Submission No. 39

AREVA

Submission to the House of Representatives standing Committee on Industry and Resources

"The strategic importance of Australia's uranium resources"

by

AREVA

May 27, 2005

Executive Summary

The AREVA group is pleased to have the opportunity to comment on the "strategic importance of Australia's uranium resources".

The AREVA group believes that Australia, with its large uranium reserves can play a leading role in the supply of energy and the reduction of greenhouse gases for many decades to come.

With respect to the particular areas of interest to the committee, we note as follows :

A) Global demand for Australia's uranium resources and associated supply issues

It is clear that the demand for uranium to fuel nuclear power generation around the world is strong and growing stronger. Recent indications in the uranium market show that there is increasing concern among uranium consumers as to where the future supply will come from. Australia is expected to play a major role in satisfying this increasing demand for uranium.

B) Strategic importance of Australia's uranium resources and any relevant industry developments

Australia hosts 30% of the estimated recoverable resources of uranium that exist in the world today. The nuclear world is looking to Australia to play a leading role in the supply of uranium for peaceful power generating purposes for many decades to come.

C) Potential implications for global greenhouse gas emission reductions from the further development and export of Australia's uranium resources

Nuclear power is essential to attaining the goal of reducing the emission of greenhouse gas while at the same time maintaining access to electricity. Australia has a large role to play at the front end of the nuclear electricity cycle.

D) Current structure and regulatory environment of the uranium mining sector (noting the work that has been undertaken by other inquiries and reviews on these issues).

Australia's regulatory system must be structured to ensure strict standards of health, safety and environmental protection, while at the same time allowing predictability and avoiding unnecessary duplication.

Our more detailed presentation follows ...

A) Global demand for Australia's uranium resources and associated supply issues

C) Potential implications for global greenhouse gas emission reductions form the further development and export of Australia's uranium resources

1. The global energy situation : increase of world electricity consumption

World electricity consumption will inevitably rise over the long-term, buoyed by economic development paired with increasing use of electricity.

According to the World Energy Outlook published in October 2004 by the International Energy Agency (IEA), demographic growth and increased consumer access to energy have pushed the use of primary energy in the world from 6 billion metric tons of oil equivalent (Btoe) in 1973 to 10 Btoe in 2001, with use forecast at 16.3 Btoe by 2030, i.e. a 1.7% average annual volume increase over the period 2001-2030. The report states that developing countries represent two thirds of the increase in energy demand. Fossil fuels, including oil, natural gas and coal, are expected to satisfy almost 85% of the demand. These assumptions could change, depending on factors such as demographics, the availability of fossil fuels, or government policies regarding energy conservation, nuclear power and the reduction of greenhouse gases.

Worldwide electricity use rose to 17,294 TWh in 2004, compared with 5,217 TWh in 1971, i.e. an average annual volume increase of 3.7%. Based on the assumption that the world's GDP will increase by about 3% annually, per capita electricity consumption in OECD member countries would increase from approximately 6,000 kWh in 1990 to about 10,000 kWh by 2030. In other countries, the average annual per capita consumption of electricity would increase from less than 1,000 kWh in 1990 to 2,000 kWh by 2030. For the IEA, this implies that the annual growth in electricity demand will remain close to 2.5% over the period 2001-2030.

The IEA also estimates capital expenditures in the electric power sector at $10,000 billion over the same period. This total includes $4,400 billion for power generation, corresponding to 4,600 GWe to replace electric generating capacities while meeting increasing demand.

The sharp increase in the price of fossil fuels over the past two years, including coal, oil and natural gas, is also noteworthy.

Over the period 2002-2004, geopolitical tensions and, more significantly, a strong increase in demand in developing countries such as China have contributed to a significant rise in fossil fuel prices. These price increases, representing 50% for oil, 100% for coal and 50% for natural gas in Europe, and 100% in the United States, have pushed electricity prices up by 15% to 20% on average.

2. Need for mitigation of greenhouse gases

According to the IAE, the sharp increase in the forecasts for energy use will trigger a 70% increase in CO_2 emissions, with dramatic consequences in terms of climate change. Greenhouse gas emissions are one of the main causes of climate change. This situation could translate into temperature increases of almost 1.5°C by the end of the century, according to the World Business Council for Sustainable Development (WBCSD).

The IEA 2002 publication states that the world emissions of greenhouse gases were about 6.2 billion metric tons of carbon (GtC) per year in 2000, the power generation emissions representing 40% of the total. Total emissions would rise up to about 7.5 GtC/year in 2010, 8.9 in 2020 and 10.4 in 2030 on a business as usual (BAU) pathway (reference scenario). The BAU trend would go as high as 15 to 16 GtC in 2050.

The CO_2 atmospheric concentration is now about 380 ppm compared with pre-industrial concentration of 280 ppm. Is it possible to stabilise the atmospheric concentration of carbon dioxide by the end of the 21st century at a level avoiding too harsh adaptation effort? Climate stabilisation will take time all the more that oceanic balances are very slow.

According to the IPCC/SRES (Intergovernmental Panel on Climate Change/Special Report on Emissions Scenarios) ad hoc scenarios, the carbon emissions per year would have to follow a curve passing by a maximum before the middle of the century and then decreasing in the long term down to around 2 GtC. Most scientific people agree that we are missing the stabilisation target of 450 ppm of CO_2 equivalent in the atmosphere because now on it would imply too much effort of reduction. Total emissions should be limited to about 10 GtC per year by 2050 to comply with the 550 ppm target. That means a division by nearly two at that time compared with the BAU pathway based on 1990's technologies.

Human adaptation systems to climate change will have to be developed, but world adaptation capacity to climate damages is limited especially for developing countries. We thus need to implement mitigation policies to avoid unbearable costs for economies.

The Kyoto Protocol requirements for 2008-2012 represent the first step but are not sufficient to curb significantly the emissions. To stabilize at 550 ppm requires avoiding about 6 GtC/year from the current trend by 2050 and even more after. This represents an enormous reduction that should address all economical sectors.

3. The role of nuclear power: a clean and economic energy source

3.1. Historical perspective

The first nuclear power programs were launched in the 1960s in the United States and at the beginning of the 1970s in Europe. In the 1970s, several countries opted for nuclear power to counter the effects of a possible shortage of fossil fuels. These programs expanded rapidly in the 1970s and 1980s.

This steady expansion slowed down after the public expressed concerns about nuclear power following accidents at Three Mile Island in 1979 and, especially, at Chernobyl in 1986.

As a result, whereas 399 reactors had been built over the period 1970-1990, installed capacity increased by only 1.2% over the period 1989-2004. Nuclear programs in Eastern Europe and Asia are now replacing the huge programs of yesteryear in the United States and Europe. It should be noted, however, that nuclear power generation continued to grow at an average annual rate of 2.1% over the 1989-2004 period, due in particular to efficiency improvements at existing reactors. Thus, the average reactor load factor in terms of capacity rose from 67% in 1989 to over 80% by the end of 2004.

With more than 2,744 TWh produced in 2004, representing a 4.4% increase over 2003, world nuclear power generation contributes approximately 16% to total electric power generation worldwide.

As of December 31, 2004, 445 reactors representing 387 GWe of capacity were connected to the grid in 31 countries, including the world's largest energy-consuming countries. A total of 437 reactors were in operation in 2004, for 379 GWe.

European installed capacity remains the largest in the world, representing 50% of the world's total, ahead of the United States, which itself accounts for approximately one third.

However, over the medium term through 2015, most of the potential for growth in nuclear power is located in Asian countries such as Japan, Korea and now China, and to a lesser extent in the CIS, as shown in the chart below.

At the end of 2004, 25 reactors were under construction worldwide and close to 60 were in the design stage or planned for the coming years.

These reactors fall into one of three main categories of reactors:

• Light water reactors, representing most of the capacity installed in the world. These are further divided in two groups: Pressurized Water Reactors (PWRs) and Boiling Water Reactors (BWRs). There are 361 such reactors in operation, including 53 Russian-designed VVER-type PWRs.

• Heavy water reactors designed in Canada (Candu technology): 44 reactors were in operation in 2004.

• Gas-cooled Magnox and AGR reactors: 22 units were in operation in the United Kingdom in 2004.

Other reactor types in operation include fast breeder reactors and Russian-designed RBMK-type graphite-moderated light water reactors.

3.2. Current environment in nuclear power

A World Energy Council (WEC) report of July 2004 points out that nuclear power generates large quantities of electricity without significant CO_2 production. The report compares emissions in tons of CO_2 equivalent produced for each unit of electricity generated by each source of energy, taking into account their entire production cycle. There is a clear gap between carbon-based sources of energy, including lignite, coal, fuel oil and natural gas, and non-carbon energies such as nuclear power and renewable energies. The minimum ratio between the two groups varies from 1 to 5, and even much higher when no CO_2 scrubbing mechanism is used.

Lignite	1,144
Coal	932
Oil	777
Gas	439
Hydro (dam)	12.5
Nuclear	12
Wind	9
Hydro (river)	5.1

Source: Areva, based on the World Energy Council report of July 2004/"Comparison of Energy Systems Using Life Cycle Analysis"

The countries that have ratified the Kyoto Protocol have committed to lowering their greenhouse gas emissions over the 2008-2012 time frame to levels below 1990 emissions. In parallel, effective January 1, 2005, the European Union has established a system to limit CO_2 emissions, with emissions credit swapping possibilities. These provisions will create a market value for emissions reductions. At the present time, nuclear power is not among the sources of energy eligible for the swapping system.

Nonetheless, nuclear power's contribution to the fight against global warming is likely to make it a necessary component of the energy mix.

The WCE report also indicates that nuclear power is the most advantageous source of energy, together with hydropower, based on a combination of three criteria, including price competitiveness (energy accessibility and availability), security of supply and environmental impacts.

Last but not least, a cost study completed in April 2004 by the Lappeenranta University of Technology in Finland has reached conclusions essentially similar to those reached by the French government agencies DGEMP (energy and raw materials) and DIDEME (energy markets) in a July 2003 study on "reference costs in electricity production". The Finnish conclusions are that nuclear and renewable energies are not only more competitive when fossil fuel prices remain high for extended periods of time, but also that, unlike its fossil fuel competitors, nuclear power is relatively immune to changes in fuel prices, which represent approximately 15% of its production cost. Based on current prices, natural uranium itself represents approximately 5% of the cost of nuclear electricity.

Thus, according to this study, a 50% increase in the cost of natural uranium would raise the cost of nuclear-generated electricity from €23.70 to €24.30. A 50% increase in the cost of natural gas or coal would raise the cost of electricity produced with these sources of energy from €31.20 to €42.40 for natural gas and from €32.90 to €41.85 for coal.

3.3 Risk control

Another prerequisite to the increased global consumption of nuclear energy is the control of associated risks. That means nuclear safety, waste minimisation and non proliferation have to be maintained and further promoted in all the countries where nuclear energy would be expanded.

3.3.1. Safety

The basic safety principle is that nuclear power plant shall not cause injury to people or damage to the environment or property. Reactors nuclear safety is based upon the three level “in-depth defense” concepts:

- First to prevent any accident
- Second to monitor and protect safety
- Third to avoid unacceptable consequences.

Safety is realised in the form of precautionary measures in design, construction and operation.

These basic safety functions are protecting the plant in cases of incidents and failures, as well as limiting the consequences of accidents. The safe design relies on the three barriers principle. A series of strong, leak-tight physical "barriers" which form a shield against radiation and confine radioactivity in all circumstances:

- The metal cladding of the fuel rods
- The metal enclosure of the reactor primary circuit
- The containment surrounding the reactor.

Nuclear safety record is based on more than 11,000 years of cumulated reactor experience globally. This large experience and extensive research and development programmes have had a significant impact, improving plant performance and availability and enhancing safety.

Nuclear energy sector is most strictly regulated with regulatory bodies operating nationally and following internationally agreed IAEA standards. Development and implementation of the methods ensuring high level of safety are largely based on wide-scoped international cooperation. As nuclear technologies continue to expand internationally and more countries develop indigenous concepts of reactors, it is important to share common views and methods.

The IAEA is the core international safety body, issuing binding conventions, safety standards, practical guidelines and recommendations, leading thorough safety reviews of the installations and coordinating technical exchanges and R&D programs. An international Incident Reporting System, jointly managed by the IAEA and the nuclear Energy Agency of the OECD has been set up for exchanging experience to improve the safety of nuclear power plants. Introduced in March 1990, the International Nuclear Event Scale (INES) jointly by the IAEA and the NEA/OECD facilitates communication and understanding between the 15/26 nuclear community, the media and the public on the safety significance of events occurring at nuclear installations. The World Association of Nuclear Operators (WANO) also promotes thorough exchange of experience between the operators. Performance indicators for plant safety and reliability have been elaborated and are now reported by practically all operating nuclear power plants. More details on the indicators and their values are available on the WANO website.

The new reactors currently proposed by the vendors are still safer by design. Key improvements are the total confinement of radioactivity even in the most serious accident scenarios and reinforced protection against external events. They are quoted as "Generation 3+" models. The EPR reactor proposed by AREVA can be taken as an example. Several novel features are noteworthy and fulfil the demands expressed by the European electricity companies and Safety Authorities:

- According to safety margins compared with the other French reactors, the EPR has a ten times lower probability of major accident.
- Even in case of severe accident with core melt, containment ensures no external radioactive release and no consequence on neighbouring population.
- Also in case of severe accident and core bleed through the vessel bottom, a special "ash-tray" underneath would recover the melted material, preventing any radioactive intrusion underground.
- Protection against external events (fire, flood, falling aircraft...) has been reinforced, including independent redundant systems to prevent common failure and a double containment of two 1.3 m thick walls.

For the future, more novel designs are developed by R&D bodies within the international "Generation 4" initiative, involving ten countries.

3.3.2. Used fuel and waste management

Different types of wastes are produced in the nuclear fuel cycle: low radioactive level waste, intermediate level waste and high level waste. In the open fuel cycle, the ultimate high level waste is the used fuel containing uranium, plutonium and fission products, while in closed cycle with reprocessing it consists mainly of vitrified fission products in canisters, from which the major part of actinides has been separated and recycled.

Half a ton of enriched uranium in a PWR fuel assembly generates as much electricity as 50,000 tons of coal. The resulting waste quantities are small in comparison with other industrial sectors. For instance, the European Commission has estimated that 40,000 m^3 of radioactive waste are generated each year in the former EU-15 where 33% of electricity is generated by nuclear power plants. About one percent is high level waste. To keep these quantities in perspective, we can simply mention the average waste density is less than 5, which makes less than 200,000 tons per year. The Commission mentions that 2 billion tonnes/year of conventional waste are generated in the same EU-15, including 35 million tonnes/year of hazardous waste. A key feature of nuclear power is that the small quantities of waste permit sophisticated conditioning and management.

As for low level waste, management procedures are rather well established. In the EU, a very large percentage is now disposed of in closely regulated sites. High level waste management remains an issue. For the long term, the scientific and technical communities (e.g. from OECD, IAEA, European Commission...) generally agree that high-level waste and spent fuel can be disposed of safely in suitable geological formations (rock, salt or clay), using appropriate combination of natural and engineered barriers to contain radioactivity as long as necessary.

The issue of geological disposal is related to long term management and impact: even with radioactive decay, the waste packages will remain more toxic than natural uranium ore during several centuries. Safety assessments have to demonstrate that the waste will have no impact on public health all over the lifetime of the repository. Demonstrations are built upon available scientific knowledge, including quantitative models and qualitative natural analogues, taking into account the effect of the barriers installed. Radioactive decay combined with delayed diffusion through the barriers ensures that only a very small fraction of initial radioactivity will come back to the biosphere. The residual risk at stake in low probability "accidental" events is local, well circumscribed and quite limited in the hypothetical health consequences for the concerned populations. There is no common measure with the global threat of climate change induced by the emission of greenhouse gases.

3.3.3. Non Proliferation

Non Proliferation has become an essential issue of public interest and more generally for the acceptance of nuclear energy systems.

Proliferation resistance is achieved every day in operating nuclear plants through a combination of technical features which are defined as "intrinsic" to the technology and institutional and other measures, including safeguards inspection, defined as "extrinsic" measures. Physical protection addresses different threats and can be complementary to proliferation resistance.

As for safety "defence in depth" principle, three categories of non proliferation barriers can be defined: barriers pertaining to the nuclear material itself, technical barriers pertaining to the technology and the facility, Institutional barriers which cover extrinsic measures The IAEA as well as regional safeguards and verification organisations (EURATOM, ABACC,..) are applying effective controls on nuclear material to ensure they are used as declared. Safeguards approaches and equipments are integrated as early as possible in the design of fuel cycle plants currently under extension or commissioning such as enrichment plants in Europe or reprocessing plant in Japan. Another example is the development in the 90's of a "safeguards in depth approach" for the AREVA MELOX fuel fabrication plant in France.

Export control is a widely applied tool to prevent proliferation of nuclear weapon and ensure that nuclear material and technology are put to peaceful use.

4. AREVA's nuclear power operations : a worldwide leader

Operating through its Front End, Back End and Reactor & Services Divisions, AREVA is the only Group active in every stage of the nuclear power cycle.

In the front end of the cycle, it supplies uranium ore, and converts and enriches the ore to fabricate the fuel assemblies that go into the reactor core.

In the Reactors & Services Division, the Group has expertise in all of the technologies needed for reactor design, construction, maintenance and continuous improvement. PWRs and BWRs are its primary markets.

In the back end of the cycle, AREVA is a specialist in used fuel management, and in particular in the treatment of used fuel, from which it recovers reusable materials for recycling into MOX fuel, which can be used in both PWRs and BWRs.

AREVA is the only international Group to operate in every stage of the nuclear fuel cycle. This gives us a definite competitive edge by giving our customers comprehensive solutions and creating synergies among our Business Units. We estimate that our Group ranks first worldwide in the front end of the nuclear cycle.

In Mining, AREVA is the world's second largest producer of uranium, with a market share of around 20% ie 12,470 tons of uranium sold and an output of 6,125 tons in 2004. The Group has a world-class diversified mining portfolio in operation in Canada, Kazakhstan and Niger, or under development, with Cigar Lake in Canada being the main one. The Group's 142,000 tons of reserves are equal to twenty times its 2004 production. AREVA's long-term contracts also provide it with strong visibility in this business.

In Chemistry, AREVA is the world's foremost supplier of conversion services, with about a 25% share of the world market and a very strong market position in Europe.

In Enrichment, AREVA is a world leader in enrichment services, with about a 25% share of global production capacity. The Group should also profit from new opportunities as it implements centrifuge technology, whose use is planned in the future Georges-Besse II plant.

In Fuel, AREVA ranks first worldwide. It supplies around 35% of the world's nuclear fuel requirements and 40% for the boiling water reactors (BWRs) and pressurized water reactors (PWRs) used in the west. Thanks to constant improvement of its fuel technology and experience built up for forty years, AREVA supplies nuclear fuel assemblies that achieve high burnups. This allows for a better management of low enriched uranium fuel, which leads indirectly to a better utilisation of natural uranium.

Customers retain ownership of the materials used in these operations. They buy uranium concentrates from AREVA that are then commercially processed up to fabrication of the fuel assembly.

5. AREVA's Mining Business Unit

5.1. Uranium market

For more than 15 years, the market for natural uranium has suffered from an imbalance between the supply of uranium straight from the mine and demand. This imbalance is offset by the use of so-called secondary resources. The secondary resources come from strategic inventories stockpiled by utilities in the 1980s and, beginning in the late 1990s, from the arrival on the market of materials originating from inventories of the former Soviet block. They also stem from the arrival on the civilian market of natural uranium derived by diluting highly enriched uranium (HEU) from the dismantling of Russia's defense arsenal.

The "Megatons to Megawatts" agreement entered into between the United States and Russia on February 18, 1993 is the first commercial non-proliferation agreement. For 20 years, or until 2013, Russia has agreed to convert 500 tons of HEU from its dismantled nuclear warheads into low-enriched uranium for civilian use. The conversion is done in Russia using a dilution process. The 5.5 million SWUs (separative work units) of HEU recovered each year in this manner are covered by a business contract with USEC, the American enrichment company and sole agent authorized to market this compound. The natural uranium compound, which represents about 9,000 tons of natural uranium a year on average, is covered by a business contract between the Russians and a team consisting of AREVA, Cameco and RWE Nukem. AREVA's share averages some 2,600 tons of natural uranium per year. The contracts expire in 2013.

The gradual depletion of secondary resources has two main effects :

- It places considerable pressure on spot prices for natural uranium, doubling the spot price in U.S. dollars from year-end 2002 to year-end 2004. This in turn puts pressure on price negotiations between suppliers and electric utilities for their medium- and long-term contracts.
- It means that major players, including AREVA, must continue their exploration efforts and increase their capacity to mine uranium. This will enable them to fill the gap in primary and secondary resources when the time comes early in the next decade. With its mineral rights in the key regions of Canada, Niger and Kazakhstan, AREVA is well-positioned in this regard. AREVA will also benefit from the start-up of production at the Katco site in Kazakhstan and at Cigar Lake in Canada. After production ramp-up from 2006 to 2010, these two ore bodies should give AREVA access to 4,000 tons of uranium per year.

In geographical terms, nearly half of the estimated 40,000 tons of uranium produced worldwide in 2004 came from Canada and Australia, followed by Central Asia (including Russia) and the African continent.

The world's three largest producers of uranium concentrates in 2004 were AREVA, Cameco and Rio Tinto. These three producers each accounted for 10-20% of total uranium production worldwide. The seven largest producers combined represent approximately 80% of world production. AREVA's competitive strength is based on a well-organized and diversified mining portfolio covering three of the world's four main producing regions. This situation gives its customers the benefit of security of supply under long-term contracts.

Development costs for new projects and their time to market pose a significant entry barrier.

5.2. Description of the Mining Business Unit

In addition to trading, the Mining Business Unit's four main activities are the exploration, mining and processing of ores and the reclamation of the Group's sites after the end of the operating period. Most of its employees are located in Africa, North America and Europe. They also work in Australia, where they produce gold and explore for uranium, and in Kazakhstan, where they build plants and drill for in situ leaching operations.

Most of the Group's mining operations involve uranium. AREVA also produces gold. In the 1980s, gold was a diversification opportunity when the uranium market weakened after large deposits were discovered. AREVA's teams of geologists focused on gold's similarity to uranium in terms of site selection, mining and processing techniques. Gold is also very easy to sell on the spot market.

The Business Unit's mining operations cover particularly long cycles requiring significant capital expenditures over several years before mining operations [per se] begin, i.e. when the first deliveries of uranium are made and the first revenues collected. Then, cash flow increases before once again falling off in the final years of operation. The first phases of exploration consist of 1) the detection of surface indicators using aerial geophysical prospecting, which is made possible by the radiation emitted by the uranium rock, 2) geochemistry and 3) surface geological investigations. This is followed by test drilling to make an initial estimate of the deposit's resources.

Once the attractiveness of the deposit has been confirmed, the drilling grid is tightened to refine the estimate of resources and confirm mining feasibility from both a technical and economic standpoint. These operations, which generally require an exploration permit eventually conferring mining rights, take an average of 10 to 15 years at an average cost of €50 million per deposit. AREVA's uranium exploration budget was around €13 million in 2004.

The reclamation of mining sites operated by AREVA is an important activity that calls for specialized mining and civil engineering techniques and calls on a full range of disciplines from the earth and life sciences.

To date, AREVA has spent over €300 million to dismantle mining facilities and reclaim the sites of some 10 mining sectors in France, Gabon, the United States and Canada.

Once reclamation is completed, the land is replanted and radiologically monitored over long periods of time (in France, that period is ten years). In France, mill tailings are listed by Andra, the French radioactive waste management agency. They remain AREVA's responsibility and are subject to special environmental and radiological monitoring.

Exploration is an ongoing activity for the Mining Business Unit. In 2004, exploration focused on the origins of deposits and on improving mining and ore processing methods. The Business Unit spent €16 million on mineral exploration and mine development in 2004, or 3% of its sales revenue.

5.3. AREVA's resources, reserves and production sites

The mineral reserves in deposits accessible to AREVA are around 142,000 tons of uranium, or more than 20 times its production in 2004. The reserves in the ground are supplemented with so-called secondary sources. In particular, AREVA has access to the equivalent of close to 26,000 tons of natural uranium during the 2004 to 2013 time frame, or about 2,600 tons per year, in connection with so-called HEU agreements to reuse uranium from Russia's dismantled nuclear weapons.

The volume of resources is around 236,000 tons, including reserves. In addition, AREVA had nearly 250,000 tons of additional mineral resources in the ground, which were reported as "Other mineral resources" at year-end 2004.

The Group's total underground mineral resources in the ground thus come to nearly 490,000 tons of uranium.

AREVA is expanding its research and exploration activities around sites that have already been mined in well characterized geological settings or in little-explored regions with promising uranium potential, notably Australia.

The timetables for these activities spans more than ten years.

In Niger, Canada and Kazakhstan, AREVA's three main areas of commercial operations, the Group now operates mainly through several joint ventures.

5.4. Operations and highlights

AREVA sold 12,470 tons of uranium in 2004, including traded amounts, and produced 6,125 tons, for 10% increase compared with 2003. The increase is attributable to a return to normal production at the McArthur mine in Canada, which was shut down for three months in 2003 following a flood in April of that year. AREVA also had secondary resources, in particular those resulting from the HEU agreements described earlier. In 2004, the Group is preparing to mine new deposits to substitute for the so-called secondary reserves in time.

On December 20, 2004, having receiving the necessary approvals from the Canadian Nuclear Safety Commission (CNSC), the project partners decided to bring the Cigar Lake mine on line in 2007. This deposit is one of the richest in the world.

When operating at full capacity, the mine will contribute around 2,600 tons of uranium annually to the Group's total production.

In Kazakhstan, the heads of AREVA and Kazatomprom signed a series of agreements on April 28, 2004 laying out new commercial and financial conditions for their partnership. This launched the industrial phase of Katco's uranium production project. Katco is a 51%-owned subsidiary of AREVA located in Kazakhstan. It is expected that Katco will have built the bulk of its new facilities by year-end 2005 and should begin mining the Tortkuduk and Muyunkum deposits. Katco will gradually raise its uranium output to 1,500 tons a year. A new plant with a total capacity of 2,000 tons will produce concentrates in oxide form. The subsidiary will contribute to the social and economic development of a region where uranium constitutes the main source of wealth.

AREVA signed a mining agreement with the Niger Government in September 2004. The agreement allows it to apply for a permit for ground exploration in targeted and promising areas. After a thirty-year hiatus, geologists will resume prospecting in one of the world's richest uranium-bearing regions.

Gold production stood at nearly 4 tons in 2004, a 10% decline from 2003. The resumption of production at the Ity mine in Côte d'Ivoire partly offsets the scheduled shutdown of the Angovia mine in the same country in 2004, and a slight drop in production in Australia.

B) Strategic importance of Australia's uranium resources and any relevant industry developments

Commonwealth Discretion

Through the approval process for sales of the uranium concentrates and the eighteen bilateral export agreements the Commonwealth has set up with various countries and the various safeguards, the Australian Government has the opportunity to exercise its discretion in regards to its uranium export. As the gap between production and requirements for nuclear reactors operations grow (particularly in SE Asia), future bilateral export agreements and contracts with countries such as China are likely to increasingly reflect Australian requirements and security concerns.

Uranium Facts

In the last forty years uranium has become one of the world's most important energy minerals. It is used almost entirely for making electricity, though a small proportion is used for the important task of producing medical isotopes.

Uranium averages about two parts per million of the earth's crust. Traces of it occur almost everywhere. It is more abundant than gold, silver or mercury, about the same as tin and slightly less abundant than cobalt, lead or molybdenum. Vast amounts of uranium also occur in the world's oceans, but in much lower concentrations.

Most of the uranium ore deposits at present being mined have average grades in excess of 0.10% of uranium - that is, greater than 1000 parts per million. Some uranium is also recovered as a co-product with copper, as at Olympic Dam in Australia, or as a by-product from the treatment of other ores, such as the gold-bearing ores of South Africa. In these cases the concentration of uranium may be as low as a tenth of those in orebodies mined primarily for their uranium content.

The existence of uranium in Australia has been known since the 1890s. In the 1930s ores were mined at Radium Hill in South Australia to recover minute amounts of radium for medical purposes. As a result a few hundred kilograms of uranium were also obtained and used mostly to produce colours in glass and ceramics.

The first major producer of uranium in Australia was the Government-owned Rum Jungle project in the Northern Territory which operated from 1954 to 1971. It was closely followed by Radium Hill in South Australia, then Mary Kathleen in Queensland.

As a result of intensive exploration in the late 1960s Australia began to emerge as a potential major source of uranium for the world's nuclear electricity production. At the beginning of the 1970s a series of important discoveries was made, particularly in the Northern Territory. Names like Ranger, Jabiluka and Nabarlek, all in the Northern Territory; Yeelirrie in Western Australia; Olympic Dam in South Australia became familiar.

Today Australia's share of the world's uranium resources in the low cost category (< US$80/kg U) is 29% (IAEA/NEA, 2003). Other countries with major uranium deposits are Canada, Kazakhstan, South Africa, Namibia, the Russian Federation and Niger.

Table 1. Estimated Recoverable Resources of Uranium in the ≤ US$80/kg U category [OECD "Red Book", 2004]

	t U	% Total
Australia	702,000	29%
Kazakhstan	384,625	16%
Canada	333,834	14%
South Africa	231,664	9%
Namibia	139,297	6%
Russian Federation	124,050	5%
Niger	102,227	4%

Uranium Resources in Australia

Uranium exploration within Australia has been in decline for a number of years, somewhat dissociated from the significant remaining potential for discovering new world-class orebodies. Australia contains the world's largest resources in the ≤US$80/kg U Reasonably Assured Resources (RAR) category [OECD "Red Book", 2004]. The majority of these resources are contained within diverse mineralised settings, for example iron oxide copper-gold- uranium, unconformity-related, sandstone and calcrete, indicating the wide variety of world-class targets possible within Australia (Figure 1).

Recently, interest for uranium in Australia has been piqued, largely as a result of the increase in the world's demand for uranium product. However, the renewed interest is also as a result of local influences such as a more balanced assessment of the nuclear industry by some legislators, commentators and the public at large. The increase in the uranium price also has obvious financial incentives for discovering a new uranium deposit (or re-invigorating a dormant resource) resulting in a number of new uranium explorers recently appearing on the Australian market and the inclusion of the commodity into established companies portfolios.

Many of these smaller companies, as well as the larger established uranium explorers, are now spreading into new regions that have either undergone sporadic exploration or none at all.

Notwithstanding this new interest in uranium exploration around Australia, exploration expenditure is still greatest in both South Australia and the Northern Territory, presently the only provinces where uranium production is ongoing and whose respective government's have given approval to the extraction of uranium product. Most State governments in Australia have policies against the production of uranium and Western Australia in particular is preparing legislation specifically prohibiting uranium extraction.

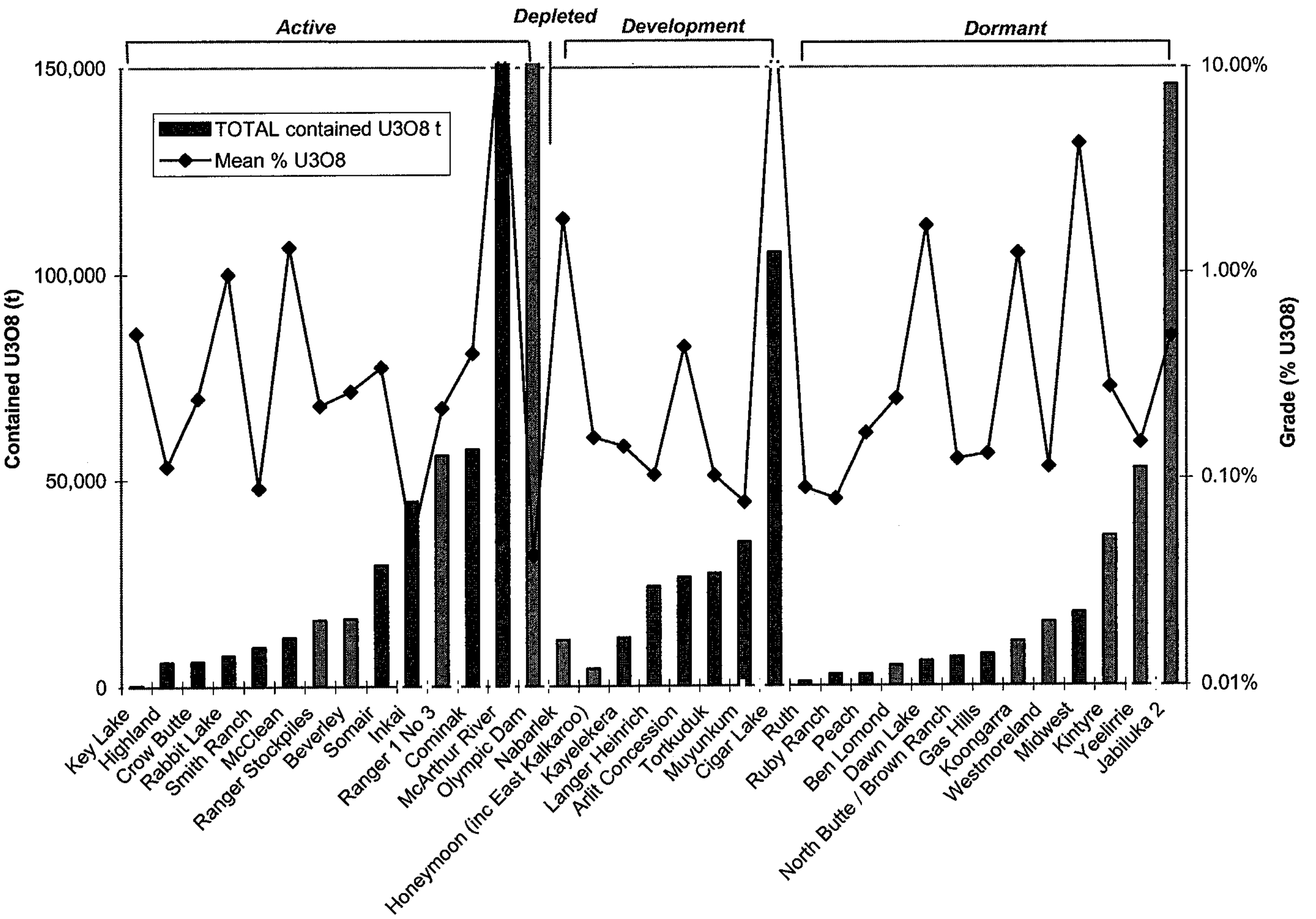

Figure 1. Total combined resources of selected uranium deposits. Orange bars refer to Australian deposits. Note that both Olympic Dam (Australia) and McArthur River (Canada) contain more than 150,000 t U_3O_8.

Importance for the Nation

The overall economic importance to the various states and territories is highlighted by table 2 (below) illustrating possible revenues from uranium sales for the most significant resources identified as of today. The figures below are based on the following assumptions:

- A metallurgical recovery of 90% for open cut and underground operations,
- An overall recovery of 60% for sediment-hosted projects (utilising In Situ Leaching methods), and
- Current reserves or (if not available), measured and indicated resources calculated at a sale price of US$26/lb U_3O_8 and an exchange rate of US$0.78.

Although royalty systems vary from a state to another, the potential significance of these resources to state treasuries cannot be underestimated.

Table 2. Possible revenues from uranium sales for the most significant undeveloped resources in Australia

State	Orebody	Potential value in the ground (million A$)	Total value per state (million A$)
NT	Jabiluka	10,500	11,923
	Koongarra	917	
	Angela	506	
WA	Kintyre	1,580	5,517
	Yeelirrie	2,300	
	Mulga Rock	660	
	Manyingee	~300	
	Oobagooma	438	
	Lake Way	239	
SA	Honeymoon	123	200
	Gould's Dam	88	
Qld	Ben Lomond	264	1,551
	Maureen	198	
	Valhalla	1,090	

The mining of these orebodies will also maintain a high level of competency within Australia in what is a highly specialised field of mining, as well as providing countless job opportunities both directly and indirectly through contractors and support companies.

Importance for the Region

Arguably though, the most significant contribution of the industry is at a more regional level where it significantly impacts on:

a) Housing and infrastructure, through the establishment of mining facilities and access roads, railways…
b) Local employment, usually promoted as part of the various approval processes
c) Health monitoring of local employees
d) Training and education: ongoing training of on-site personnel is considered standard practice in the mining industry and the uranium mining industry is no exception, with a special emphasis on occupational health and safety
e) Sports and recreation, usually benefiting not only the mine site but also surrounding communities

D) Current structure and regulatory environment of the uranium mining sector (noting the work that has been undertaken by other inquiries and reviews on these issues)

Legislation and Regulation of the Uranium Mining Sector

A significant number of safeguards are present in the uranium mining industry within Australia, commencing from earliest exploration through to the export of natural uranium products ("yellowcake"). All of the Mining Acts, Regulations and Guidelines prepared by the State Governments generally incorporate clauses and rules that apply specifically to radioactive substances. Furthermore, various forms of legislation exist that deal specifically with the exploration for and mining of uranium (or other naturally occurring radioactive substances). These various laws, rules and guidelines provide strict measurements on both the procedures and performance by which a uranium explorer and miner must abide.

From an international perspective Australia, as a member state of the International Atomic Energy Agency, must always ensure compliance with the Nuclear Non-Proliferation Treaty (NPT) and as a further safeguard have allowed the IAEA complementary inspection access through being a signatory to the Additional Protocols agreement. Within Australia, the Commonwealth Government have enacted a number of Acts, Regulations, and Parliamentary Inquiries (most recently in October 2003) into the uranium industry all of which have precipitated in strengthened safeguards for the industry.

Senate Inquiry October 2003

The most recent inquiry into the uranium industry was conducted by the *Environment, Communications, Information Technology and the Arts References Committee* and was entitled "Regulating the Ranger, Jabiluka, Beverley and Honeymoon uranium mines". The inquiry was convened to determine the effectiveness and adequacy of the (then) current system of environmental regulations as applied to the four uranium projects – only two of which are in operation.

Findings of the committee included, amongst others:

- The exclusion of the Traditional Owners from the decision making process;
- The roles of the Commonwealth and State Governments and other agencies, the lack of clearly defined responsibilities between these bodies, and at times the apparent conflict of interest that these Departments operate under, and;
- Dispute between various parties as to what represents the appropriate level of contamination acceptable in environmental monitoring.

A number of findings and recommendations of the committee are at odds with an objective and balanced assessment of the uranium mining industry in Australia. These would include the recommendation that the Honeymoon project should not be allowed to proceed citing that mining by in-situ leaching processes is an experimental technology. However, some of the major findings and recommendations of the inquiry, such as greater transparency and independence of the various agencies, are entirely valid and are being implemented.

The Regulatory Environment

Outlined below are the various processes applying to today's exploration and mining activities in Australia, with a special emphasis on the processes that apply to uranium.

Some of the processes discussed below result directly from regulatory requirements[1] and codes of practices, whilst others have simply become accepted standards in the mining industry.

Assessment processes

Assessment processes differ depending upon the activity, be it initial exploration, development or mining. However all these activities require a number of surveys to be completed before formal approval can be considered.

Ethnographic, anthropological, archaeological and heritage surveys

Initial ethnographic, anthropological and archaeological impact assessments of the proposed activities are conducted by anthropologists and/or archaeologists accompanied by traditional owners. This team will establish the presence of sites of cultural and/or mythological significance as well as sites of significance when it relates to early European settlements.

Depending upon the outcomes of the surveys, different conditions will be imposed upon the mining company in regard to the protection of the sites. These sites will also be registered in a national database.

Environmental management, fauna and flora surveys

Due to the sensitivity relating to the nuclear industry in Australia, exploration and mining for uranium in the recent past has been subjected to much more stringent checks and environmental assessment processes than activities with similar impacts. Given the remoteness of most uranium resources in Australia, conducting detailed ecological and environmental studies of the areas under consideration has become an accepted standard practice.

Any development of uranium resources, be it through an open cut, underground or in-situ leaching operation, requires the highest level of assessment to be carried out through the preparation of an Environmental Impact Statement and Environmental Management Programme (ERMP, or EMP depending on the State).

Prepared by multi-disciplinary teams, these documents will state the proposed action, analyse the rationale for that action (including the consequences of not going ahead with that project), and provide a detailed description of the project, including all technical data relevant to the assessment of a projects impact on the environment. Once established, all criteria form the basis of the legally binding conditions under which a given project will operate.

In environmentally sensitive areas, the early stages of exploration will most probably be subject to an EIS.

Assessment of competing and/or complementary interests for the land

Mining of a different commodity/industrial mineral

Albeit a rare occurrence, it is possible that competing uses for the same land arise from different mining companies in regards to different commodities. In that case, the responsibility is primarily with the Minister for Resources of the given State to prioritise the competing activities. The Minister will need to consider all aspects of the proposals, including the economic potential, the long-term impact, and the possibilities of sequencing or combining the projects.

[1] Such as the Atomic Energy Act and the Radiation Protection and Control Act and Regulations at the federal level or various Dangerous Goods and Transport Acts, Occupational Health and Safety Act and Mining Acts at the state level.

Pastoralist activities

In most states where uranium exploration and mining take place, pastoralists are the prime caretakers of the land and as such also represent the best source of local knowledge of the ground. Exploration activities take place in accordance with local conditions and rules regarding timing, nature of work and degree of disturbance to the activities of the pastoralists.

Tourism

The local governments and administrators have much to gain from closely cooperating with mining and exploration companies and tourism operators. Investments by the mining industry in an area can justify the building and maintenance of numerous infrastructure networks as well as sustain the survival of a number of facilities, thus making tourism economical in remote regions of Australia.

Consultation processes

Work programmes

All uranium exploration programmes are generally submitted to local Native Title Councils and the State Department for Mineral Resources, occasionally accompanied by site visits to assess the potential impact of exploration. Local authorities are also actively involved in establishing acceptable levels of reporting for environmental management and rehabilitation.

Historically, these work programmes have generally ensured a minimum level of understanding and participation from local authorities and elders.

Although approval systems vary, exploration programmes need to be approved by both Local and State Government agencies and councils before proposed exploration could take place.

In the past, a successful way of reaching sustainable agreements with local communities has been achieved through the appointment of an aboriginal liaison officer.

Royalties

All royalty negotiations with Traditional Owners and other recognised landowners are dependent on the quantity of uranium produced and the commodity price. Consultation with the local authorities will determine an acceptable royalty to compensate landowners for restricting access to parts of their land.

Approval processes

A number of approval processes are in place today to oversee all stages of a uranium exploration and mine project.

Approval of exploration activities

Approval of exploration activities starts with the grant of tenements, which requires national advertising and clearance of drill sites and other areas that may be subject to significant disturbance. Where applicable, permits to work on aboriginal land are also required.

Approval of mining activities

In addition to various provisions by State legislation affecting all mining activities, the mining of uranium is also tightly controlled by various codes of practice designed by the Australian Government to administer the mining, processing and transportation of radioactive materials. A project will only be allowed to commence after gaining full approval from regulatory authorities.

In addition to these codes of practice, State Mining Acts regulate issues such as monitoring radiation exposure of employees, water and fauna/flora management and dust minimisation practices.

Veto

Aboriginal local councils and/or communities currently hold a very powerful bargaining tool in the form of a veto on exploration and/or mining activities on aboriginal land. Additionally, explorers and miners are obligated to negotiate with the land councils or traditional owners on land for which claims have been registered under the National Native Title Tribunal. This effectively precludes any activity from mining companies prior to a conditional agreement between the parties.

In the past (particularly in the Northern Territory), this power has been used on a number of occasions with activities resuming only when a full exploration and mining management plan amenable to the local council could be implemented.

Ongoing environmental monitoring

In addition to the various permits discussed above, following the start of mining activities a company has an obligation to submit monitoring results at prescribed intervals over the relevant projects. Continuous monitoring generally extends past the completion of mining and rehabilitation activities to guard against any long-term effects. There is generally no time limit to the monitoring activities and they are only declared complete after mutual consent between the company, local council and the regulatory authority.

Approval of decommissioning and rehabilitation

A bank guarantee or bond is arranged by the company prior to the commencement of any mining operation to ensure rehabilitation costs will be recovered if the company is unable to undertake the work. The value of this bond is reviewed at regular intervals and updated to reflect amendments to the activities, environment or legislation.

Cultural and Heritage Management Plan

Although still at an early stage, more mining activities in the future will operate under a Cultural and Heritage Management Plan (CHMP) where it is established that its activities have the potential to impact sites of significance of both Aboriginal and European heritage. These plans define the level of protection required for the project to operate and detail the rehabilitation and restoration standards that will be required on completion of the decommissioning.