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# Taking a Risk for Rare Earths

By **KEITH BRADSHER**

KUANTAN, Malaysia — A colossal construction project here could help determine whether the world can break [China's](#) chokehold on the strategic metals crucial to products as diverse as [Apple's iPhone](#), [Toyota's Prius](#) and [Boeing's](#) smart bombs.

As many as 2,500 construction workers will soon be racing to finish the world's largest refinery for so-called [rare earth](#) metals — the first rare earth ore processing plant to be built outside China in nearly three decades.

For [Malaysia](#) and the world's most advanced technology companies, the plant is a gamble that the processing can be done safely enough to make the local environmental risks worth the promised global rewards.

Once little known outside chemistry circles, rare earth metals have become increasingly vital to high-tech manufacturing. But as Malaysia learned the hard way a few decades ago, refining rare earth ore usually leaves thousands of tons of low-level radioactive waste behind.

So the world has largely left the dirty work to Chinese refineries — processing factories that are barely regulated and in some cases illegally operated, and have created vast toxic waste sites.

But other countries' wariness has meant that China now mines and refines at least 95 percent of the global supply of rare earths. And Beijing has aroused international alarm by wielding that virtual monopoly as a global trade weapon.

Last September, for example, China imposed a two-month embargo on rare earth [shipments to Japan](#) during a territorial dispute, and for a short time even blocked some shipments to the United States and Europe. Beijing's behavior, which has also included lowering the export limit on its rare earths, has helped propel world prices of the material to record highs — and sent industrial countries scrambling for alternatives.

Even now, though, countries with their own rare earth ore deposits are not always eager to play host to the refineries that process them. An American company, Molycorp, plans to reopen an abandoned mine near Death Valley in California; but Molycorp must completely rebuild the adjacent refinery to address environmental concerns.

All of this helps explain why a giant Australian mining company, [Lynas](#), is hurrying to finish a \$230 million rare earth refinery here, on the northern outskirts of Malaysia's industrial port of Kuantan. The

plant will refine slightly radioactive ore from the Mount Weld mine deep in the Australian desert, 2,500 miles away. The ore will be trucked to the Australian port of Fremantle and transported by container ship from there.

Within two years, Lynas says, the refinery will be able to meet nearly a third of the world's demand for rare earth materials — not counting China, which has its own abundant supplies.

Nicholas Curtis, Lynas's executive chairman, said it would cost four times as much to build and operate such a refinery in Australia, which has much higher labor and construction costs. Australia is also home to an environmentally minded and politically powerful Green party.

Despite the potential hazards, the Malaysian government was eager for investment by Lynas, even offering a 12-year tax holiday. If rare earth prices stay at current lofty levels, the refinery will generate \$1.7 billion a year in exports starting late next year, equal to nearly 1 percent of the entire Malaysian economy.

Raja Dato Abdul Aziz bin Raja Adnan, the director general of the Malaysian Atomic Energy Licensing Board, said his country approved the Lynas project only after an interagency review indicated the imported ore and subsequent waste would have low enough levels of radioactivity to be manageable and safe.

Malaysia had reason to be cautious: Its last rare earth refinery, operated by the Japanese company Mitsubishi Chemical, is now one of Asia's largest radioactive waste cleanup sites.

"We have learned we shouldn't give anybody a free hand," Raja Adnan said.

Despite such assurances, critics are not convinced that the low-level radioactive materials at the Lynas project will be safe.

"The word 'low' here is just a matter of perception — it's a carcinogen," said Dr. Jayabalan A. Thambyappa, a general practitioner physician and toxicologist. He has treated leukemia victims whose illnesses he and others have attributed to the old Mitsubishi Chemical refinery.

That plant, on the other side of the Malay peninsula, closed in 1992 after years of sometimes violent demonstrations by citizens protesting its polluting effects. Now, in an engineering effort that has largely escaped the outside world's notice, [Mitsubishi is engaged in a \\$100 million cleanup](#).

Rare earths, a group of 17 elements, are not radioactive themselves. But virtually every rare earth ore deposit around the world contains, in varying concentrations, a slightly radioactive element called thorium.

Radiation concerns — along with low-cost Chinese competition — eventually forced the closing of all rare earth refineries in Japan. It was during this phase-out that Mitsubishi moved its refining operation to Malaysia, where old tin mines had left behind thousands of tons of semiprocessed slag that was rich in rare earth ore. It also had extremely high levels of radioactive thorium.

The new Lynas refinery, with nearly two dozen interconnected buildings and 50 acres of floor space, will house the latest in pollution control equipment and radiation sensors. A signature feature will be 12 acres of interim storage pools that will be lined with dense plastic and sit atop nearly impermeable clay, to hold the slightly radioactive byproducts until they can be carted away.

But carted to where? That is still an open question.

Building the lined storage pools was one of the promises Lynas had made to win permission to put the refinery here, in an area already environmentally damaged by the chemical plants that line the narrow, muddy Balok River.

Mr. Curtis, the Lynas chairman, insists that the new factory will be much cleaner and far safer than the old Mitsubishi plant, which “never should have been built,” he said recently, as he led a tour of the sprawling Lynas refinery construction site here.

One big difference, he said, is that the ore being imported from Australia is much less radioactive. It will have only 3 to 5 percent of the thorium per ton found in the tin mine tailings that Mitsubishi had processed. And he said the Lynas factory would also process 10 times as much ore with only twice as many employees — about 450 in all — thanks to automation that will keep workers away from potentially harmful materials.

But the long-term storage of the Lynas plant’s radioactive thorium waste is still unresolved.

After using sulfuric acid to dissolve the rare earths out of the concentrated ore, Lynas plans to mix the radioactive part of the waste with lime. The aim is to dilute it to a thorium concentration of less than 0.05 percent — the maximum permitted under international standards to allow the material to be disposed with few restrictions.

Lynas wants to turn this mixture into large concrete shapes known as tetrapods that are used to build artificial reefs for fish and as sea walls to prevent beach erosion.

Local residents seem to be of two minds about the sprawling plant being built near the river. The river empties into the ocean several miles away, next to an impoverished fishing village, where on a recent evening a small group of fisherman sat at the end of a wooden dock.

Muhamad Ishmail, age 56, said pollution from the chemical factories that started opening upstream in the 1990s had forced local fishing — a river industry for generations — to move primarily out to sea. Although one of his five children works in the nearby industrial district, Mr. Ishmail said he did not want Lynas or anyone else to open any more factories.

“This river used to be clean, and you could catch fish right here,” he said.

But Muhamad Anuar, 30, said his community needed the reliable paychecks that Lynas might offer. “I have two kids, and I don’t want them to be fishermen,” he said. “It’s a hard job.”

