

# ARAFURA RESOURCES

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CORPORATE BROCHURE



# Rare to well done

Several years ago, Arafura Resources identified the imminent shortage of rare earth oxides. Now, it is about to become an alternative supplier for users worldwide to China's monopoly




arl Auer von Welsbach is best known as the inventor of the lighter 'flint', but he also had some claim to have invented the gas mantle and the electric light filament. Von Welsbach was very interested in what are called rare earth elements (REE) and was the discoverer of four of these. By 1903, his factory was producing lighter flints from mischmetal, a pyrophoric alloy of REE in various naturally occurring proportions, typically including approximately 50 per cent cerium and 45 per cent lanthanum.

According to the US Geological Survey, the term REE is an historical misnomer; reflecting unfamiliarity rather than true rarity. The more abundant rare earths are present in about the same proportion as commonplace industrial metals such as chromium, nickel, copper, zinc, molybdenum, tin, tungsten or lead. Even the two least abundant, thulium and lutetium, are nearly 200 times more common than gold. However, in contrast to ordinary base and precious metals, REE has very little tendency to become concentrated in exploitable ore deposits. Consequently, most of the world's supply of REE comes from only a handful of sources.

More than 95 per cent of rare earth production is currently controlled by China, which needs these elements for its manufacturing. The trouble is that it has little to spare and the Western world increasingly needs more elements like neodymium for wind turbines, terbium for fuel cells, praseodymium for low energy lighting, or lanthanum used as a petrol cracking catalyst in oil refineries, among many other uses.



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We are proud to be associated with Arafura Resources in the process of becoming the world's pre-eminent supplier of Rare Earths. Bauer Resources Australia has successfully drilled and extracted more than 1,200 tonnes of bulk samples in a three month period during the Nolans Bulk Sampling Campaign in 2010.

The Bauer Bulk Sampling Method offers the major advantage of replacing the need for costly trial pits, thereby saving substantial time and money.

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The price of these elements has increased quite remarkably over recent years. To take just one example, a kilogram of cerium oxide would have cost you \$1.57 in 2004; by the end of 2010 that had risen to \$61—startling enough but by May 2011 the price of a kilo of cerium oxide, in demand for glass polishing and as a UV filter in glass, had shot up to \$134. The other rare earth oxides (REO) all show a similar pattern. They are essential for renewable energy and other green technologies as well as flat screens so it's no wonder that strategic economists worry about the supply risk associated with dependency on China.

All this has created a 'perfect storm' for the few companies outside of China that will be able to supply these markets in the current decade, says

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Steve Ward, CEO of Arafura Resources. Which is why the Perth, Australia-based company is focusing on its 100 per cent owned Nolans Project which will involve rare earth mining and processing operations in Australia, an open cut mine at Nolans Bore in the Northern Territory and a processing and separation plant at the South Australian port city of Whyalla.

Nolans Bore is 130 kilometres north of Alice Springs and only 10 kilometres from the Stuart Highway, the principal north-south route through Central Australia. "It will be a drive in, drive out operation and relatively straightforward," says Ward. Ore from the open pit will be transferred to an on-site beneficiation plant for upgrading to a

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mineral concentrate. It will then be trucked 65 kilometres to the Darwin-Adelaide railway for the 1,400 kilometre journey to Whyalla.

The company is currently engaged in a bankable feasibility study (BFS), and has engaged the best Australian engineering partners available to assist it—Amec Minproc at the Whyalla Rare Earths Complex and Lycopodium at Nolans Bore. “We aim to complete the BFS in October 2011, then to raise the project financing of about \$1 billion by the end of the year. Our plan is to start construction early in 2012 and be in production during the second half of 2013,” says Ward. He hopes to ramp up to full production by 2015.

The project is much more a chemical processing operation than a mining operation. The processing plant will be built on a brownfield site which is in the process of being acquired from Onesteel at Whyalla, an industrial town which will see its population grow, he predicts, from 25,000 to 30,000 once the plant is up and running. Apart from the rare earths, it will produce phosphoric acid from the phosphate in the ore body, gypsum (calcium sulphate) from the calcium, and uranium oxide from the uranium. It is planned that the other radioactive element thorium

will be returned to the mine and stored securely as an iron thorium precipitate.

It took Arafura four years to develop the process flow sheets for the complex. They were tested and refined at the ANSTO (Australian Nuclear Science and Technology Organisation) facility in Sydney, with help from CSIRO, Australia’s national science agency. Bateman Litwin was engaged to help work out how to process the phosphates. “We have cut no corners in designing this process. It is very much an inorganic chemistry flow sheet, apart from the final separation steps, and it is a relatively low temperature operation, mostly carried out at atmospheric pressure.” It’s a process Ward feels at home with from his 20 years’ experience of the pigment industry with the Tioxide group.

Getting investors to finance the project should be no problem. It will place Arafura among the world leaders, capable of producing over 20,000 tonnes of REO a year to meet current rapidly escalating demand, on a par with Molycorp, owner of the world’s largest rare earth resource at Mountain Pass California, and Australia’s Lynas.

Plenty of other discoveries have been made, but it takes 15 years to get to production. “In this decade the number of rare earth projects coming into production will be very small,” he says. “Arafura will be shipping its first consignment of REO by the

end of 2013; the newcomers with recent exploration finds will be lucky to reach that stage by 2025.”

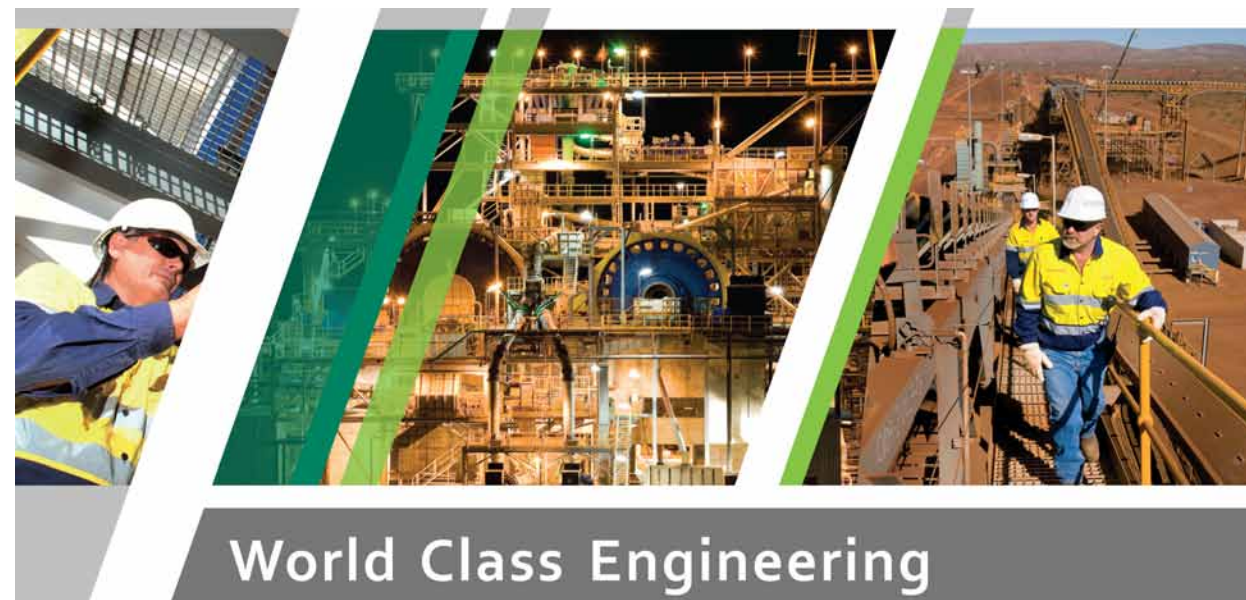
One thing that endears Arafura to investors and potential customers alike is that it is doing the whole job in Australia, he adds. “Australia tends to supply raw materials rather than added value products to the rest of the world; additionally, Australia is perceived to be stable, a good sovereign risk, and very responsible when it comes to environmental management so once we confirmed the all-Australian model we had a lot of positive feedback from prospective customers.”

Since it will be selling into all three of the main markets relying on rare earths, namely consumer electronics, clean energy and energy efficiency, Arafura has an admirably balanced market position. “Given the amount of neodymium and praseodymium that we have we’ll

### Lycopodium Minerals

International engineering and project management consultancy Lycopodium Minerals has developed a reputation for providing technically innovative and cost effective engineering solutions to the mining and mineral processing industries. Lycopodium is currently preparing a definitive feasibility study for the mine and beneficiation of rare earth elements and other minerals for Arafura Resources’ Nolans Project located in Central Australia.

certainly have a focus on clean energy,” says Ward—but all these markets are expanding, world demand will increase and prices will continue to rise for the foreseeable future. A perfect storm indeed. [www.arafuraresources.com.au](http://www.arafuraresources.com.au)



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