COUNTRY NOTES

The Country Notes on Uranium have been compiled by the Editors, drawing principally upon the following publication: *Uranium 2005: Resources, Production and Demand* (known as the Red Book); 2006; OECD Nuclear Energy Agency and International Atomic Energy Agency.

Information provided by WEC Member Committees and from other sources has been incorporated when available.

Algeria

Uranium exploration began in 1969, with an aerial radiometric survey in 1971 leading to the identification of numerous promising areas. However, follow-up investigations gradually petered out, and there has been no exploration or prospecting activity in recent years. In-situ RAR at less than US$ 80/kgU have been assessed as 26 000 tonnes U, of which an estimated 75% is recoverable, but no production has ensued.

Argentina

Exploration for uranium started in the early 1950s, since when deposits have been discovered in a number of locations, mostly in the western part of the country and in the southerly province of Chubut in Patagonia. During the 1990s, a countrywide programme of exploration directed at the evaluation of areas with uranium potential was undertaken. Regional assessment of uranium potential continues, with selected areas of interest being studied in greater depth. Several Canadian companies have been involved in exploration activities in recent times.

Uranium was produced on a small scale from the mid-1950s, with cumulative production reaching 2 631 tonnes by the end of 1999. Since then, output has been in abeyance. The production centre at San Rafael in the province of Mendoza, which processed ore from the Sierra Pintada deposit, has been placed on a standby basis. In June 2004, the state agency CNEA, which since 1996 has owned and operated Argentina's uranium industry, presented a proposal to reactivate the San Rafael complex, but in early-2007 a firm decision to reopen the plant had not yet been taken.

Proved reserves of uranium, in terms of RAR recoverable at less than US$ 80/kgU, were 4 880 tonnes at the beginning of 2005. Further Identified Resources comprised 2 200 tonnes of RAR, recoverable at US$ 80-130/kgU and 8 560 tonnes of IR recoverable at less than US$ 130/kgU. Undiscovered resources (at the latter cost level) consisted of 1 440 tonnes of PR.

Australia

Exploration activities between 1947 and 1961 led to a number of uranium discoveries, including the deposits at Mary Kathleen (Queensland), Rum Jungle (Northern Territory) and Radium Hill (South Australia). A decrease in

uranium requirements for defence purposes induced a virtual cessation in exploration between 1961 and 1966. Activity picked up again during the late 1960s, as civilian export demand accelerated, and numerous major deposits were located.

In 1983 the Government introduced the so-called 'three mines' policy, which permitted uranium exports only from the Nabarlek, Ranger and Olympic Dam mines. This restrictive measure, with its dampening effect on uranium exploration, lasted until 1996. Exploration expenditure and drilling activity rose in the latter half of the 1990s, but declined to historic lows in 2001 and 2002. Exploratory activity increased sharply in 2003-2005, and was concentrated on parts of the Northern Territory and South Australia.

Australia produced 9 519 tonnes of uranium in 2005, up significantly from previous years' output, bringing cumulative output to more than 131 800 tonnes since 1954. Three uranium production centres were in operation in 2005: Ranger (open-pit mine, production capacity 4 660 tU/yr), Olympic Dam (underground mine at present, possibly also open pit in the future, current production capacity 3 930 tU/yr) and Beverley (in-situ leaching, production capacity 848 tU/yr). In August 2005 BHP Billiton began a two-year environmental assessment of the proposed expansion of its Olympic Dam operation. A new centre with a production capacity of 2 290 tU/yr has been constructed at Jabiluka, but the facility has been on a standby and environmental maintenance basis since 2000. An ISL production centre is planned for the Honeymoon deposit, with production expected to begin in early 2008, according to the owners, sxr Uranium One Inc.

Total Australian production dropped to 7 593 tU in 2006, primarily because of pit flooding and acid-plant problems at Ranger early in the year.

Reasonably Assured Resources (RAR) are reported in the Red Book as 714 000 tonnes at less than US$ 80/kgU and 33 000 tonnes at US$ 80-130/kgU. Inferred Resources (IR) recoverable at these cost levels are 360 000 and 36 000 tonnes, respectively. Compared with the levels in the 2004 Red Book, there were increases at the less-than-US$ 80 level in both RAR and IR, reflecting a revised assessment of the resources at Olympic Dam, the world's largest uranium deposit.

Brazil

Exploration activity over a period of some 40 years, ending in 1991, resulted in the discovery of occurrences and deposits of uranium in eight different areas of Brazil. Total Identified Resources are substantial, consisting of RAR of 157 700 tonnes (recoverable at less than US$ 80/kgU) plus IR of 121 000 tonnes. Undiscovered conventional resources are put at 300 000 tonnes of PR recoverable at under US$ 80/kgU and 500 000 tonnes of SR with no cost range assigned.

Although Brazil's RAR are very substantial, and backed up by massive additional resources, its

uranium output has never been on a commensurately large scale: cumulative production at end-2005 was not much more than 2 000 tonnes. Output in 2004 was 300 tU but dropped to 110 tU in 2005 owing to environmental disputes. Mine output recovered to 183 tU in 2006.

After 2 years on standby, the 360 tU/yr Poços de Caldas production centre in Minas Gerais state was definitively shut down in 1997 and is now being decommissioned. It has been replaced by a new plant (now called Caetité) at Lagoa Real in the eastern state of Bahia. The Caetité plant has a current nominal production capacity of 340 tU/yr.

Another production centre, at Itataia in north-eastern Brazil, is scheduled to commence operations in 2007. Its annual uranium production capacity, as a by-product of phosphate output, is planned to be 680 tonnes.

Brazil's conventional resources are supplemented by unconventional resources, for which there are at present no plans for recovery:

- carbonatite (containing 13 000 tonnes U);
- marine phosphates (28 000 tonnes U);
- quartz-pebble conglomerates (2 000 tonnes U).

Canada

Canadian production began in 1942 when uranium was extracted from pitchblende ore from Port Radium, Northwest Territories, which had been mined since the 1930s for its radium content. During the post-war period, uranium deposits were discovered and developed in the Beaverlodge area of northern Saskatchewan and in the Elliot Lake area of Ontario. Demand for uranium increased in the 1960s as the use of nuclear power expanded. After the discovery of large high-grade deposits in the Athabasca Basin in the 1970s, Saskatchewan became Canada's main producer and output from Ontario was gradually phased out, ceasing altogether in 1996.

Canada is the world's largest producer of uranium, with 28% of total world production (2005), about 85% of which is destined for export. In 2005, Canada produced a total of 11 629 tU, valued at over US$ 520 million, all from northern Saskatchewan. This output comes from three production centres, two of which are operated by Cameco Corporation (Key Lake/McArthur River and Rabbit Lake) and the other operated by AREVA Resources Canada Inc. (McClean Lake). The ore is mined from high-grade deposits (up to 23% uranium) which have grades that are one to two orders of magnitude greater than found elsewhere in the world. Production in 2006 appears to have declined by 15% to 9 863 tU.

Two additional mines – Cigar Lake and Midwest - are scheduled to begin production in Saskatchewan in the future. The Cigar Lake Mine is currently being developed and is expected to begin production in 2009. Serious flooding of the underground development area in

October 2006 has delayed the start-up date, which had been scheduled for early-2008. The project leader, Cameco, is devising a comprehensive remediation plan. A proposal to develop the Midwest deposit is undergoing an environmental assessment.

Canada currently holds 9% of world uranium reserves; at 1 January 2006 it had 333 000 tU of RAR at up to US$ 80/kgU and 96 000 tU of IR at less than US$ 80/kgU, while undiscovered resources at below US$ 130/kgU are estimated to be 850 000 tU, of which 150 000 tU are PR and 700 000 tU are SR.

Owing to rising uranium prices, exploration is presently very active in many regions of Canada and the prospects for finding additional resources are excellent.

Chile

Exploration activities have been carried out since the early 1950s, leading to the detection of numerous areas of interest and uranium occurrences. However, no production has so far ensued.

For the 2005 Red Book, Chile has reported in-situ RAR as 748 tonnes and IR as 1 183 tonnes, with no cost ranges assigned. The IAEA/NEA has allocated both amounts to the less than US$ 130/kgU category and assumed a recovery factor of 75% in each case. Undiscovered resources comprise 4 142 tonnes of PR at up to US$ 130/kgU and 2 360 tonnes of SR, with an unassigned cost range.

China

More than 50 years of exploration for uranium have resulted in the discovery of deposits in various parts of the country. The major resources are in Jiangxi and Guangdong provinces in the south-east, in Liaoning province to the northeast of Beijing and in the Xinjiang Autonomous Region of north-western China. In April 2007, it was announced that future uranium exploration would focus on the Yili Basin in Xinjiang and the Ordoo Basin in Inner Mongolia.

Total Identified Resources in ten locations are stated to be 85 000 tonnes (in situ), an increase of 8 000 tU over the level reported for the 2003 Red Book, but with no breakdown by cost category. For the 2005 edition of the Red Book, recoverable RAR at less than US$ 80/kgU have been estimated as 38 019 tonnes and IR in the same cost bracket as 21 704 tonnes. Undiscovered resources have been retained at the 2003 levels of 3 600 tonnes of PR and 4 100 tonnes of SR.

There are five operational production centres, with an aggregate nominal capacity of 840 tU/yr. Construction of a new production centre at Fuzhou is in hand. China, the only producing country in East Asia, does not report official production figures. Production is estimated to have been 730 tU in 2004 and 750 tU in 2005, primarily from underground mining. Given its nuclear power expansion plans and, in order to avoid overdependence on foreign sources of uranium, there are determined efforts under way for further exploration, the development of mines and the improvement of mine productivity.

Colombia

Although no resource data were reported to the IAEA/NEA for their 2005 Red Book, Colombia is still quoted as possessing 11 000 tonnes of uranium in the PR category and 217 000 tU of SR, both amounts on an in-situ basis, at less than US$ 130/kgU. No production of uranium has so far been recorded.

Czech Republic

After an early start in 1946, uranium exploration in the republic was systematic and intensive during a period of more than 40 years. From 1990, however, expenditure decreased sharply, with field exploration coming to an end early in 1994.

There are 23 uranium deposits, of which 20 have been mined-out or closed. The Rozná deposit is being mined and two others may be exploited in the future. The Straz production centre has been closed but some ISL extraction is continuing under a remediation regime. Output from Czechoslovakian mines began in 1946 and until 1990 was all exported to the Soviet Union. Production in 2005 amounted to 408 tonnes, giving a cumulative output of about 109 500 tonnes. The Rozná mine had been scheduled to close in mid-2006 but the sharp increase in the price of uranium means that it can operate profitably until at least the end of 2008.

As a result of the Straz deposit being deemed uneconomic, and of the depletion of resources at the Rozná production centre, RAR declined to 510 tU at the end of 2005 and IR to only 60 tU, both recoverable at up to US$ 80/kgU. Undiscovered resources (on an in-situ basis) comprised 180 tonnes of PR recoverable at up to US$ 80/kgU and 179 000 tonnes of SR, unassigned to a cost category.

Finland

Exploration for uranium took place during the period 1955-1989, resulting in the identification of four uranium provinces. Proved reserves (RAR at US$ 80-130/kgU) amount to 1 500 tonnes, of which 75% is regarded as recoverable. Unconventional resources are represented by possible by-product production of 3 000-9 000 tU from Talvivaara black shales and 2 500 tU from Sokli carbonatite.

Finland's past production of uranium has been limited to the minor quantity (circa 30 tU) produced by a pilot plant at the Paukkajanvaara mine in eastern Finland, which was operated from 1958 to 1961.

Recent years have witnessed a revival of interest in exploration for uranium, with a number of new licences being awarded by the Ministry of Trade & Industry in October 2006 and January 2007.

France

Exploration for uranium commenced in 1946 and during the next 40 years a number of deposits were located. Exploration activities have now ceased and production is confined to small amounts obtained during remediation. Total

output in 2005 was only 6 tonnes, bringing the cumulative tonnage to 76 000 tonnes. Since the closure of France's last uranium mine (Jouac) in 2001, RAR have been put at zero; inferred resources are 11 740 tonnes, recoverable at below US$ 130/kgU.

The last French ore-processing plant, at Le Bernardan in the north-western part of the Massif Central, ceased operations in 2001.

Gabon

Exploration by the French Commissariat à l'Energie Atomique (CEA) led to the discovery in 1956 of a substantial deposit of uranium ore near Mounana in south-eastern Gabon. Further deposits in the Franceville Basin were located during 1965-1982. Exploratory activity continued until the late 1990s. Signs of a revival of interest in Gabon's uranium resources were evident in March 2006 when a press release announced that two Canadian corporations, Cameco and Pitchstone Exploration, had signed an agreement with Motapa Diamonds Inc. to jointly explore Motapa's uranium exploration licences in the Franceville Basin.

Uranium production from the Mounana production centre began in 1961 and built up to a peak of around 1 250 tpa by the end of the 1970s. Subsequently output followed a declining trend, ceasing altogether in early 1999. The last underground mine, exploiting the Okelobondo deposit (discovered in 1974), closed down in November 1997. An open-pit operation at the Mikouloungou deposit (discovered in 1965) was in production from June 1997 to March 1999, since when Gabon has ceased to be a uranium producer.

Gabon's cumulative production of over 25 000 tonnes of uranium indicates its historic significance as one of the leading minor producers.

Known conventional resources of uranium in Gabon amount to just under 6 000 tonnes, comprising 4 830 tonnes of RAR recoverable at less than US$ 130/kgU, and 1 000 tonnes of IR in the same price category.

Germany

Prior to Germany's reunification in 1990, the GDR had been a major producer of uranium, with a cumulative output of some 213 000 tonnes. All uranium mines have now been closed and the only production relates to uranium recovered in clean-up operations in the former mining/milling areas: 2005 output from this source was 77 tonnes, obtained during the decommissioning of the Königstein mine in Saxony.

Germany's Identified Resources of uranium total 7 000 tonnes, comprising 3 000 tonnes of RAR recoverable at less than US$ 130/kgU, and 4 000 tonnes of IR in the same price category. Speculative Resources are put at 74 000 tonnes, with their cost range unassigned.

Greenland

Exploration for uranium was carried out for more than 30 years (1955-1986), with moderate success. Fairly sizeable quantities of in-situ uranium resources were reported for Greenland in the 2003 Red Book (there was no national report in the 2005 edition): 27 000 tU of RAR and 16 000 tU of IR, 75% of both being recoverable at US$ 80-130/kgU, together with an in-situ 60 000 tU in the speculative category, most of which was deemed to be recoverable at less than US$ 130/kgU. No production of uranium has yet taken place.

Hungary

Uranium exploration commenced in the early 1950s, with the Mecsek deposit in southern Hungary being discovered in 1954. An underground mine came into production at Mecsek in 1956. Initially the raw ore produced was shipped to the USSR, but from 1963 onwards it passed through a processing plant at Mecsek before being shipped as uranium concentrates.

Mining and milling operations at the Mecsek site were shut down at the end of 1997. Cumulative production of uranium, including a relatively small amount derived from heap leaching, was about 21 000 tonnes. Since 1998, the only production has been of very small quantities (currently about 4 tonnes per year) obtained as a by-product of water treatment activities.

An Australian company, Wildhorse Energy, was granted a uranium exploration licence in January 2007 for its Máriakéménd project in the Pécs region of southern Hungary, in the vicinity of the former Mecsek operation.

Hungary's remaining known conventional resources of uranium, as reported to the IAEA/NEA, are 18 399 tonnes of PR, 75% of which is deemed to be recoverable at less than US$ 130/kgU.

India

Exploration for uranium began in 1949, since when deposits have been located in many parts of the country. Exploratory activity is continuing, with expenditure of around US$ 20 million per annum. Uranium has been produced at the Jaduguda mine in the eastern state of Bihar since 1967. In 2005, output from this and three other mines in the same area (Narwapahar, Bhatin and Turamdih) was some 230 tonnes. The recovery of uranium as a by-product of copper refining has been temporarily suspended.

RAR (with their cost range unassigned) are reported as 54 800 tonnes. Other Identified Resources consist of just over 29 800 tonnes classified as IR, also without an assigned cost range (both were allocated to the less than US$ 130/kgU category in the Red Book). Both these amounts are expressed on an in-situ basis, thus recoverable tonnages would be substantially lower. IAEA/NEA estimates imply average recovery factors of approximately 78% for India’s RAR and about 75% for its IR. Undiscovered conventional resources consist of 12 100 tonnes of PR and 17 000 tonnes of SR. Unconventional resources have been estimated

to amount to about 6 600 tonnes, recoverable from copper mine tailings in the Singhbhum district of the state of Jharkhand.

An ion-exchange/acid leaching (IX/AL) plant at Jaduguda processes ore from the Jaduguda, Bhatin and Narwapahar production centres, and is scheduled to process the output of a new underground mine at Bagjata, 30 km to the east. A new IX/AL plant being built at Turamdih will take ore from the adjacent mine as well as from the uranium production centres planned for Banduhurang and Mohuldih. New production centres planned for Lambapur-Peddagattu in Andhra Pradesh and Domiasiat in Meghalaya State will have their own ore-processing facilities at Seripally (IX/AL) and Domiasiat (solvent extraction/acid leaching), respectively.

Indonesia

The Nuclear Minerals Development Centre of the Indonesian National Atomic Energy Agency (BATAN) began exploring for uranium in the 1960s. Since 1996, exploratory work has tended to focus on the vicinity of Kalan in West Kalimantan. Exploration drilling has continued in recent years in a number of locations. No production of uranium has yet taken place.

At the beginning of 2005, Indonesia's RAR, on an in-situ basis and recoverable at less than US$ 130/kgU, amounted to 6 797 tonnes, of which about 7% fell within the less than US$ 80 bracket; Inferred Resources (at up to US$ 130) were 1 699 tonnes, in situ. For both RAR and IR, an estimated 68% was considered to be recoverable. Over and above these amounts, SR were put at 12 481 tonnes.

Iran (Islamic Republic)

Exploratory work has been undertaken for more than 20 years and a number of prospects have been defined, mostly in the central province. However, no production has yet ensued.

Small uranium production centres are planned for construction at Ardakan in central Iran (to use Saghand ore) and Bandar Abbas on the southern coast (to use ore from Gachin).

At the beginning of 2005 RAR (in situ) amounted to 491 tonnes, with IR assessed as 1 436 tonnes, with an estimated 77-78% of both being recoverable at US$ 80-130/kgU. Undiscovered conventional resources (in situ) consisted of 4 050 tonnes in the PR category plus 4 500 tonnes of SR, both recoverable at less than US$ 130/kgU. An additional 6 000 tonnes of SR, with cost range unassigned, was also reported.

Japan

Between 1956 and 1988, the Power Reactor and Nuclear Fuel Development Corporation (PNC) and its predecessor undertook domestic exploration for uranium, resulting in the discovery of deposits at two locations on the island of Honshu. Total discovered reserves, reported as RAR recoverable at up to US$ 130/kgU, were some 6 600 tonnes at the beginning of 2005.

Cumulative production of uranium in Japan amounts to only 84 tonnes, produced by a test

pilot plant operated by PNC at the Ningyo-toge mine between 1969 and 1982, together with a small-scale vat leaching test facility from 1978 to 1987.

Jordan

Uranium exploration got under way during the 1980s, since when a number of significant occurrences have been observed. Total Identified Resources are estimated to approach 100 000 tonnes of uranium. On an in-situ basis, Jordan's RAR are put at 37 500 tU and its IR at 60 000 tU, both at a production cost of less than US$ 40/kgU and with an estimated recovery factor of 81%. Prognosticated Resources at up to US$ 80/kgU are estimated to amount to a further 37 500 tU.

By-product resources consist of approximately 70 000 tU associated with phosphate deposits.

Kazakhstan

Uranium exploration commenced in 1948 and since then a large number of ore deposits have been located, initially in the districts of Pribalkhash (in southeastern Kazakhstan), Kokchetau in the north of the republic, and Pricaspian near the Caspian Sea. Since 1970 extensive low-cost resources have been discovered in the Chu-Sarysu and Syr-Darya basins in south-central Kazakhstan.

Production started in 1953, initial output being processed in Kyrgyzstan. Production centres in Kazakhstan were started up by the Tselinny Mining and Processing Company in 1958 (based on underground-mined ore) and by the Kaskor Company in 1959 (based on open-pit mining). Economic pressures forced the closure of the Kaskor plant in 1993 and of the Tselinny plant in 1995. Almost all subsequent uranium production has utilised ISL technology.

At the beginning of 2005 there were six ISL production centres in operation in Kazakhstan, with an aggregate production capacity of 4 700 tU/yr, together with one production centre linked with the Vostok underground mine, with a capacity of 1 250 tU/yr. Total output of uranium in 2005 was 4 357 tonnes, and cumulative national production now exceeds 32 700 tonnes. Provisional data show uranium production rising to 5 279 tonnes in 2006, and there are plans to raise it by over 30% to 6 937 tU in 2007.

Kazakhstan was the 3rd largest producer in 2005, but its RAR of 378 290 tonnes (recoverable at up to US$ 80/kg) put it in a much higher ranking - second only to Australia - and give it a 14.3% share in global resources at that cost level. In addition, there are well over 400 000 tonnes of other identified resources: 135 607 tonnes of other RAR (at US$ 80-130/kgU) and 302 000 tonnes of IR recoverable at costs of less than US$ 130/kgU.

Undiscovered resources (in situ) recoverable at costs below US$ 130/kgU are also massive: 310 000 tonnes of PR and 500 000 tonnes of SR.

The state entity KazAtomProm plans to increase Kazakhstan's uranium production to 15 000 tU/yr by 2010, aiming to make it the world's

largest producer. A number of new ISL facilities will be constructed, including several based on joint ventures with foreign corporations. A joint venture (APPAK LLP) with Sumitomo Corp. and Kansai Electric Power Company to construct and operate a mine at West Mynkuduk was established in January 2006. In June, commercial operations commenced at the KATCO joint venture with AREVA, whilst in December the Zarechnoye joint venture with Russia produced its first uranium. Other new mines are planned.

Malawi

Exploration during the 1980s led to the discovery of a uranium deposit at Kayelekera in northern Malawi. The Australian company Paladin Resources Ltd. is currently mounting a project for developing uranium production at Kayelekera, for which it was granted a Mining Licence in April 2007. The mine is scheduled to be commissioned in September 2008 and to reach its full annual production rate of 3.3 million pounds of U_3O_8 during second quarter 2009.

The last Red Book national report (2000) quoted uranium resources in the Kayelekera deposit as amounting to 11 700 tonnes (in situ). They were classified as RAR, 75% of which the IAEA/NEA estimated to be recoverable at less than US$ 80/kgU. No other uranium resources, either identified or undiscovered, were reported.

Mexico

Exploration for uranium came to an end in 1983: at that point, known in-situ resources totalled 2 400 tonnes recoverable at US$ 80-130/kgU, comprising 1 700 tonnes of RAR and 700 tonnes of IR: the IAEA estimates that 75% of these tonnages would be recoverable. Additional undiscovered resources (in situ) amounted to 13 000 tonnes, the bulk of which (10 000 tonnes) were speculative.

Unconventional resources contained in marine phosphates in Baja California amount to about 150 000 tU, as assessed in the early 1980s.

For a short period (1969-1971), molybdenum and by-product uranium were recovered from a variety of ores at a plant in Aldama, Chihuahua state. Uranium output totalled 49 tonnes: there are presently no plans for resuming production.

Mongolia

In-situ resources have been assessed as 61 600 tonnes of RAR and 21 000 tonnes of IR, both at up to US$ 80/kgU, plus 1.39 million tonnes of SR at less than US$ 130/kgU. In assessing recoverable resources, the IAEA/NEA applies a recovery factor of 75% to Mongolia's in-situ RAR and IR tonnages. Despite the considerable size of its Identified Resources, Mongolia’s recorded cumulative production of uranium amounts to only 535 tonnes. The tempo of exploratory activity has increased in recent years. A number of Canadian companies have become involved, either through purchasing prospective areas or by obtaining exploration licences.

Namibia

Although uranium mineralisation had been detected in the Rössing Mountains in the Namib

Desert in 1928, extensive exploration for uranium did not get under way until the late 1960s. The major discovery was the Rössing deposit, located to the north-east of Walvis Bay; other discoveries were made in the same area of west-central Namibia, notably the Trekkopje and Langer Heinrich deposits.

UraMin Inc., a UK/South African company, was granted exploration licences for Trekkopje and the surrounding area in November 2006, and aims to bring a new production facility into production as soon as possible. The Langer Heinrich deposit was acquired by an Australian company, Paladin Resources Ltd., in August 2002. Since then the company has constructed a new mining and processing facility, with a nominal production capacity of 1 000 tU per annum. The processing plant came into operation in December 2006 and is scheduled to reach its designed production rate by mid-2007.

A large open-pit mine operated by Rössing Uranium Ltd (68.58% owned by Rio Tinto Zinc, 3% by the Government of Namibia, 15% by the Government of Iran, 10% by the Industrial Development Corporation of South Africa and the balance by individual shareholders) has been in production since 1976; output in 2005 was 3 147 tonnes, with cumulative production amounting to almost 85 000 tonnes. The 2005 output level represented 79% of the 4 000 tU/yr nominal capacity of Rössing's processing plant. Although Rössing Uranium had intended to close down its operations in 2007, a rise in the price of uranium led to a change of plan. The company is now investing US$ 120 million to extend the mine's life by ten years, and the facility might stay in operation beyond 2016/2017.

Together, the Rössing and Langer Heinrich mines would confirm Namibia's position as the top uranium producer in Africa.

The Valencia deposit, lying in the vicinity of the Rössing and Langer Heinrich deposits, was declared uneconomic by Goldfields Namibia, following feasibility studies undertaken in the 1980s. In late-2005 the Canadian company Forsys Metals Corporation acquired the project and now plans to develop an open pit mine by late-2009. At end-March 2007 the results of an environmental impact assessment were awaited.

Namibia is currently the 5th largest uranium producer in the world. Its reasonably assured reserves (at up to US$ 80/kgU) are now put at 151 321 tonnes and are equivalent to nearly 6% of the global total. RAR recoverable at US$ 80-130/kgU are over 31 000 tonnes; Inferred Resources have also been increased and now exceed 123 000 tonnes (in situ), of which almost 100 000 tU would be recoverable at up to US$ 130/kgU.

Niger

Exploration for uranium began in 1956, resulting in the discovery of a number of deposits in the Aïr region of north-central Niger. There are currently two uranium production centres, one near Arlit processing ore from the Ariege, Arlette, Tamou and Taza deposits and operated

by Société des Mines de l'Aïr (Somaïr), and the other at Akouta processing ore from the Akouta and Akola deposits and operated by Compagnie Minière d'Akouta (Cominak). Niger's participation in the producing companies is 36.6% in Somaïr, and 31% in Cominak. Both companies continue to carry out exploratory drilling. In 2005-2006, a number of Canadian and Chinese companies were reported to be interested in obtaining exploration concessions in Niger.

Somaïr has been producing uranium from open-pit operations since 1970, while Cominak has carried out underground mining since 1978. The two companies have current production capabilities of 1 500 and 2 300 tU/yr, respectively. Niger's production peaked at 3 245 tU in 2004 before declining to 3 093 tU in 2005. Low productivity has hampered its competitiveness, despite rising uranium prices. Niger is the world's sixth largest producer of uranium, accounting for 7.4% of global output.

The 2005 Red Book features further radical revisions to Niger's uranium resources, compared with the previous edition. RAR recoverable at up to US$ 80/kgU now stand at 180 466 tU, compared with a figure of 102 227 tU in the 2003 book, whilst IR, in the same cost bracket, now show as 44 993 tU recoverable as against 125 377 tU. PR, also in the same cost bracket, are now put at 14 508 tU compared with 9 534 tU, whilst PR at US$ 80-130 amount to 10 100 tU, against zero in the previous edition. Overall, Niger's uranium resources (up to US$ 130/kgU) now total just over 250 000 tU, compared with around 237 000 tU in the 2003 book.

Pakistan

Extensive exploration for uranium has been carried out. Discoveries reported in the 1999 Red Book related to the Kamlial Formation in the Salt Range and the Maraghzar area in the Swat district, but no uranium resources have been reported to the IAEA. A number of previously discovered deposits have been mined out. Production is estimated to be some 40-45 tU per annum. Cumulative output of uranium, all recovered using ISL technology, now exceeds 1 000 tonnes.

Peru

During the course of exploration carried out up to 1992, the Peruvian Nuclear Energy Institute (IPEN) discovered over 40 occurrences of uranium in the Department of Puno, in the south-east of the republic, but no production has taken place.

For the 2005 Red Book, Identified Resources (in situ) in the Macusani area in northern Puno were reported to amount to 3 650 tonnes, of which 1 790 were classified as RAR and 1 860 as IR: 68% of each category was estimated to be recoverable. Undiscovered resources (in situ) consisted of 6 610 tonnes in the PR category (recoverable at less than US$ 80/kgU), plus 19 740 tonnes of SR (recoverable at less than US$ 130/kgU).

Portugal

The first traces of uranium were discovered as long ago as 1907, in association with radium deposits. From the mid-1950s to the mid-1990s, extensive exploration was undertaken, resulting in the discovery of numerous small-to-medium deposits. Starting in 1951, uranium was produced on a relatively small scale for fifty years, mostly at the Urgeiriça mill in north-central Portugal. Operations came to an end in 2001, after cumulative production of almost 3 700 tonnes.

A revised resource assessment in the 2005 Red Book puts RAR (at up to US$ 80/kgU) at 6 000 tonnes, with a further 1 000 tonnes in the US$ 80-130 cost bracket. Other Identified Resources consist of a revised IR level of 1 200 tonnes, recoverable at less than US$ 80/kgU. Undiscovered conventional resources recoverable at below US$ 130/kgU comprise 2 000 tonnes of PR, of which 80% is classed as recoverable at less than US$ 80/kgU, plus 5 000 tonnes of SR.

Romania

Since 1952, when Romania started to produce uranium, cumulative output has exceeded 18 000 tonnes. There are deposits in three principal areas: the Apuseni Mountains in the west, the Banat Mountains in the south-west and the Eastern Carpathians. Since 1978, all of Romania's production of uranium ore has been processed at the Feldioara mill in the centre of the country.

Uranium output in 2005 was approximately 80 tonnes, with RAR (up to US$ 130/kgU) at the beginning of the year estimated as 3 145 tonnes (recoverable). Other Identified Resources recoverable at the same cost level were 3 608 tonnes of IR; in-situ undiscovered resources comprised 3 000 tonnes of PR together with an equal tonnage of SR.

Russian Federation

Uranium exploration has been undertaken since 1944. Over a hundred ore-bearing deposits have been located in 14 districts of the Federation: the Streltsovsk district, where underground mining takes place, the Transural and Vitim districts, where the deposits are suitable for in-situ leaching (ISL), and 11 other districts, where higher-cost resources have been discovered. Government funding for uranium exploration more than doubled in 2005, with the object of stepping-up the search for sandstone-type deposits suitable for the application of ISL technology, as well as for rich unconformity-type deposits suitable for mining.

Mining and processing of uranium ore started in 1951 in the Stavropolsky region of European Russia, a source which had been exhausted by the late 1980s, after producing 5 685 tonnes, of which underground mining accounted for 69% and various leaching techniques for the balance. Between 1968 and 1980, the Sanarskoye deposit in the Transural district produced 440 tonnes of uranium, using ISL technology.

For more than a decade, the most important uranium producing area has been the

Streltsovsk region near Krasnokamensk in the Chitinskaya Oblast of eastern Siberia. The state concern responsible for production in the Krasnokamensk area is the Priargunsky Mining-Chemical Production Association; its production centre has a nominal production capacity of 3 500 tU per annum. Priargunsky accounts for more than 90% of national production. Lower-concentration deposits at the mine are increasingly exploited via block and heap leaching.

In 2002, the Dalur production centre in the Kurgan region started commercial ISL extraction from the Dalmatovskoe deposit. By 2010, it is planned that additional ISL sites at this deposit and at Khokhlovskoe will increase Dalur's annual output to 750 tU. Another production centre, with a nominal output capacity of 1 000 tU per annum, is planned for the Khiagda deposit in the Vitim district of the Buryat Republic.

Total national output in 2005 was 3 431 tU, most of which was derived from ore obtained by underground mining, the balance being obtained from low-grade ore by heap- or in-place leaching. The Russian Federation was the world's fourth largest producer of uranium in 2005, accounting for 8.2% of global output.

Its RAR (estimated to be recoverable at up to US$ 80/kgU) of 131 750 tonnes represented 5.0% of the global total at the beginning of 2005. The balance of Identified Resources recoverable at less than US$ 80/kgU consisted of 40 652 tonnes of IR. Undiscovered resources (in situ) at up to US$ 130/kgU are estimated to be exceedingly large: nearly 105 000 tonnes of PR (over half of which is reckoned to be recoverable at less than US$ 80/kgU), plus 545 000 tonnes of SR.

Slovenia

Exploration of the Zirovski Vrh area began in 1961, followed some 20 years later by the commencement of mining and eventually by the production of yellow cake in 1985. Exploration expenditure ceased in 1990 and uranium production came to an end two years later, with cumulative output of 382 tU.

The reported in-situ uranium resources are fairly modest: RAR of 2 200 tU and IR of 5 000 tU, both recoverable at under US$ 80/kgU, plus 5 000 tU of IR and 1 060 tU of PR, both of which are deemed recoverable at US$ 80-130/kgU. The Red Book estimates that 55% of the Identified Resources (RAR and IR) would actually be recoverable.

South Africa

Between the late 1940s and the early 1970s uranium exploration was pursued as an adjunct to exploration for gold, centred on the quartz-pebble conglomerates in the Witwatersrand Basin in the Transvaal. The 1973-1974 oil crisis triggered intensified exploration for uranium, leading to the country's first primary uranium mine (Beisa) being commissioned in 1981. Output as a by-product of gold mining had begun 30 years previously, and by 1959 26

mines in the Witwatersrand Basin were supplying 17 processing plants, resulting in an annual output of nearly 5 000 tonnes.

Between the late 1980s and the early 1990s, a substantial reduction in production capacity took place; subsequent closures brought the total of operational production centres at the beginning of 2002 down to two, each served by a single mine. The companies in production were Vaal River Operations at Klerksdorp, and Palabora Mining Company in the Northern Province; uranium production by the latter company, as a by-product of copper mining, ceased during the year.

Uranium production in South Africa is a by-product of gold mining and thus highly dependent on the dynamics of the world gold markets. Gold output in South Africa declined by some 20% between 2004 and 2006 and uranium production followed suit: 747 tU in 2004, 674 tU in 2005 and an estimated 640 tU in 2006. Total uranium output in 2005 was the eleventh largest national level in the world. The cumulative output of uranium in South Africa up to the end of 2005 exceeded 159 000 tonnes.

South Africa's uranium production will receive a boost as sxr Uranium One's Dominium mine comes into production during 2007; processing of underground ore had begun by the beginning of March, with the initial annual production rate planned to be 1 460 tU.

The country's RAR (at up to US$ 80/kgU), consisting to a considerable extent of quartz-pebble conglomerates, came to just over 177 000 tonnes by the end of 2005, equivalent to 6.7% of the world total. Further resources are on a commensurately large scale: about 78 000 tU of RAR recoverable at US$ 80-130/ kgU, over 85 000 tU of IR recoverable at up to US$ 130/kgU, 110 000 tU of PR in the same cost range, and more than 1.1 million tU in the speculative category (with no cost range assigned).

Spain

The first uranium discoveries were made in the western province of Salamanca in 1957 - 1958. Subsequently other finds were made further to the south and, in one instance, in central Spain. Production began in 1959 and by the end of 2002, a cumulative total of over 6 000 tonnes had been produced. Ore mining ceased in December 2000 and the production of uranium concentrates was terminated 2 years later. In January 2007 a Canadian company, Mawson Resources, applied for two exploration permits in the La Haba district of Extremadura in south-western Spain.

At beginning-2005, remaining RAR (at less than US$ 80/kgU) were 2 460 tonnes. Further Identified Resources recoverable at US$ 80-130/kgU comprised 2 465 tonnes of RAR and 6 380 tonnes of IR.

Sweden

Exploration for uranium was carried out from 1950 until 1985, when low world prices for the

metal brought domestic prospecting to a halt. Four principal uranium provinces were identified, two in south/central Sweden and two in the north. Interest in exploration has revived recently, with the Canadian corporation Mawson Resources Ltd obtaining several concession areas. In April 2007 Mawson reported that drilling had commenced at its Tasjo and Klappibacken projects.

Sweden's proved reserves are reported as 4 000 tonnes of RAR recoverable at less than US$ 130/kgU, with additional amounts recoverable comprising 6 000 tonnes of IR in the same cost bracket.

There are substantial unconventional resources of uranium in alum shale, but the deposits are of very low grade and recovery costs would exceed US$ 130/kgU. During the 1960s, a total of about 200 tonnes of uranium was recovered from alum shale deposits at Ranstad, in the Billingen district of Västergötland, southern Sweden. This mining complex has now been rehabilitated, the open pit being transformed into a lake and the tailings area treated to prevent the formation of acid.

Thailand

Exploration for uranium was carried out from the mid-1970s to the mid-1990s, leading to the discovery of a number of occurrences, mostly in northern Thailand. The in-situ Identified Resources are, however, very small, with RAR amounting to only 4.5 tonnes and IR to about 7 tonnes, both recoverable at up to US$ 130/kgU.

Turkey

The first exploration work took place in 1956-1957, but did not locate any economic deposits. Subsequent activity, which is continuing at the present time, has identified a number of uranium occurrences. In-situ RAR at less than US$ 80/kgU have been assessed as 9 129 tonnes, of which an estimated 81% would be recoverable.

Ukraine

Since the start of exploration for commercial resources of uranium in 1944, a total of 21 deposits have been discovered, mostly located in south-central Ukraine, between the rivers Bug and Dnepr. The most important ore bodies are Vatutinskoye, Severinskoye and Michurinskoye, all in central Ukraine. Uranium has been produced since 1947, initially by the Prednieprovskiy Chemical Plant and since 1959 also by the Zheltiye Vody production centre. The first plant ceased producing uranium in 1990; the 2005 output of the other facility was some 800 tonnes, 80% of its nominal production capacity. All currently processed ore comes from underground operations at the Ingul'skii mine on the Michurinskoye deposit and from the Vatutinskii mine on the Vatutinskoye deposit. In 2005 Ukraine was the ninth largest producer of uranium, accounting for 1.9% of the world total.

Ukraine's uranium resources have been substantially revised for the 2005 edition of the Red Book, largely as a result of a re-assessment of the production costs applicable to the Severinskoye deposit. RAR (at up to US$

80/kgU) are now put at 76 150 tonnes in situ, of which 58 498 is deemed to be recoverable. Further Identified Resources are represented by 10 760 tonnes of in-situ RAR (8 208 recoverable) at US$ 80-130/kgU and 30 070 tonnes of in-situ IR (23 130 recoverable) at up to US$ 130/kgU.

Undiscovered resources (in situ) comprise 15 300 tonnes of PR and 120 000 tonnes of SR (both recoverable at up to US$ 130/kgU), plus 135 000 tonnes of SR (with cost range unassigned).

In separate developments reported in late 2006, an Australian company and a Russian state concern were seeking joint ventures with Ukraine to develop uranium deposits.

United States of America

Between 1947 and 1970 the US Atomic Energy Commission (AEC) promoted the development of a private-sector uranium exploration and production industry; in late 1957 the AEC concluded its own exploration and development activities. Private-sector efforts accelerated in the 1970s in a context of rising prices and anticipated growth in the demand for the metal to fuel civilian power plants.

This exploration activity revealed the existence of extensive ore deposits in the western half of the United States, particularly in the states of Wyoming, Nebraska, Utah, Colorado, Arizona and New Mexico and in the Texas Gulf Coastal Plain. Numerous production centres were erected over the years, but many have now been closed down and either dismantled or put on standby.

Current production is mainly reliant on ISL, although some uranium is obtained from solvent extraction and other operations, such as mine water treatment and environmental restoration. At the beginning of 2005, three ISL plants (with an aggregate capacity of 1 460 tU/yr) and one conventional mill (capacity 210 tU/yr) were operational; one ISL plant and two conventional mills were on standby; one ISL plant was in development and two new facilities were seeking permits and licences. US uranium output in 2005 amounted to an estimated 1 039 tonnes, the eighth highest in the world. Preliminary information indicates that there was a substantial increase in production in 2006 over the previous year's level, reaching 1 586 tU.

The USA's RAR (at up to US$ 80/kgU) at the beginning of 2005 were estimated to be 102 000 tonnes, equivalent to 3.9% of the global total; RAR recoverable at US$ 80-130/kgU were 240 000 tonnes. Prognosticated Resources at up to US$ 80/kgU were 839 000 tonnes, with a further 434 000 tonnes at US$ 80-130/kgU. SR at up to US$ 130/kgU were 858 000 tonnes, with additional SR (with a cost range of US$ 130-260/kgU) amounting to 482 000 tonnes.

Uzbekistan

Deposits of uranium ores have been found in at least 25 locations since the early 1950s, mostly lying in the central Kyzylkum area running from

Uchkuduk in the north-west to Nurabad in the south-east. Although there was some production in the Fergana valley area, starting in 1946, commercial mining began in 1958 at Uchkuduk from open-pit and underground operations. ISL recovery methods were brought into use from 1965 and gradually came to dominate the production scene. The last of the open-pit and underground mines were closed in 1994, after conventional mining had produced a cumulative total of nearly 56 000 tonnes, 65% of which had come from open-pit operations.

Uranium output in 2005 by the state-owned Navoi Mining and Metallurgical Complex (NMMC), the sole producer, totalled about 2 300 tonnes – corresponding to 5.5% of global output. Production is exclusively ISL-based and takes place at eight locations. In operation during 2005 were three ISL production centres, which sent their output by rail to the NMMC processing plant at Navoi (nominal production capacity 3 000 tU/yr).

The republic's in-situ RAR (at up to US$ 80/kgU) amounted to 85 347 tonnes at the beginning of 2005, of which 70% was considered to be recoverable. The balance of known conventional resources consisted of 24 562 tonnes of in-situ RAR (of which 70% was considered recoverable at US$ 80-130/kgU) and 55 129 tonnes of in-situ IR (again with an estimated 70% recoverable, at up to US$ 130/kgU). Undiscovered conventional resources (on an in-situ basis) totalled about 220 000 tonnes, of which PR recoverable at up to US$ 130/kgU accounted for very nearly 85 000 tonnes, the balance (some 135 000 tonnes) being SR without a cost range assigned.

Vietnam

Exploration for uranium in selected parts of the republic began in 1955, and since 1978 a systematic regional programme has been undertaken. Virtually the entire country has now been explored, with a number of occurrences and anomalies subjected to more intensive investigation. Since 1997, exploration activity has been concentrated on the Nong Son basin in the Quang Nam province of central Vietnam.

As at beginning-2005, RAR recoverable at up to US$ 130/kgU (on an in-situ basis) were 1 337 tonnes and IR (on the same basis) 7 244 tonnes: in both categories, about 75% is estimated to be recoverable. Approximately 15% of the IR was reported to fall into the less than US$ 80 cost bracket. Undiscovered in-situ conventional resources recoverable at up to US$ 130/kgU consisted of 7 860 tonnes in the PR category, plus 100 000 tonnes of SR. Further SR (without a cost range assigned) amounted to 130 000 tonnes.

Unquantified amounts of unconventional resources have been reported to be present in deposits of coal, rare earths, phosphates and graphite.

No production of uranium has so far been achieved.