

URANIUM MINING in Australia



Ranger Uranium Project in the Northern Territory 1981

Exploration for uranium in Australia was first carried out in the 1940's at the request of the British government which wanted uranium for its nuclear weapons program. In 1954 uranium mining began at Rum Jungle in the Northern Territory, and at Radium Hill in South Australia. Mining began at Mary Kathleen in Queensland two years later. But the promised growth in the nuclear power industry failed to take place and, with the ban on the testing of nuclear weapons in the atmosphere, imposed under the 1963 Partial Test Ban Treaty, the demand for uranium fell sharply. As a result, by 1971 the three mines had ceased operations and 7000 tonnes of uranium had been exported.

In the early seventies new uranium deposits were

discovered at Ranger, Jabiluka, Koongarra and Nabarlek, all in the Northern Territory. With the discovery of the huge uranium deposit at Roxby Downs in South Australia in 1975, Australia now has almost a third of the world's economically recoverable uranium.

These discoveries came at a time when the prospects for the world's nuclear power industry looked bright and so uranium mining was hailed as a great boost to Australia's economic fortunes. Headlines boasted enormous employment opportunities and wealth. But by 1984 only one large mine, Ranger, and a smaller one, Nabarlek, were producing commercial uranium. The Mary Kathleen mine had reopened in 1976, but closed for good in 1982 and the giant Roxby Downs deposit was yet to go into production.

What is uranium?

There are 92 naturally occurring elements but only one, uranium, has become the key to the development of nuclear power. Uranium, the most, unstable of all the natural elements, is a mixture of mainly uranium 235 and uranium 238. Less than one percent of naturally occurring uranium is uranium 235. It is this uranium 235 from which energy is obtained in the nuclear reactor. When uranium 235 atoms are bombarded by neutrons they may split into two smaller atoms and give off energy as heat. These neutrons then split more uranium atoms and so on. The process is called a *chain reaction*. The uranium 238 atoms can capture neutrons to create a new element, *plutonium*, a long-lived and highly toxic material, which is the base for nuclear weapons.

How does Australia compare with other countries?

Australia, with 30 pc, has the largest reserves of uranium in the world. Next is South Africa (12 pc), then Canada (15 pc), Brazil (8.5 pc), Niger (8 pc) and the United States (7 pc). Traditionally the United States has been the biggest uranium producer, but is losing ground fast to Canada and Australia. World uranium production in 1983 was 38 000 tonnes, of which Australia contributed 3 700 tonnes or just under 10 pc. The US produced about 21 pc, Canada 20 pc and Namibia 10 pc.

During 1983, world demand only reached 31 000 tonnes. This trend seems likely to continue as growth in nuclear power generation is almost at a standstill. Large stockpiles, heavy overproduction and declining market prices for uranium look certain for the foreseeable future.

Australia has contracted to sell almost 60 000 tonnes of uranium between 1976 and 1996, to Japan (40 pc), West Germany (35 pc), United States (7 pc), Sweden (5 pc), France (4 pc), South Korea (4 pc), Belgium (1 pc), and Finland (1 pc).

How is uranium mined?

Uranium is mined mainly two ways: *open-cut* or *underground*, much the way coal is. In open-cut mining, the area is bulldozed and roads, plant and dams are built. The ore is extracted by heavy blasting and transported by dump trucks to a milling plant where it is crushed to a sand-like material, which is mixed with water to form a slurry. The uranium is dissolved in acid solution and separated from the undissolved solids. The uranium in the acid solution is purified and deposited in solid form as pure uranium oxide which, because of its yellow crumbly appearance, is called *yellowcake*. This is then packed in ordinary 44-gallon drums, ready for shipment.

For each tonne of ore only three kilos of yellowcake are actually recovered. This leaves a huge quantity of waste rock and low-grade ore. For example, the Ranger mine with an annual production of 3 000 tonnes of yellowcake will produce one million tonnes of waste each year of operation. This waste, known as *tailings* looks like liquid mud and is pumped into a huge tailings dam. There, it is treated with lime to lower the solubility of the heavy toxic metals still present.

While underground mining is less visually polluting, uranium tailings still pose an enormous environmental threat. Other problems include cave-ins after extensive excavations and the constant release of radioactive gas and noxious chemicals from the ventilation shafts.

A new method of mining, *in-situ* or *solution mining*, has been used at some mines. It was proposed for the Honeymoon and Beverley mines in South Australia.

Here, an acid solution is forced through the orebody to dissolve the uranium, which is then recovered by chemical processing of the acid solution. It is an unproven technology which has had a poor track record in the United States.

Is it economic?

The great promise of 500 000 jobs and \$20 billion in foreign earnings from uranium mining has failed to materialise. Job opportunities in mining fluctuate along with metal prices. The new mines, like Roxby Downs, and the existing ones, Ranger and Nabarlek, are all looking for new contracts when the market is shrinking and prices are falling. In 1979 uranium was worth \$45 per pound. Now it has fallen below \$20 per pound, and as more nuclear reactors are cancelled and go out of service worldwide, the price will drop further.

Mining is capital-intensive, which means more money is spent to provide each job than say in manufacturing. For example the Ranger mine employs 300 workers at a cost of \$800 000 per job. In manufacturing, it's about \$50 000 per job. The mining industry provides only about three percent of the job market, despite the enormous investment. Even fewer jobs are created in industries that serve mining because uranium companies import most of their heavy earth-moving equipment and their ore milling and refining plants. This equipment makes up a large portion of their investment in mining.

The mining industry has always had generous government support, including tax concessions and infrastructure, like roads, railways, energy and water supplies to serve mines. For instance, the South Australian government has agreed to spend an initial \$50 million on infrastructure at Roxby Downs. Because mining companies are mainly owned by foreign corporations, most of the profits go overseas. Sometimes more money goes out of Australia in loan and interest repayments, profits and equipment purchases than is received in royalties and jobs. The federal government's Fitzgerald Report says that during the mining boom of the late 1960's the government paid out \$55 million more in tax concessions and subsidies than it received in royalties.

Is it environmentally safe?

No matter how uranium is mined, there is radioactive contamination of the surrounding environment. The uranium tailings retain 80 pc of the radioactivity of the ore and this radioactivity will be emitted for hundreds of thousands of years.

Tailings are a major source of pollution because they are so easily dispersed by wind and rain. Tailings dams have a dreadful safety record. At the Ranger mine there have been 28 reports of leaks from the dam and the company has been excused from the legal requirement to keep the tailings covered with water at all times. Regulated releases of about two million cubic metres of contaminated water from the mine during each wet season carry radioactive radium and such toxic pollutants as selenium, copper, lead, cadmium and arsenic down nearby Magela Creek and into the floodplains. After each successive wet season, radioactive wastes have become increasingly concentrated in plants, animals and water. This is made worse by fears about the dam's poor construction, which has been further weakened by periodic explosions, and about the growing seepage of contaminated water caused by rising groundwater. These and other problems indicate a failure to protect the environment and go no way toward allaying fears that the delicate Kakadu National Park will be damaged by mine pollution, especially once the mine is abandoned with its masses of tailings.

Uranium mines in other countries, particularly the United States and Canada, have had their share of

radioactive spills. One of the most dramatic accidents occurred on January 5, 1984 at the Key Lake mine in Saskatchewan province in Canada, when a pump was inadvertently left running and one hundred million litres of radioactive water contaminated a large area of the province. This was the largest, but there have been at least five serious spills at Key Lake since the beginning of 1983. Even worse, in 1979, the United Nuclear Corporation spilled 45 million litres of radioactive water into the Rio Puerco River in New Mexico, when a tailings dam at the Churchrock uranium mine broke. The water has now spread throughout parts of Arizona and California.

Uranium mining and milling operations also release great quantities of radioactive radon gas into the atmosphere. Other hazards include ammonia, nitrous oxide, sulphur dioxide and sulphuric acid mist which are known to kill plants and corrode rock faces, and are released as a part of normal operations. Already Mt Brockman near the Ranger mine has suffered corrosion after only a few years of the expected 40-year lifespan of the mine.

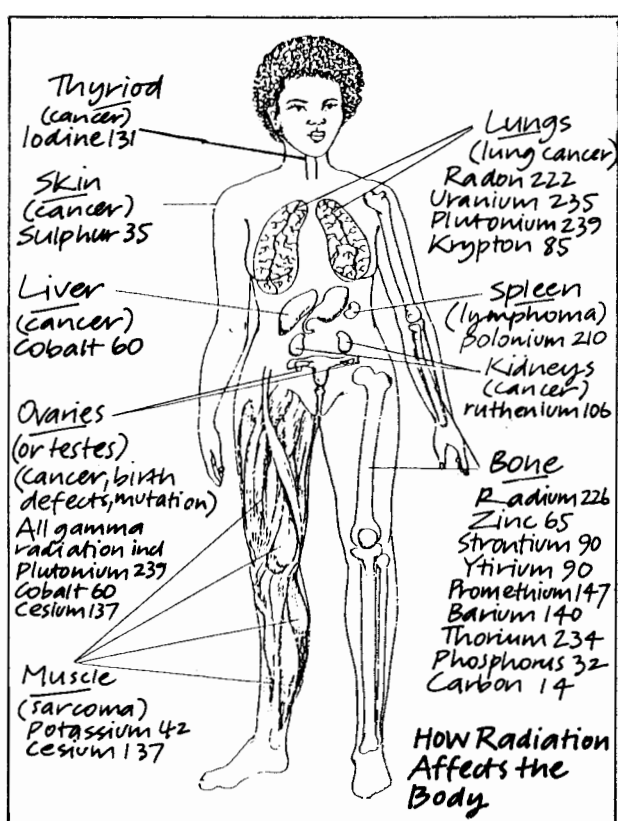
Even when the mine closes the problems aren't over. Tailings dams should be at least covered for thousands of years to reduce the risk of environmental contamination. Rum Jungle, a small abandoned uranium mine near Darwin, is a telling example of abject neglect. The dam was breached by monsoonal rains and pollution now extends over one hundred square kilometres, including the Finnis River. At Mary Kathleen, another abandoned uranium mine in Northern Queensland, one million litres of radioactive liquid was deliberately released from the mine's evaporation ponds into a nearby creek on February 27 1984 during an unexpected wet season. Cleanup operations are costly and will not return the area to its original condition and the taxpayer is picking up the tab. Abandoned sites are also an eyesore with their derelict buildings, bulldozed earth and lifeless landscape.

How are the workers affected?

Since 1920, it has been known that uranium miners suffer high mortality from lung cancer caused by exposure to radioactive radon gas during their work. When inhaled, radon gas and its decay products lodge easily in the human lung, emitting energetic alpha-particles, which affect the vulnerable layer of cells lining the fine tubes in the lung. Radioactivity from the tailings dam will last thousands of years beyond the life of a uranium mine, affecting not only workers but all those who come in contact with it.

Between 1920 and 1957, authorities revised the maximum permitted radiation dose drastically downwards, as new evidence came to light. However, since then, despite even more evidence that the current dose is too high, authorities are still reluctant to change the standard. In 1980 the US National Institute for Occupational Safety and Health (NIOSH) found "a clear indication that cumulative exposure to radon (and its decay products) is associated with an increased risk of lung cancer". A study of the Register of Deaths shows that 40 pc of those who worked underground in the Radium Hill uranium mine in South Australia have died from cancer. Underground miners are more at risk than open-cut miners. Nonetheless, on windless days, radon can build up in open-cuts, especially when the ores are rich in uranium.

The NIOSH has criticised the existing standard as having "no margin of safety", and wants to see the permissible exposure limits for all uranium and nuclear workers reduced to one-tenth the current level. To do this would mean substantial increased cost to the industry, which opposes any lowering of permissible levels. Although exposure of workers to radon gas is now more strictly regulated, uranium mining still presents a substantial health risk as the



effect of exposure to radon gas is according to the cumulative dose over the number of working years.

Radiation from the mines not only affects workers but also those who live nearby. In the United States, a two-year preliminary study of Navajo Indians in New Mexico found an unusually high number of birth defects, including, hydrocephaly, microcephaly, Down's Syndrome, cleft lip, cleft palate and epilepsy, among more than 5 000 babies born between 1967 and 1974. Earlier surveys had found a serious increase in bone, ovarian and testicle cancers among children living in areas of former uranium activity. The area around the Navajo Nation is pockmarked by more than 350 abandoned open-cut uranium mines.

In Grand Junction, Colorado, where uranium tailings were used in the construction of more than 6 000 homes, schools, shopping centres and footpaths, a 1979 study showed a significant increase in acute leukemia and chronic myelocytic leukemia between 1970 and 1976. There are similar problems wherever uranium has been mined in North America.

Up until 25 years ago, Port Pirie in South Australia was the site of a milling plant for the production of yellowcake from ore mined at Radium Hill. Today, a tailings dam and derelict tanks remain on the very edge of town. Washed by high tides and eroded by winds are 200 000 tonnes of tailings. Very recently and after much public protest, the authorities begrudgingly fenced off the area. For many years children swam and played in the dams.

Uranium mining companies have played down the health consequences to workers and residents of radon and other radioactive decay products. If experience is anything to go by, taxpayers rather than the companies will foot the bill for efforts to contain the enormous problems that are now beginning to emerge.

How are Aborigines affected?

Aboriginal people have for a long time opposed uranium mining on their land because

- the contamination of water supplies and the spread of radioactive pollution, directly and indirectly, endangers their lives;
- sacred sites of vital cultural and spiritual significance would be destroyed;

“Uranium is a threat to all people — radiation kills and bombs kill. I follow the culture of my people. We belong to the land. We are caretakers for the land. Our lifetime on this earth is only a blink in time, so our lifetime is spent protecting and caring for this land for future generations.”

Vincent Forrester, Northern Territory Chairman, National Aboriginal Conference in a speech to the Darwin ALP State Conference, June 1984

- white settlement brings problems like alcoholism, prostitution, drug addiction and disease, which continue to have disastrous effects on Aboriginal communities;
- traditional landowners and community workers have frequently criticised the Northern Land Council (NLC) for exerting pressure on landowners to agree to mining.

The NLC, funded mostly by uranium mining royalties, has developed a large bureaucracy of lawyers, scientists and social scientists to handle negotiations between landowners and the companies. Under intense pressure from the Fraser government and the companies, the NLC changed its mind and agreed to mining in 1978. The NLC's vested interest in uranium mining, together with the presence of the white mining community has led to political division and conflict between the NLC and traditional landowners over royalties, distrust of government, fighting, accidental deaths and general demoralisation.

In 1984, the NLC's chairman Galarrwuy Yunipingu, with financial support from mining companies, began lobbying ALP state branches to change the party's policy to allow mining. Many Aboriginal people feel Yunipingu and the NLC do not represent their interests. Vincent Forrester, Northern Territory chairman of the National Aboriginal Conference, says, “It is not correct to say that any Aboriginal community has made a real decision on uranium until all the facts are presented to all of our people affected, and they must be presented in Aboriginal languages in a manner that has meaning to our people”.

Can Australia's uranium make nuclear weapons?

Australia has signed a string of safeguards agreements with countries that buy its uranium. These agreements are designed to ensure Australia's uranium is not used in the manufacture of nuclear weapons. They are backed up by the International Atomic Energy Agency (IAEA), which polices the nuclear industry, and the Non-Proliferation Treaty (NPT), which is supposed to outlaw the spread of nuclear weapons.

Safeguards are an illusion because

- there is plenty of scope for governments to deceive the IAEA;
- the IAEA's main priority is to promote nuclear power and the safeguards are not allowed to unduly hinder the industry;
- nations with half the world's population do not allow inspections;
- nations who allow inspections can determine which countries do the inspections and can withdraw from the NPT at three months' notice; and
- the IAEA is understaffed and insufficiently funded to do its work properly.

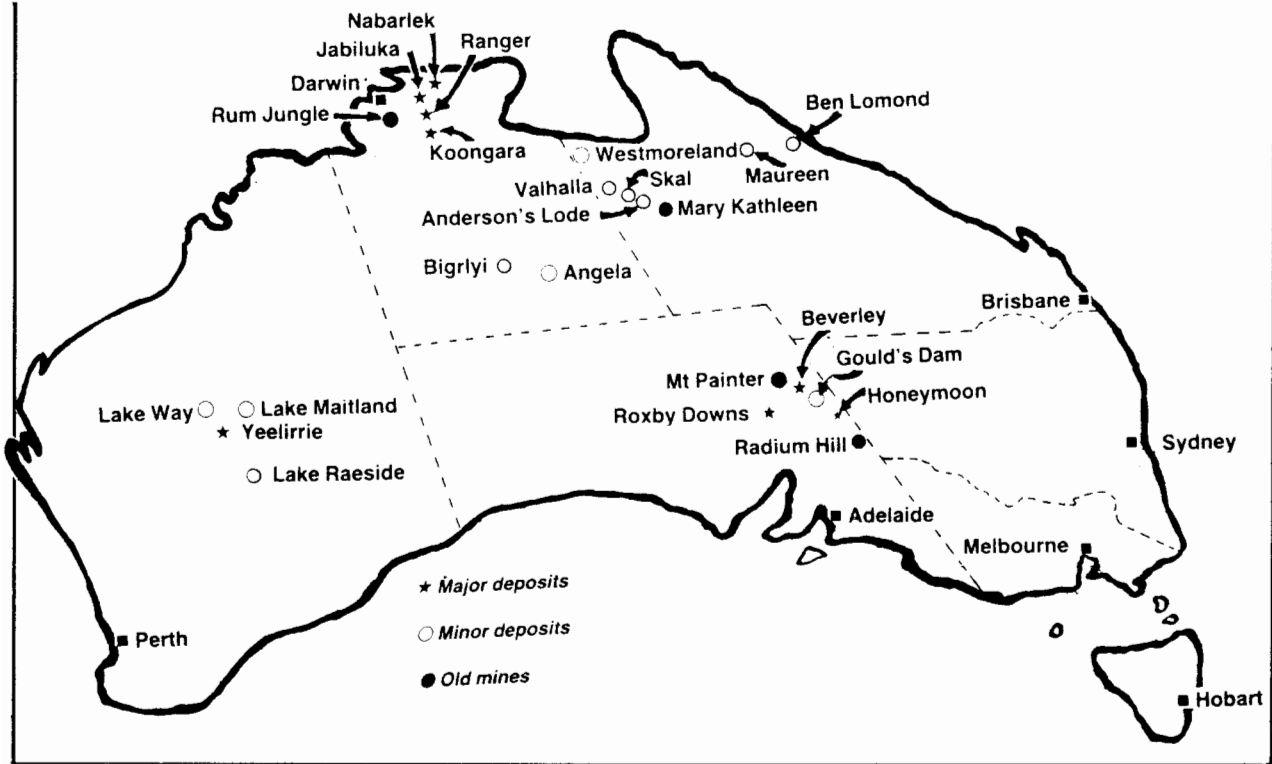
“No international treaty or convention, however universal, can offer a guarantee of comprehensive foolproof protection against proliferation of nuclear weapons.” *Australian Uranium Advisory Council 1981 Annual Report*. Even if the safeguards could prevent the diversion of uranium to nuclear weapons, there are bigger problems. Long before Australia's, or any country's, uranium is used in a nuclear power station, long before nuclear weapons are made, it must be enriched. After enrichment, Australia's uranium becomes part of a common pool of uranium. It ceases to be identifiable as Australia's, except as a book entry. The uranium that an importing country actually receives is made up of uranium from all countries that have their uranium enriched at that particular plant. Besides, enrichment plants are not safeguarded against weapons diversion. The barriers are virtually non-existent and anyway Australia does not insist on safeguards at the Oak Ridge plant in Tennessee, where much of its uranium is enriched. This plant is a major nuclear weapons facility in the United States.

Australia's eagerness to sell uranium on a depressed market has made the government's safeguards negotiations no more than a pretense. For instance, already Australia has compromised its safeguards policy by selling uranium to South Korea which makes no secret that it may build nuclear weapons. Before they would sign uranium contracts with Australia, Japan, Germany and other West European countries insisted on, and won, the freedom to reprocess plutonium, regardless of Australia's wish that they not.

What do political parties and unions say?

The Fraser government, in power from 1975 till 1983, vigorously encouraged the expansion of Australia's uranium industry. The Australian Democrats has a policy to halt the industry. The Australian Labor Party favoured uranium mining until 1977, but in that year adopted a policy of opposition to it. Then, in 1982, the Labor Party weakened its opposition and instead promised only to restrain development. It amended its anti-uranium policy to allow the Roxby Downs mine in South Australia to go ahead, claiming that when uranium is mined ‘incidentally’ to other minerals, it was acceptable. Hawke's federal Labor government came to power in 1983 with an ambiguous, though widely believed anti-uranium policy, but many in the government favour mining. Despite the controversy and divisiveness in the party, many and Hawke in particular, want to see the industry expanded.

In keeping with the Australian Council of Trade Union's (ACTU) strong anti-uranium policy, sections of the trade union movement have taken industrial action against uranium exports. A national one-day railway strike was staged in 1976 to protest uranium mining at Mary Kathleen. On the Darwin wharf in 1981, the Waterside Workers Federation maintained a blockade of a uranium shipment for seven weeks. However, opinion on the nuclear debate within the union movement is divided, effectively preventing fully concerted opposition to uranium mining by the ACTU.



The mines

Ranger

Location At Jabiru, about 200 kms east of Darwin, on the eastern edge of the Kakadu National Park.

Reserves 110 000 tonnes at 0.3 pc uranium oxide or yellowcake*.

Ownership Energy Resources of Australia (30.8 pc Peko-Wallsend Ltd; 30.8 pc EZ Industries; 14.2 pc other Australian shareholders. (mainly insurance and nominee companies that own EZ and Peko-Wallsend); 10.1 pc Japan-Australia Uranium Development Co; 4 pc Urangesselschaft (West Germany); 6.3 pc Braunkohlenweke (West Germany); 3.6 pc Saarberg Interplan GmbH (West Germany).)

Method of mining Open-cut

Production 3 000 tonnes per year

Contracted production 45 000 tonnes 1982-1996

Contracts Japan 14 176 tonnes 1982-1996; West Germany 18 479 tonnes 1982-1996; South Korea 2 270 tonnes 1983-1992; United States 2 043 tonnes 1982-1990 (new contracts negotiated with US utilities in 1983, first 2 100 tonnes 1984-1992 and second 200 tonnes per year for an unspecified period); Sweden 2 850 tonnes 1982-1996; Belgium 1 429 tonnes 1982-1994; Australian Government Stockpile replacement 1 011 tonnes 1982-1996. This represents 95 pc of current planned production to 1996, valued at \$US 2.8 billion.

Status Operating, seeking new contracts

In June 1975, an inquiry into the Ranger project and into uranium mining in Australia generally was set up by the Whitlam Labor government. The Ranger Inquiry's Second Report published in May 1977, was said by the industry to be a green light for uranium mining in Australia. In fact, the inquiry's conclusions were very cautious and stated that if mining were to take place, it could do so only under the most stringent conditions and within a tight framework. In practice, those conditions have been progressively ignored by each Environmental Impact Statement (EIS) for each new mine. One condition recommended was that tailings should be covered by at least two metres of water at all times to minimise the release of radon. In November 1981, the Office of the Supervising Scientist

discovered islands in the dam. From then on the recommendation was ignored and now the tailings only need be saturated. This is one indication that companies place less importance on environmental protection than they do on profits.

The Ranger project lies within the Arnhem Land Aboriginal Reserve, close to Magela Creek and Mt Brockman. The mine area is restricted to 83 square kms, but future mining activities could envelop the whole area, including Mt Brockman, the ruggedly beautiful sandstone escarpment and the Kakadu National Park. The park along with South West Tasmania and the Great Barrier Reef, is one of only three World Heritage Listings in Australia. Kakadu is extraordinarily rich in flora and fauna and is home to many migratory birds. Its variety of landscape is truly spectacular — savannah grass, coastal rainforest, plateau and wetlands — and it has many significant Aboriginal sacred sites. Already, acid fumes mingled with radioactive dust are hastening the erosion of the escarpment.

The area is subject to high and unpredictable monsoonal rainfall and it has already proved difficult to contain tailings seepage. In 1981, Ranger's engineers deliberately breached the partly-built tailings dam, during a deluge of 400 millilitres over three days, in order to avert structural damage to the dam. The water flowed into Magela Creek.

There have been other incidents. Sulphur dioxide emissions from the milling plant exceeded the allowed limits in June and July 1982, and in August of the same year, two workers, who were trying to clear a blocked pipe in the yellowcake packaging room, were knocked over by a large spill of yellowcake. Both lost their respirators and they received 70 pc of their annual radiation dose. In September 1983 workers went on strike because the drinking water system was connected to the tailings effluent system, and because they were concerned about high radioactive dust levels and about the company's disregard for their health.

*only a small portion of the whole uranium deposit is uranium oxide or yellowcake. The percentage indicates the quality or richness of the deposit. In most cases, the higher the percentage the more economic the mine.

Nabarlek

Location About 250 kms east of Darwin, in the Arnhem Land Aboriginal Reserve, near Oenpelli

Reserves 12 000 tonnes at 2.1 pc uranium oxide (seven times as rich as Ranger)

Ownership 100 pc Queensland Mines

Method of mining Open-cut

Production completely mined out, ore stockpiled

Contracted production 6 721 tonnes or 56 pc of the orebody

Contracts Japan 2 929 tonnes 1975-1985; Finland 815 tonnes 1981-1989; South Korea 1 359 tonnes 1983-1992; France 2 355 tonnes 1982-1988. Another 1 621 tonnes has been committed for sale to Japan under a firm letter of intent for 1982-1988

Status Operating, seeking contracts

Nabarlek was considered by the Ranger Inquiry and after its draft EIS was released in 1978, the Fraser government approved the project almost immediately. With the relative small size of the deposit and its rich ore grade, the orebody was completely mined out in one year and stockpiled to be processed over ten years. The high quality of the ore means the processing plant will emit significant quantities of radiation, and both the ore stockpile and the tailings will produce greater quantities of radon than at Ranger and other mines.

In March 1981, after heavy cyclonic rain, radioactive material was released into a nearby creek. The infringement was not reported by the company and only came to light four months later following media reports, although environmental regulations require immediate notification. When a report was presented by the company, the Supervising Scientist found it contained contradictions and insufficient information. His office expressed concern about problems with water quality monitoring, excessive radioactive dust concentrations, and a lack of response from the company about plans for decommissioning, rehabilitation, dewatering and covering the tailings at the end of the project.

The mine is very close to an area of special significance to Aboriginal people. The Gabo-Djang — the Dreaming Place of the Green Ants — is only one km from the mine and is one reason the Oenpelli people oppose Nabarlek. They clashed with the pro-uranium Northern Land Council over the mine's go-ahead and over building roads through sacred sites. But the Fraser government overruled the Oenpelli Tribal Council's court appeal. Queensland Mines has a poor record of dealing with Aboriginal people and lacks sympathy for their culture and tradition.

Jabiluka

Location 200 kms east of Darwin, 20 kms north of Ranger, on the Magela Creek, on the eastern edge of the Kakadu National Park

Reserves 202 400 tonnes at 0.39 pc uranium oxide

Ownership 65 pc Pancontinental Mining; 35 pc Getty Oil (US)

Method of mining Underground

Production 4 500 tonnes per year (Stage 1), 9 000 tonnes per year (Stage 2)

Status Draft EIS December 1977, final EIS July 1979.

No contracts. With declaration of Kakadu National Park Stage II, future uncertain

Originally Jabiluka was to be an open-cut mine, but Aboriginal and environmental groups pressured the company to adopt an underground mining plan. They successfully argued there would be problems with radon levels in the vast open pit, and that the revised project would need a new draft EIS. Little progress has been made with the project, although an agreement with the NLC was negotiated in July 1982, after prolonged Aboriginal opposition.

Jabiluka's uranium lies below the floodplain, requiring huge volumes of contaminated water to be pumped into the Magela Creek. The EIS admits it isn't possible to contain radioactive waste water in the tailings dam. A total of between one and one and a half million cubic metres of radioactive water would be discharged into Magela Creek every year through seepage and overflow. A failure of the tailings dam at either Ranger or Jabiluka would bring nothing less than ecological disaster to aquatic ecosystems. Huge quantities of sandstone would need to be removed to mine the uranium. One hundred metre high waste rock dumps covering 250 hectares, plus a permanent 160 hectare tailings dam, will permanently scare the area.

Koongarra

Location In the middle of the Kakadu National Park, near the ecologically sensitive Woolwonga Wildlife Sanctuary and the Nourlangie Rock

Reserves 13 000 tonnes at 0.3 pc uranium oxide

Ownership 100 pc Denison Mines (Canada), world's largest uranium producer

Method of mining Open-cut

Production 1 000 tonnes per year

Status Draft EIS produced December 1978. No contracts. With declaration of Kakadu National Park Stage II, future uncertain

The Ranger Inquiry stated that the Koongarra project should not go ahead under any circumstances. "The Woolwonga area is so valuable ecologically that we would oppose in principle any mining development upstream of it at least until it has been demonstrated by experience that it could take place without environmental damage." page 289, *Ranger Inquiry*.

The future of the project is unclear, with the Chairman of the Northern Land Council (NLC), Galarrwuy Yunipingu pressing for a go ahead and the Minister for Aboriginal Affairs, Clyde Holding, making half-hearted attempts to stop it. Injunctions to prevent mining were taken out by the traditional Aboriginal owners, the Alderson family, but these failed in court. Legislation was rushed through by the Fraser government in June 1981, excising the lease area from the national park. That way mining could not actually be said to be taking place within a national park, and so controls under the park's plan of management could not be applied to the project. Throughout 1982 and 1983, negotiations continued between the NLC and Denison Mines, in an attempt to reach an agreement to allow mining on Aboriginal land.

In December 1982, Denison told the NLC it was considering confining all its mining activity within the original lease area, even though the company wanted a larger lease area in which to process the ore and dispose of its waste. That way Denison would not need Aboriginal approval, because its original lease was granted before the Northern Territory Aboriginal Land Rights Act, which now requires NLC consent before mining can go ahead.

Denison and the NLC negotiated an agreement to allow mining to go ahead, 'in principle', in June 1983. The Department of Resources and Energy has given its consent to the environmental requirements for the project.

During mining radon gas concentrations in the open pit could average six to nine times acceptable levels, yet the EIS says radon levels will be 'negligible'. The project will create a long-lasting hazard in the region because of radon gas. This would have to be taken together with the impact of other projects to figure the long term health effects. There will be serious deterioration in groundwater quality, despite the operation of the so-called 'no-release' system, which will only delay contamination beyond the life of the mine. After mining, there would be four

enormous waste dumps the height of surrounding tall trees. Other problems would include erosion caused by extremes of climate, insufficient data on rainfall and concentration of toxic heavy metals and radioactive elements in the clay materials of nearby billabongs.

The Koongarra area has one of the most important records of pre-history and Aboriginal rock art. Explosions at the mine and increased dust will hasten the deterioration of the rock paintings. Insufficient time has passed for any realistic study of the full impact of mining on this extremely valuable environment.

Yeelirrie

Location 700 kms north east of Perth, near Kalgoorlie

Reserves 47 320 tonnes at 0.14 pc uranium oxide

Ownership 90 pc Western Mining Corporation; 10 pc Urangessellschaft; Esso, with an original 15 pc share withdrew in 1982

Method of mining Open-cut

Production 2 000 tonnes per year

Status Draft EIS December 1978, pilot processing plant in Kalgoorlie. No contracts. Attitude of federal and state governments uncertain.

Yeelirrie is a corruption of an Aboriginal word which means *place of death*. The proposed company town, with a population of 850, is two kms from an Aboriginal sacred site. The company says the site could be protected if the town was relocated, but is reluctant to move it. Water used in the mining operation would be pumped from underground bores, affecting pastoral activity and causing the water table to drop.

In its natural state, the area already has very high radon gas levels. Radiation levels would increase as the ore is crushed, as excavation work begins and as radioactive water evaporates after it is pumped from the mine. The company has chosen potentially the most hazardous method to dispose of radioactive tailings left after mining. Permanent surface storage — the cheapest, easiest and quickest way — is favoured over returning tailings to the open pit, because the latter would prolong the company's involvement by 20 years, at considerable cost. If there was a break in the external wall of the dam, wind and water erosion would carry waste further afield.

The company has no extensive rehabilitation program for the area after mining and it admits revegetation is unpredictable in a semi-arid region. This, together with the constant surveillance and monitoring necessary long after mining, casts doubts on the company's responsibility towards environmental protection. According to the company, "the Yeelirrie tailings dam would not be the only structure left in the world for occasional maintenance by future generations".

Honeymoon

Location 75 kms north west of Broken Hill, on the South Australian side of the border

Reserves 3 384 tonnes at 0.157 pc uranium oxide

Ownership 49 pc MIM Holdings Ltd (48 pc Asarco (US), 46 pc Australian 5 pc other); 25.5 pc CSR; 25.5 pc Teton Mining (US)

Method of Mining Solution or in-situ leaching

Production 250 tonnes per year

Status Draft EIS November 1980. No contracts. Refused operating licence by South Australian government 1983

The Honeymoon deposit was discovered in 1972. The company had proposed to use the solution mining technique to extract the uranium ore (See *How is uranium mined*). This technique is not a fail-safe proven technology and there were great fears that water aquifers and the groundwater in the area

would be contaminated. In 1981, the Irigaray uranium project in the American state of Wyoming was closed after chemical leach solution percolated through fractures in a supposedly impenetrable rock layer. In May 1982, the first nationally coordinated occupation of an Australian uranium mine was staged at Honeymoon. After vigorous lobbying, the South Australian government rejected the mine's licence.

Beverley

Location Just east of Lake Frome in the northern Flinders Ranges, South Australia

Reserves 15 600 tonnes at 0.24 pc uranium oxide

Ownership 50 pc Phelps Dodge Corporation (US); 16.67 pc Oilmin; 16.67 pc Transoil; 16.67 pc Petromin;

Method of mining Solution or in-situ leaching

Production 450 tonnes per year

Status Draft EIS August 1982, rejected by state Department of the Environment and Planning late 1982. No contracts. Operating licence refused 1983

The DEIS was full of errors including deliberately misleading tables, statements about the geology of the project area that were contradicted by diagrams in the appendix and illustrations that simply made no sense. The project would cause severe pollution in water aquifers in the Willawortina formation resulting in serious problems for pastoralists in the area. The DEIS (as a document) represents a further decline in the quality of Environmental Impact Statements, leaving the credibility of the environmental assessment process virtually in tatters.

After intense lobbying by the anti-nuclear movement, Beverley's licence was denied by the South Australian Labor government.

Roxby Downs (also known as Olympic Dam)

Location 90 kms north of Woomera in South Australia

Reserves 1 200 000 tonnes uranium oxide, ore grade not yet known. Largest deposit in the world, combined with copper, gold, silver and rare earths

Ownership 51 pc Western Mining Corporation; 49 pc British Petroleum

Method of mining Underground

Production 3 000 tonnes per year

Status Indenture Ratification Bill passed 1981, draft EIS December 1983. No contracts. South Australian and federal government approval granted.

Roxby Downs will be a vast underground operation, requiring a town of 3 000 people and great quantities of water from borefields, close to Lake Eyre, to sustain it. Concern centres on the effect this will have on groundwater, on the adequacy of the method adopted for tailings disposal and the project's economics.

Because of its size, Roxby will have enormous environmental consequences. The mine will draw 33 million litres of water each day from the Great Artesian Basin, in the short term, drying up bore holes in the vicinity. The long-term effect on the 500 000 year old Basin is not known. But there are fears that bore holes for pastoral activity will be rendered useless when the water table level drops. Mound springs found in the area — each a delicate ecosystem — are likely to be irreparably damaged because an adequate flow of ground water is essential for the survival of their unique aquatic life. Plant and animal life as far away as the Flinders Ranges may also disappear.

During the lifetime of the mine, 180 million tonnes, or 400 hectares, of tailings — equal to about 150 football fields each thirty metres high — will contaminate the soil, water, plants, animal and human life for hundreds of thousands of years. If the tailings are allowed to dry out and crack, radon gas dust could be carried by prevailing winds across Port

Augusta and perhaps Adelaide. This adds to the problem of radioactive dust sucked from the mine each day by huge ventilation shafts. Residents and workers, who are already exposed to radon from working underground, will breathe the dust as it settles.

The traditional owners, the Kokotha people, are actively resisting the mine. In 1983, they blockaded the Canegrass sacred site to prevent the company forcing a road through to the bore holes. There are 50 sites of significance, including ten that have so far been destroyed. The main mining shaft has desecrated one site and further development will damage more sites.

An agreement between the state government and the companies, known as the Indenture Bill, requires the state to provide an initial \$50 million for infrastructure costs plus annual maintenance. Unlike other mining projects, royalties will only be payable after a certain production level is reached. This means there is no guarantee the state will receive any return on its investment.

Roxby Downs will take an investment of \$1.4 billion to create 2 400 direct jobs, at more than \$500 000 per job, and up to just over 8 000 indirect jobs. The South Australian government has tied its political future and the state's economic salvation to the success of this single resource project.

The huge investment would be better spent on creating many more, longer lasting, jobs that are less hazardous, more socially productive and not prone to the whims and fancies of the metals market. They would at the same time help meet pressing environmental and social problems currently facing the state, like chronic structural unemployment, deforestation, soil erosion, water salination problems and a declining manufacturing industry.

Ben Lomond

Location 70 kms west of Townsville, in the Burdekin River catchment, in Queensland

Reserves 1 720 tonnes at 0.3 pc uranium oxide

Ownership 100 pc Minatome (Total Mining Group (France))

Method of mining Underground and open-cut

Production 450 tonnes per year

Status Draft EIS November 1983. No contracts. Licence refused 1980, no government approval

The project is relatively small, however, there is a risk that the often torrential rainfall in the area will result in the radioactive contamination of the Burdekin River. Already, before mining has started, radioactive material from the mine's ore stockpile of 3 500 tonnes, has leached into Keelbottom Creek. This creek feeds Charters Towers water supply, which is used by 10 000 people in the region. There are also fears that the Burdekin River, which provides water for farming and for recreation, could be contaminated. Because Aborigines in Queensland have no land rights, no listing of sacred sites in the area has been made.

The project's application for a mineral lease was challenged in 1980 by the Queensland Conservation Council at the Charters Towers Mining Wardens Court, which eventually denied the licence on environmental grounds. Documents subpoenaed during court hearings showed the company ignored the recommendations of successive radiation safety officers, and acted with contempt for state and federal radiation safety requirements. Opposition to Ben Lomond is widespread and crosses traditional political divisions.

Aborigines in Australia are not the only indigenous people on the Earth to be affected by uranium mining. Native Indians in the United States and Canada have paid dearly for and will continue to suffer the con-

"A nation with a designed and fabricated weapon could fuel it with diverted plutonium in less time than detecting and reporting it might take. I know no-one knowledgeable about safeguards who disputes this ... Large quantities of plutonium being transported, stored and fabricated cannot be adequately safeguarded."

Peter Bradford, former commissioner, US Nuclear Regulatory Commission

sequences of uranium and other mining on their lands. Chief Seattle, leader of the Suquamish Tribe in North America, gave us these words that are as timely now as they were when he first spoke them in 1854. "Whatever befalls the Earth, befalls the people of the Earth. We did not weave the web of life, we are merely strands in it. Whatever we do to the web, we do to ourselves."

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Credits

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