold plant tailings, followed by ion exchange and solvent extraction.
- In-situ bicarbonate leaching followed by ion exchange.
- In-situ sulphuric acid leaching followed by ion exchange.

Other methods which have been used include:

- Ore crushing and grinding, followed by pressure sulphuric acid leaching.
- Ore crushing and grinding, followed by atmospheric or pressure carbonate leaching, including the use of bio-leaching conditions.

- Ore crushing followed by vat leaching.
- Heap leaching of run of mine or crushed ore.
- Bacterial leaching of mined-out areas.
- Use of salt or oxidising roast ahead of leaching.

The Australian Scene

Australia has three current operations, Ranger in NT, and Olympic Dam and Beverley in SA. The latest, Beverley, which started up in late 2000, uses in-situ acid leaching and ion exchange.

Beverley In- Situ Processing Plant (Source UIC Website)

Australia has 25-30% of the world's low cost uranium resources, about double that of Canada, and is in a good position to take advantage of future growth in the uranium market, provided that the political, native title and environmental issues can be effectively managed. A considerable number of potentially viable deposits have been identified, and some have been brought to an advanced state of development. Some the most advanced include Jabiluka and Koongara in NT, Kintyre and Yeelirrie in WA, and Honeymoon in SA. Like Beverley, Honeymoon is based on in-situ acid leaching, but incorporates solvent extraction instead of ion exchange for treating the leach solution, due to the high chloride content. The project has the necessary permits in place to move into full production, and owners Southern Cross Resources are understood to be focussing on increasing the ore reserves. Jabiluka, Koongara, Kintyre, and Yeelirrie, along with a number of other projects, have been stalled by a combination of political and native title issues, as well as by the low uranium price. The success of Beverley and Honeymoon in obtaining permits will likely lead to increased interest in deposits amenable to in-situ leaching.

Pointers for Future Project Development

Some of the key points to consider in future uranium project development include:

- Deposits with more favourable political, native title and environmental conditions may be a better bet that those with larger resources and higher grades.
- Given the highly political nature of uranium in Australia, overseas deposits may be worth a look, although the security situation would have to be carefully considered in today's world.
- In the light of Beverley and Honeymoon, in-situ leaching may be a favoured option for Australia for deposits with the right characteristics.
- Project timing is all important. In the seventies, some good projects were too slow and missed out, while some not so good projects got into production in time to ride the high uranium price wave. This means that the project development work has to be in place well ahead of time.
- Most uranium is sold by long term agreements, so that marketing is a key aspect of any new project.
- The characteristics of uranium deposits vary widely, and thorough up-front mineralogical studies are essential before starting serious metallurgical testwork.
- To minimise risk and project development time, it is advisable to stick with proven technology if possible. An enormous amount of process development work was done from the sixties through to the eighties, and a wide variety of treatment routes were commercialised.
- The key environmental issues of water management and tailings disposal are generally more favourable in locations with low rainfall.

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(The writer acknowledges the web site of the Uranium Information Centre (UIC) Melbourne as a key source of information)