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EURATOM
SUPPLY AGENCY

Annual Report 2006

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EURATOM
SUPPLY AGENCY

Euratom Supply Agency

Annual Report 2006

Contents

Overview

During 2006, interest in new nuclear generation capacity continued to gather momentum worldwide. While fossil fuel prices did not increase on average as much as in 2005, rising concern about global warming and the need to reduce CO_2 emissions are causing many countries to consider introducing nuclear energy or increasing its share in their mix of energy sources. The European Commission published in 2006 a Green Paper on European energy policy, which led to a series of objectives and proposals announced in January 2007.

Security of energy supplies in general remained one of the key issues on the political agenda, and while supplies of oil and gas get more attention, security of nuclear fuel supplies is no less important, since nuclear provides about 32 % of the electricity in the EU.

Regarding the global supply and demand for nuclear fuels, some new uranium mines have started or are about to start operation, but further primary production is needed since consumption continues to exceed mining production. Higher prices have led to increased exploration and mining activity, but global uranium production decreased slightly in 2006 compared to 2005, due to technical or weather related problems or lower ore grades. Several planned mine expansions and new mines should help to bridge the gap between supply and demand over the period 2010–2015, but in the short term the market continues to be tight.

Canada, Russia, Niger and Australia remained the largest suppliers of nuclear materials to the EU. While prices for new spot and long-term contracts have increased quite dramatically, the increase in prices paid under existing contracts remains more measured (some 15 % for long term contracts and 21 % for spot contracts in 2006).

There were no major changes in the pattern of nuclear fuel supplies for EU users. The biggest uranium producers, Canada and Australia, had rather big declines in production and also a slightly lower share in EU supplies.

The only remaining uranium mine in the EU – in the Czech Republic – has extended its operation until 2010. Production of the Rožna mine after 2010 could be in the range 200-300 t/year, depending on additional exploration results. Uranium exploration is now ongoing in several other member states. It is however likely to take several years before new production can start in the EU. Romania, which joined the EU in January 2007, has some uranium mining but only for covering its domestic requirements.

The focus in the enrichment industry continues to be on new plants and on the progress made in keeping up with the planned schedules. Important milestones were reached in 2006 with several of the ongoing new projects. Construction of the Georges Besse II plant in France started after the final approval of the governmental agreement between the Urenco governments (Germany, Netherlands and United Kingdom) and France concerning the AREVA–Urenco joint venture which will provide the centrifuges. Production at the GB II plant is expected to start in 2009.

Urenco is expanding its capacity at all of its three locations in Europe and received a construction and operating license from the US Nuclear Regulatory Commission (NRC) in June 2006 for a new facility in New Mexico, USA.

Demand for enrichment services is forecast to increase due to lower tails assays caused by higher uranium prices. As a result of this and higher electricity prices, enrichment prices are also under upward pressure.

For the first time in many years, uranium deliveries to EU utilities were slightly higher than the amount of uranium loaded into reactors. This indicates that inventories are being rebuilt in response to security of supply concerns and rising prices. The implementation of the diversification policy remains vital for the long term security of supply of the EU electro-nuclear industry.

Chapter 1

General developments

Main developments in the Member States

In the EU one new authorisation to build a new nuclear power plant was given in 2006: in France.

In Finland, due to some problems with subcontractors in the construction of TVO's Olkiluoto 3 plant Evolutionary (or European) Pressurized Water Reactor (EPR, started in 2005) the plant is expected to be operational only by late 2010 or 2011. Studies for a sixth reactor are already under discussion as electricity consumption in Finland is expected to continue to grow and that new baseload capacity will be needed by the latter part of the next decade.

In France, after Électricité de France received authorisation at the end of 2006 to build an EPR of 1 600 MWe at the Flamanville site in Normandy, construction has started in early 2007 and the reactor should be operational by 2011, for a planned life of 60 years. As for legal developments, during 2006, two important laws were voted in France on nuclear energy: a law on the sustainable management of radioactive materials and waste, and a law on transparency and security in the nuclear field.

The first law intends to implement a national policy on management of all radioactive materials and waste - including a research programme on all radioactive materials and waste, and to set a three-year national plan for the management of radioactive materials and waste. In this respect, the law reaffirms that the storage of radioactive wastes from abroad is forbidden in France; restates that treatment and reprocessing of spent fuel is part of the French strategy for an efficient management of radioactive wastes, and states that deep geological disposal is the solution for ultimate radioactive wastes.

The second law renews the regulatory framework for the use of nuclear energy and its control, and establishes a fully independent nuclear safety authority. It improves the access of public to information, providing a statute to local information commissions as well as a High Committee for Transparency and Information on Nuclear Security. It strengthens transparency for nuclear licensees and adapts to the French regulatory framework the civil nuclear liability regime, such as provided by the revised protocols to Paris and Brussels conventions.

The governments of the three Baltic States and Poland negotiated during 2006 a new agreement which was finally concluded in March 2007 to jointly construct a new nuclear power plant in Lithuania. The political agreement was followed by a memorandum of understanding by the concerned energy companies – Lietuvos Energija AB, Eesti Energija and Latvenergo – concerning a feasibility study for such a new reactor. Initial proposals foresee a plant of up to 1600 MWe capacity - possibly an EPR. This was complemented by an agreement, signed at the highest level, to link the electricity grids between Poland and Lithuania, allowing thus Lithuania to export power from Ignalina.

In the Netherlands, after the Borssele reactor (481 MW) had received in June 2006 an extension of its operating lifetime until the end of 2033, in September 2006 the environment minister submitted to parliament a document entitled "Conditions for New Nuclear Power Plants". The objective of this document is to outline what conditions in the field of environment, non-proliferation, safety, radioactive waste, dismantling etc. have to complied with if there would be private initiatives to build new nuclear power plants. The accompanying statement said that the government wanted to move to a sustainable energy supply and that nuclear power could reduce carbon emissions. A new nuclear reactor could also be fitted into this transition model. However, as general elections took place on 22 November 2006, these plans could be affected.

In Germany, after the shutdown of the Obrigheim reactor in 2005, no decisions have yet been made on the eventual extension of the operating life of other German NPP's. Under the nuclear phase out agreement, the operating life of plants is limited by total output. RWE had applied for the transfer of lifetime from the Mülheim-Kärlich plant, which operated for only a short time in the 1980s before being permanently closed, to Biblis A. Although Biblis B already has enough lifetime, the closure of one unit at the two-PWR site could render the other too costly to run.

In Spain, the country's oldest reactor, Jose Cabrera of 160 MWe, was permanently shut down on 30 April 2006 by governmental decision, after 38 years of operation.

In Slovakia, Italian utility Enel, which now holds a majority stake in Slovenské elektrárne, is proceeding to finish units 3 and 4 at the Mochovce site. E.ON of Germany is considering the construction of a new NPP at the existing Bohunice site, as the Slovak government is seeking energy alternatives to compensate for the loss of generating capacity with the closure of Bohunice 1 reactor at the end of 2006 and scheduled shutdown of Bohunice 2 by end 2008.

Several other EU Member States, like the UK and Italy are actively discussing their energy policy options and the possibility to build new nuclear reactors in order to raise the security of their energy supplies and to reduce their greenhouse gas emissions.

In November the UK Prime Minister told the parliament that the UK needs to put nuclear back on the agenda and at least replace the nuclear energy they will lose from closing old plants. Without it the UK will not be able to meet any of the objectives on climate change, or on energy security. As it was announced during the year, four Magnox reactors ceased operations on 31 December (Dungeness A-1 and 2 at 420 MWe and Sizewell A-1 and 2 at 420 MWe), bringing the total number of these first-generation units to have closed in the UK to 22, with only four youngest still operating.

In the fuel cycle, construction of the new Georges Besse II centrifuge enrichment plant at the Tricastin site in France started after the final approval in June of the Cardiff Agreement allowing Urenco to share its centrifuge technology with Areva in a joint venture (called Enrichment Technology Company). Production from the new facility is expected to start in 2009 and to reach its nominal level of 7.5 million SWU's by 2018.

The European Commission approved in September the deal of taking over of Westinghouse by the Japanese company Toshiba, with the condition that Toshiba modifies its contractual arrangements in the Global Nuclear Fuels joint venture.

Main developments in the EU

Enlargement of the EU

Two new Member States joined the EU on 1 January 2007: Bulgaria and Romania. Both countries have active nuclear power programmes, Bulgaria having four operating light water reactors as of 31 December 2006, and Romania one Candu reactor with its indigenous fuel cycle, and a second one reaching first criticality in the first half of 2007. The construction of a third and fourth nuclear reactor at the Cernavoda plant is already under consideration by the Romanian energy authorities. After the shutdown of the Kozloduy reactors (units 3 & 4) at the end of 2006 as a condition for Bulgaria's accession to the EU, Bulgaria plans to complete the Belene power plant with two 1000 MWe units of third generation.

Regarding further accessions, screening of all the national legislation and its compatibility with EU legislation is on-going for both Croatia and Turkey. No further candidates were identified during 2006. Croatia shares the Krško NPP with Slovenia.

In Turkey, a bill allowing and regulating the construction and operation of nuclear power plants has been accepted in principle by the country's Energy Commission. The draft law is currently being debated in parliament and the Turkish government plans to construct a three-unit plant of 5 000 MWe capacity by 2020. The plant would be either on the Black Sea or the Mediterranean.

EU energy policy

In March 2006, the European Commission presented a Green paper setting a basis for a common European Energy Policy, the core objectives of which are sustainable development, competitiveness, and security of supply. Linked to these objectives are six priority areas:

- Completion of the internal energy market
- Ensuring solidarity among Member States
- A more sustainable, efficient and diverse energy mix, whilst respecting the right of Member States to make their own energy choices
- A strategic energy technology plan
- The need for a common external energy policy
- Identifying infrastructure priorities for the EU's security of supply.

As a set of concrete measures, the Commission then has presented in January 2007 a new integrated energy and climate change package to cut CO_2 emissions for the 21st Century. The package of proposals set a series of ambitious targets on greenhouse gas emissions and renewable energy and aim to create a true internal market for energy and strengthen effective regulation. The package proposed by the Commission and then adopted by the Council seeks to provide solutions to these challenges based on three central pillars:

A true Internal Energy Market: aiming at giving a real choice for EU energy users, whether citizens or businesses, and to trigger the huge investments needed in energy. The single market is good not just for competitiveness, but also sustainability and security.

Accelerating the shift to low carbon energy: maintain the EU's position as a world leader in renewable energy by proposing a binding target of 20% of its overall energy mix to be sourced from renewable energy by 2020. The EU will also increase by at least 50% its annual spending on energy research for the next seven years. At present, nuclear electricity makes up 14% of EU energy consumption and 32% of EU electricity. The Commission proposals underline that it is for each member state to decide whether or not to rely on nuclear electricity. The Commission recommends that where the level of nuclear energy decreases in the EU this must be offset by the introduction of other low-carbon energy sources otherwise the objective of cutting greenhouse gas emissions will become even more challenging.

Energy efficiency. The Commission reiterates the objective of saving 20% of total primary energy consumption by 2020. If successful, this would mean that by 2020 the EU would use approximately 13% less energy than today, saving 100 billion euro and around 780 million tonnes of CO_2 each year. Taken together, the sector enquiry, strategic review and action plan represent the core of a proposed new European Energy Policy. This process seeks to move from principles into concrete legislative proposals. (The energy and climate change proposals of the Commission were endorsed during the spring 2007 European Council.)

As part of the package, the Community's Nuclear Illustrative Programme (known as **PINC** from "Programme Indicatif Nucléaire de la Communauté") was adopted by the College of Commissioners and discusses the realities and prospects of the nuclear sector in the EU, i.e. the nuclear industry is not subsidised, is at the top of the energy technologies and is without CO_2 emissions, etc. It is a comprehensive document on the nuclear sector in the EU, its role, needed investments etc.

Also, a **high-level group** in charge of reviewing existing national legislations in the field of nuclear safety, security and waste management was proposed to be set up, backed both by the European Parliament and the Council.

The new shipments directive

Based on the Commission's proposal from December 2005[1] which took into account the opinions expressed by the European Economic and Social Committee and the European Parliament, the Council has adopted the Directive[2] on the supervision and control of shipments of radioactive waste and spent fuel (thus replacing the existing Directive 92/3). This new directive also applies to spent fuel intended for reprocessing, and simplifies procedures while ensuring consistency with the Basic Safety Standards (BSS) Directive and International Conventions.

Nuclear research developments

The agreement establishing the international organisation for the "International Thermonuclear Experimental reactor (ITER)" was signed on 21 November in Paris. With seven parties participating in the project - the European Union (represented by EURATOM), Japan, the People's Republic of China, India, the Republic of Korea, the Russian Federation and the USA, ITER constitutes one of the largest international scientific projects of its kind and brings together countries representing over one-half of the world's population.

The EU's Domestic Agency to provide its contribution to ITER is called 'Fusion for Energy' and has been set up in the form of a Joint Undertaking under the Euratom Treaty (located in Barcelona), and it is building upon the success and expertise gained in previous leading fusion experiments such as JET. The construction of ITER will allow the study of fusion in conditions similar to those expected within a fusion electricity-generating power plant in the future. ITER will be constructed in Southern France, at Cadarache, where the headquarters of the ITER International Organisation is also based. The fusion reactor is expected to start operating in 2016. The aim of ITER is to show that fusion could be used to generate electrical power, and to gain the necessary data to design and operate the first electricity-producing plant.

The construction of the Jules Horowitz Reactor (RJH) began on 21 March 2007 in France. RJH will be a 100 MW light water cooled materials test reactor at the Cadarache site in southern France, operated by the Commissariat à l'énergie atomique (CEA), and it will replace the 70 MW Osiris reactor, which itself took over some of the roles of the 35 MW Siloé reactor. Upon operation in 2014, RJH would be a versatile research tool over a lifetime of 50 years. It may be used by nuclear utilities, nuclear steam system suppliers, nuclear fuel fabricators, research organisations and safety authorities. Its primary uses will be research into the performance of nuclear fuel at existing reactors, testing designs for fuel for future reactors and the production of radioisotopes for use in medicine. The construction of RJH is funded by a consortium of CEA (50%), EdF (20%), EU research institutes (20%) and Areva (10%).

Bilateral nuclear cooperation agreements

Implementation of the bilateral agreements with Australia, Canada and the USA

The implementation of nuclear co-operation agreements with Australia, Canada and the United States of America continued during 2006 to the satisfaction of all parties. Regular bilateral consultation meetings were held between the Commission/ESA and Australia as well as Canada and the United States. There are also preparations to consolidate the existing text of the bilateral agreement with Canada, signed in the 1960s.

(1) COM(2005) 673 of 21.12.2005.

(2) Council Directive No 2006/117/EURATOM of 20 November 2006, OJ L 337, 5.12.2006.

Ukraine, Kazakhstan and Uzbekistan

An agreement for co-operation in the peaceful uses of nuclear energy between Euratom and the Ukraine entered into force on 1 September 2006[(1)]. This agreement provides a new framework for co-operation in the peaceful uses of nuclear energy between the Community and Ukraine. It covers nuclear safety, controlled nuclear fusion, nuclear research and development, international transfers, including trade in nuclear materials and provision of nuclear fuel cycle services, as well as measures aiming at the prevention of illicit trafficking of nuclear materials.

An agreement for co-operation in the peaceful uses of nuclear energy between Euratom and Kazakhstan was finally signed in December 2006, and the administrative arrangements are being discussed.

A similar agreement with Uzbekistan entered into force already in 2004, but the administrative arrangements are yet to be discussed.

Japan

The agreement for co-operation in the peaceful uses of nuclear energy between Euratom and Japan was signed on 27 February 2006, and the related administrative arrangements were ratified by the Japanese side and thus entered into force in December 2006.

Russia

Negotiations for an agreement on trade in nuclear materials with the Russian Federation, based on a draft agreement presented by the Commission in 2004, are showing no progress.

Legal developments

The main legal development concerning the ESA over the past year was the ruling of the European Court of Justice (ECJ) in September 2006 in joined cases C-123/04 and C/124/04, INB v TXU and UBS([2]), regarding the interpretation of uranium enrichment (product vs. service). The ECJ ruled that uranium enrichment should be considered as a form of transformation like conversion or fabrication and thus falls under the Article 75 of the Euratom Treaty. This subject was discussed thoroughly by the Members of the Advisory Committee in late 2006 and early 2007. Accordingly, the ESA is to revise its procedures for handling enrichment contracts.

A proposal for new Statutes and for a financial regulation of the ESA were prepared in 2006, approved by the European Commission in early 2007 and were then submitted to the Council for adoption. As a next step, the Agency plans to define and propose new rules on balancing supply and demand of nuclear materials on the European Atomic Energy Community market.

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(1) OJ L 261, 22.9.2006.

(2) The full text of the judgment may be downloaded from the website of the ECJ: http://www.curia.europa.eu.

Chapter 2

Global supply and demand, security of supply

This chapter presents a short overview of the main recent developments affecting the global supply and demand balance and security of supply at different stages of the fuel cycle.

Demand for nuclear fuels

Compared to previous years, the outlook for demand shows more potential for increase in demand, although part of the increase is due to the EU enlargement. Construction of new reactors has been decided in Bulgaria and Romania, the latest EU members, in addition to Finland, France and Slovakia. Plans for a new reactor in Lithuania have also been confirmed. However, for many EU member states, the situation is not clear regarding the future share of nuclear in their energy mix.

Worldwide, plans for new reactors are still heavily concentrated in Asia (China, India, Japan, South Korea) and Russia. Numerous other countries have announced that they are considering nuclear energy as a potential source of energy or to increase its existing share. For many countries however, it is difficult to assess a realistic time schedule for the use of nuclear energy.

China, India, Japan and Russia all have plans to continue increasing the share of nuclear in their energy mix, albeit from very different starting levels. In the United States, the number of potential new reactors has continued to increase to around 30 from 12–20 a year ago, but so far no firm decisions have been announced by any US utilities. The US Nuclear Regulatory Commission's (NRC) has granted the first Early Site Permits, which is the first step in the US procedure of approving new nuclear reactors. Meanwhile, power uprates and life extensions have continued in the US.

Supply of nuclear fuels

Natural uranium

After a few years of modest increase in global uranium production, total primary production fell in 2006 despite the strong incentive of steadily rising prices. This was largely due to forces of nature, in the form of weather related events and lower ore grades at some mines.

In 2006, preliminary figures indicate that worldwide uranium production amounted to some 39 567 tU, compared with 41 722 tU in 2005 (- 5 %).

The biggest producer remained Canada with 9 862 tU, compared with 11 628 tU in 2005, a significant decrease of 15 %.

Total Australian production in 2005 was 7 602 tU, compared with 9 516 tU in 2005, also a significant decrease (-20 %).

In contrast, production in Kazakhstan increased by about 22 %, and the country is now firmly in third position before Russia, Namibia and Niger.

Production in the United States increased by 59 %, although from a low base.

Table 1: Natural uranium production in 2006, compared to 2005[1]

	Production in 2006 (Tonnes uranium)	Share in 2006 (%)	Production in 2005 (Tonnes uranium)	Change over 2005 (%)
Canada	9 862	24.9	11 628	-15.2
Australia	7 602	19.2	9 516	-20.1
Kazakhstan	5 283	13.4	4 329	+22.0
Niger	3 431	7.4	3 093	+10.9
Russia	3 300	8.7	3 325	-0.8
Namibia	3 067	7.8	3 148	-2.6
Uzbekistan	2 260	5.7	2 300	-1.7
US	1 618	4.1	1 020	+58.6
Ukraine	800	2.0	800	0.0
China	769	1.9	769	0.0
South Africa	534	1.3	674	-20.8
Czech Republic	360	0.9	400	-10.0
Others	681	1.7	719	-5.3
Total	**39 567**	**100.0**	**41 722**	**-5.2**

[1] Figures published by producers or industry estimates.

New production plans and exploration activity

Some new mines and new mining companies moved to actual production in 2006, increasing the number of possible suppliers to the market. On the other hand, consolidation among the junior mining companies and explorers has continued.

Uranium resources are not the limiting factor for increasing production over the medium term. Known and proven resources exist for a substantial increase or sustaining the current rate for decades, and more focused exploration is expected to increase available resources over time, since there has been very little exploration from the mid 1980's until recently, and exploration methods have improved significantly over that period.

The difficulty in increasing uranium production in the short term is due to regulatory delays, geological challenges, technical issues and lack of skilled staff or infrastructure. The relative importance of these constraints varies between different countries or regions. Especially licensing procedures and the required time to accomplish them can vary greatly.

Global uranium exploration activity has been rising for several years now and continued to increase in 2006. There are literally hundreds of uranium exploration companies active worldwide, most of them headquartered in Canada or Australia. While most of them operate in North America, Australia or Africa, many EU countries are also targeted for exploration: Finland, Hungary, Portugal, Slovakia, Spain and Sweden. Some of these may have relatively good prospects for future production, but actual production is still several years away, and is likely to be small scale in the global context. However, any domestic production would be a useful addition to Europe's security of supply.

Globally, the big expansion potential continues to be in Kazakhstan, Canada and Australia. Of these, near term prospects for Canadian production have been downgraded after the flooding of the Cigar Lake mine in Saskatchewan, Canada, in October 2006. This mine was supposed to start production in 2007 and eventually supply 7000 tU per year, or about 17 % of global primary production, but now the start up has been postponed until 2010.

In Australia, the nuclear debate over allowing more uranium mines has been very active, and the Labour Party at federal level has finally eased its opposition, but various individual states in Australia are still opposed to new mines, which limits the possibilities for quick expansion in Australia's overall production.

Expansion of the Olympic Dam mine (in Australia) to 15 000 tU/year from the current 4 000 tU/year is still being studied and increased production is not expected before 2013.

In the near term, new production continues to come on line from Kazakhstan, which has very ambitious plans to produce 15 000 tU/year in 2010 and further increase its production thereafter. The national uranium company KazAtomProm has concluded joint ventures and partnerships with European, North-American, Russian, Japanese, Chinese and South Korean companies.

Russia is also trying to increase its domestic production in order to support the planned expansion of its own nuclear reactor fleet. Several African countries, notably Namibia, Niger and South Africa also have potential to increase uranium production quite rapidly. In the United States, several small mines are planned for the coming years, but the quantities are likely to remain modest compared to some of the expansion plans elsewhere in the world. Uranium as a by-product from phosphates is under consideration again.

Overall, primary supply is expected to increase quite substantially in the period 2010–2015, but the possible reduction in secondary supplies and usual delays in planned new mine developments are likely to keep the market tight over the next few years.

Investment demand and changes in the uranium market

Several investment funds continued to add to their uranium holdings in 2006, again contributing to the increase of published spot price indicators, which doubled in 2006 from 36 USD/lb U_3O_8 at the beginning of 2006 to 72 USD/lb U_3O_8 at the end of the year and crossing 100 USD/lb U_3O_8 in April 2007.

Attempts to increase the transparency and liquidity of the uranium market have continued with mixed results. Since fixed price contracts are nowadays rare, the commonly referenced spot price indicators have become highly dependent on occasional uranium auctions. In the first half of 2007, financial futures contracts for uranium were introduced by NYMEX, bringing uranium closer to other energy commodities and metals in that respect.

Conversion

The conversion market and prices were stable in 2006. The geographical unbalance of conversion capacities between Europe and North America still remains, and additional conversion capacity in Europe is likely to be needed at some stage, especially in light of the new enrichment capacity being installed.

Of the big western converters, ConverDyn has announced a capacity expansion in addition to upgrading its existing facilities, while AREVA has announced in early 2007 the start of the new 'Comurhex II' project, aiming at building a new conversion plant in France. With first industrial output to be expected in 2012, AREVA's Comurhex II could have a capacity of 15 000 tU/year, which could be further extended to 21 000 tU/year if needed.

Enrichment

The trend towards lower tails assays continued in 2006, some utilities going now down to 0.20 % tails. This reduces demand for natural uranium but obviously increases the requirements for separative work. As a result, enrichment prices have been under some upward pressure as expected. Another reason for the price increase are rising electricity costs which are an important cost element for companies using the gaseous diffusion technology, AREVA/Eurodif and USEC. Published enrichment price indicators increased from USD 112-113/SWU in the beginning of 2006 to to USD 135/SWU at the end of the year. While significant (+20 %), this increase is much less than the doubling of published natural uranium price indicators.

The focus in the enrichment industry continues to be on the new plants and on the progress made in keeping up with the planned schedules. Important milestones were reached in 2006 with several of the ongoing new projects. Construction of the Georges Besse II plant in France started after the final approval of the governmental agreement between the Urenco governments (Germany, Netherlands and United Kingdom) and France concerning the AREVA-Urenco joint venture which will provide the centrifuges. Production at the GB II plant is expected to start in 2009, and the full capacity of 7.5 million SWU for the first two modules should be reached by 2018.

Urenco is expanding its capacity at all of its three locations in Europe and leading the LES consortium to build a new facility in New Mexico, USA. This National Enrichment Facility (NEF) received a construction and operating license from the US Nuclear Regulatory Commission (NRC) in June 2006.

USEC is assembling the lead cascade of its American Centrifuge machines at the plant in Piketon, Ohio. The US NRC issued a construction and operating license for the American Centrifuge Plant in April 2007. The anticipated capacity of the plant is 3.8 million SWU, with a maximum of 7 mSWU.

Also in 2006, General Electric bought the licence from Australian company Silex for the laser enrichment technology. GE plans to apply for a license in 2007, but commercial production with the laser technology is still further out, although it may become a viable alternative in the longer term.

Due to the ongoing reorganisation of the Russian nuclear industry, it is difficult to exactly estimate current or future capacities. It appears that the Russian industry is upgrading its centrifuges and planning to increase centrifuge production.

Fabrication

There was some reshuffling among the fabricators in 2006 due to the sale of Westinghouse by British Nuclear Fuels to a group of companies led by Toshiba of Japan. The European Commission approved the deal in September, with the condition that Toshiba modifies its contractual arrangements in the Global Nuclear Fuels joint venture. Prior to this, concerns arose about possible effects on potential competition in the fuel assembly market. Since Toshiba has been part of the Global Nuclear Fuels grouping with GE and Hitachi, the latter two are now developing their joint alliance.

European Union fabrication facilities continued to provide adequate coverage of the utilities' needs. MOX fuel fabrication continued in France and Belgium, but the facility of Bélgonucléaire at Dessel was shut down in July 2006.

In the market for VVER fuel (for Soviet/Russian design reactors), the Russian supplier TVEL has now re-established a dominant position - nearly 100% market share.

Reprocessing

Reprocessing of irradiated fuel continued at the plant of La Hague in France. Due to national legislation, German utilities are no longer able to send their spent fuel abroad for reprocessing. On the other hand, due to the increase in natural uranium prices, reprocessing is becoming an economically attractive alternative. In the United States, where reprocessing has not been pursued before, serious considerations is now being given to this possibility, which would not only save natural uranium but would also decrease the quantities of waste destined for final disposal.

Secondary sources of supply

The 'Megatons to megawatts' programme agreed between the USA and Russia in 1993 for down blending over a period of 20 years highly enriched uranium (HEU) from Russian nuclear weapons has continued to be implemented as before. However, it is not expected that this programme would be extended beyond 2013. Russia's needs for its internal nuclear power expansion and the needs for its fuel exports are likely to be given priority. Russia and the USA are also discussing a general nuclear cooperation agreement which could set a new framework for nuclear trade.

Another question mark is the continuation of depleted uranium tails re-enrichment in Russia for western enrichers. Russia indicated in 2006 that it will stop this re-enrichment once the existing contracts come to an end.

In the USA, the Department of Energy (DoE) has announced plans to sell some US high-enriched uranium from the government's excess stockpile for down blending and use as commercial nuclear fuel. Although the US hold large quantities of uranium inventories, a large part is subject to a sales moratorium until 2009.

Non-proliferation and multilateral approaches to the fuel cycle

Over the last two years, there have been a number of proposals from the USA, Russia, Germany, UK, Japan and others to develop multilateral mechanisms, fuel banks or international fuel centres which would guarantee nuclear fuel supplies to countries that do not wish to develop their own nuclear fuel cycle. In September 2006, the IAEA held a special event discussing the various proposals, and it is working to consolidate these proposals in 2007 in order to develop concrete projects or action plans. The Russian proposal to create an international enrichment centre in Angarsk has moved forward with the announced participation of Kazakhstan.

Security of supply

Nuclear energy was producing 32 % of Europe's electricity in late 2006, from 152 reactors spread across 15 Member States. That makes it the largest source of low carbon electricity in the European Union and contributes to the aims of a European energy policy.

Security of energy supplies, including nuclear fuels, continues to receive increasing attention globally, with demand from China, India and other rapidly growing economies putting more pressure on supplies and prices. Nuclear energy has the advantage that uranium resources are relatively well dispersed around the globe, and despite uranium price increases, fuel costs are still relatively low compared to electricity generation from fossil fuels. While the EU does not have significant uranium resources on its territory, several EU companies are active in uranium mining elsewhere. Maintaining good relations with producer countries is therefore essential. It is also important for the EU security of supply that significant parts of the needed conversion, enrichment and fuel fabrication are performed in the EU. Over the medium term, there is some potential for uranium production in the EU Member States.

The implementation of a true diversification policy remains vital for the long term security of supply of the EU electro-nuclear industry. Global uranium resources are sufficient for a major expansion of the industry, but the investments now being undertaken will not show immediate results. Due to a low number of major players at the various steps of the fuel cycle, supply constraints can happen at any stage, but reasonable inventory levels can mitigate eventual problems. Regarding fabrication, there is concern about the possible lack of alternative suppliers for VVER reactors in the future.

Secondary uranium supplies continue to have a very large impact on the market, and therefore it is in the interests of all parties to strive for as much transparency as possible about future plans for the use and release into the market of such supplies.

ESA recommendations and diversification policy

The Supply Agency continues to recommend to EU utilities that they maintain an adequate level of strategic inventories and use market opportunities to increase their inventories, according to their individual circumstances. Furthermore, it is recommended that utilities cover most of their needs under long-term contracts with diversified supply sources.

The Agency is pleased to note that for the first time in many years, uranium deliveries to EU utilities were slightly higher than the amount of uranium loaded into reactors. Thus inventories are being rebuilt in response to security of supply concerns and rising prices.

The Supply Agency continues to monitor the market, especially the supply of natural and enriched uranium to the EU, to ensure that EU utilities have diversified sources of supply and do not become over-dependent on any single source. Maintaining the viability of the EU industry at all stages of the fuel cycle remains an important goal for long-term security of supply. In recent years, restrictions on imports of natural uranium have not been deemed necessary. Regarding enrichment, the supply policy remained unchanged.

Chapter 3

EU supply and demand for nuclear fuels

The overview of supply and demand for nuclear fuels in the European Union is based on information provided by the EU utilities or their procurement organisations concerning the amounts of fuel loaded into reactors, estimates of future fuel requirements, and on the quantities, origins and prices of acquisitions of natural uranium and separative work.

The data presented for 2006 includes 25 EU Member States, but not yet Bulgaria or Romania which joined the EU on the 1 January 2007.

Fuel loaded into reactors

During 2006, about 2 700 tU of fresh fuel were loaded into EU-25 reactors containing the equivalent of 21 000 tU as natural uranium and 12 700 tSWU. Compared to the previous year, the amount of contained SWU's increased and that of natural uranium decreased as a result of lower tails assays. Many utilities had specified their tails assays to be in the range of 0.20–0.25, although values in the range 0.30-0.35 were also still common.

Reactor needs/net requirements

Estimates of future EU reactor needs and net requirements for uranium and separative work, based on data supplied by all EU utilities, are shown in Graph 1 (see Annex 2 for the corresponding table). Net requirements are calculated on the basis of reactor needs less the contributions from currently planned uranium/plutonium recycling, and taking account of inventory management as communicated to the Agency by utilities.

The new Member States represent an addition of about 10 % to the requirements of the EU-15. The foreseen decline over the years reflects the planned closure of reactors in some Member States, especially Germany, and the small number of firm plans for new reactors, although several others are planned.

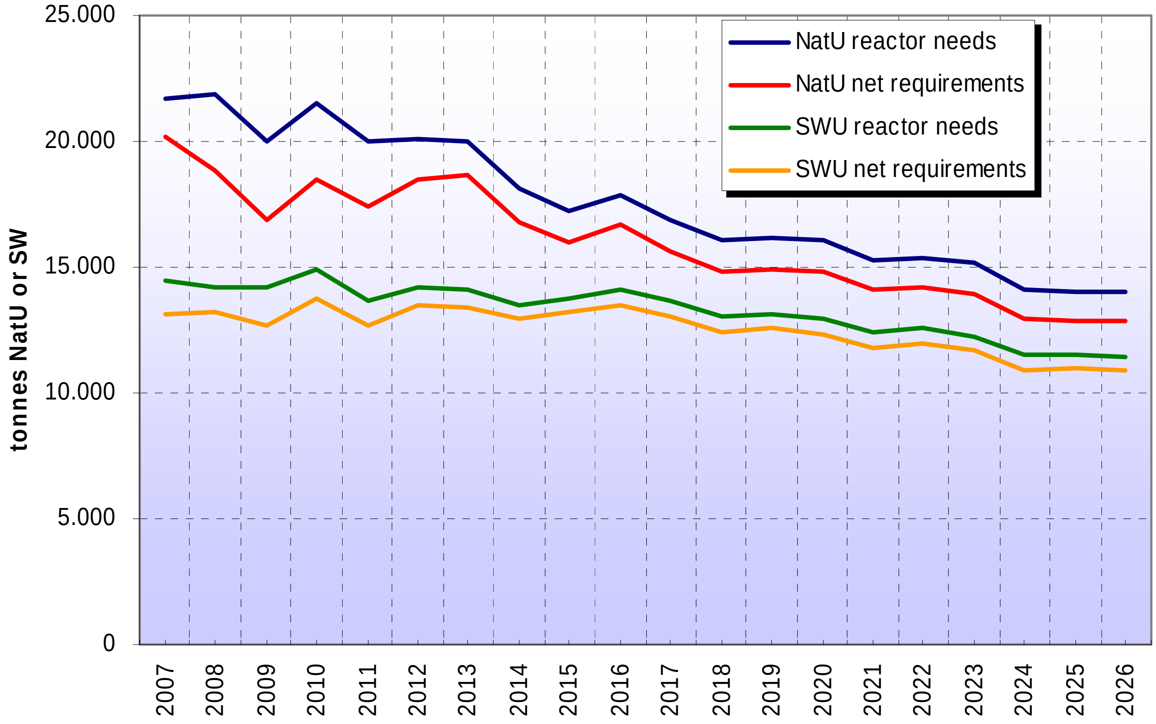
For the EU-25, average reactor needs for natural uranium over the next 10 years are forecast to be 19 840 tU/year, while average net requirements are about 17 840 tU/year.

Average reactor needs for enrichment over the next 10 years are expected to be 14 110 tSWU/year, while average net requirements will be in the order of 13 200 tSWU/year (see Annex 2 for details).

It was noted already in the previous report that forecast net requirements for natural uranium had decreased and estimates for enrichment requirements had increased. This tendency has continued with the latest forecasts provided by EU utilities. Average estimated net requirements for natural uranium for the next 10 years are down 1.4 % but forecast net enrichment requirements are up 6.5 % from the previous estimates (for total reactor needs the figures are -2.7 % for natural uranium and +6 % for enrichment).

This reflects further decreasing tails assays due to the current relationship between natural uranium and enrichment prices. However, it is not certain whether the enrichment companies will be able to accommodate the wishes of utilities for lower tails assays without causing a substantial increase in enrichment prices, which in turn could again affect the relationship between uranium and enrichment requirements.

Graph 1: Reactor needs and net requirements for uranium and separative work (EU-25)



Supply of natural uranium

Conclusion of contracts

The number of contracts and amendments relating to ores and source materials (essentially natural uranium) which were dealt with in accordance with the Supply Agency's procedures during 2006 is shown in Table 2. Transactions totalled approximately 62 800 tU (including contract amendments), which was substantially higher than the 47 800 tU in 2005. Some 49 100 tU were the subject of new purchase contracts by EU utilities (spot and multiannual), versus 33 800 tU in 2005. Amendments to existing contracts were concluded for a net increase of 7 400 tU.

Table 2: Natural uranium contracts concluded by or notified to the Supply Agency (including feed contained in EUP purchases)

Contract type	Number	Quantity (tU) [1]
Purchase/sale by an EU utility/user — multiannual [2] — spot [2]	 9 9	 46 400 2 700
Other purchase/sale — between EU utilities (multiannual) — between EU utilities (spot) — between intermediaries [3] (multiannual) — between intermediaries [3] (spot)	 1 4 1 6	 400 800
Exchanges and loans [4]	13	4 800
Amendments to purchasing contracts [5]	5	7 400
TOTAL	**48**	**62 800**

(1) In order to maintain confidentiality the quantity has been indicated only when there were at least three contracts of each type, but all quantities have been included in the total.

(2) Multiannual contracts are defined as those providing for deliveries extending over more than 12 months, whereas spot contracts are those providing for either only one delivery or deliveries extending over a period of a maximum of 12 months, whatever the time between the conclusion of the contract and the first delivery.

(3) Purchase/sale contracts between intermediaries — both buyer and seller are not EU utilities/end users

(4) This category includes exchanges of ownership and U_3O_8 against UF_6. Exchanges of safeguards' obligation codes and international exchanges of safeguards' obligations are not included.

(5) The quantity represents the net increase (or decrease) in material contracted for.

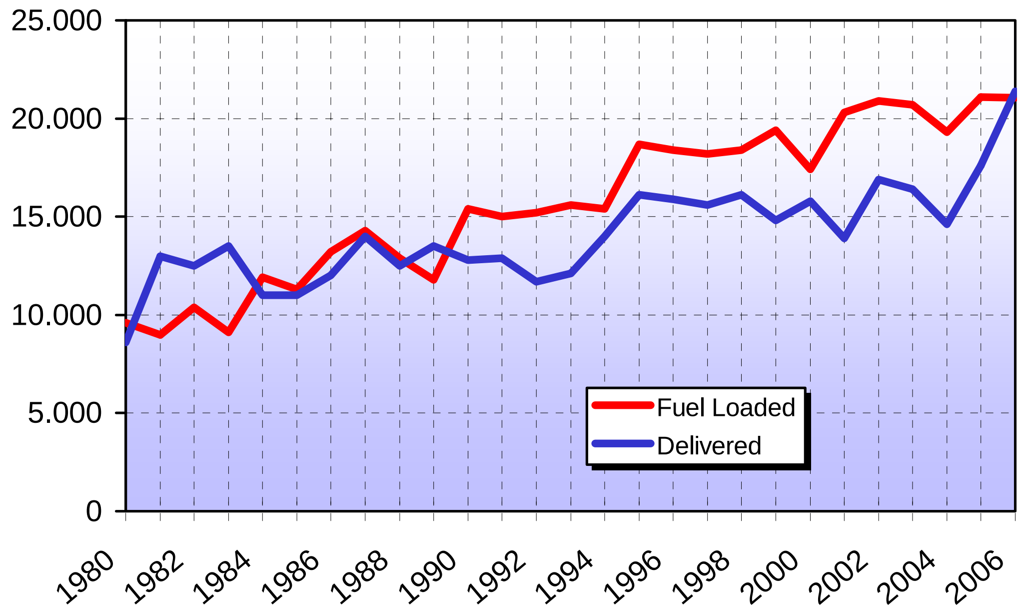
Volume of deliveries

During 2006, deliveries of natural uranium to EU-25 utilities were 21 400 tU which was slightly higher than the quantity loaded into reactors (21 000 tU). For many years, quantities loaded into reactors were higher than deliveries, which could indicate that reduction of inventories has now ended and even turned into accumulation in some cases. The last time when quantities delivered and loaded were in balance was in the late 1980's. The amount of uranium delivered under spot contracts was in line with historic averages, representing just under 8 % of total natural uranium deliveries.

The difference between deliveries and the amount of fuel loaded in previous years can be explained by the use of reprocessed uranium or MOX fuel and drawing down of inventories.

The deliveries taken into account are those made to the EU-25 utilities or their procurement organisations (excluding research reactors); they also include the natural uranium equivalent contained in enriched uranium purchases. Deliveries and fuel loaded into reactors by EU utilities since 1980 are shown in Graph 2. The corresponding table is in Annex 3.

Graph 2: Natural uranium feed contained in fuel loaded into EU reactors and natural uranium delivered to utilities under purchasing contracts (tU)



Average prices of deliveries

In order to provide comparable price information with previous years, the deliveries taken into account in the average price calculations are those made to the EU utilities or their procurement organisations under purchasing contracts; they also include the natural uranium equivalent contained in enriched uranium purchases. Excluded from the calculations are a number of contracts where it was not possible to establish reliably the price of the natural uranium component (e.g. some cases of enriched uranium deliveries priced per kg EUP), which is often the case for utilities in the new Member States. The ESA prices therefore refer to contracts where natural uranium is purchased separately or when there is a reliable estimate of the component price.

To calculate the average price, the original contract prices are converted (using the average annual exchange rates as published by the European Central Bank) into euro per kgU in U_3O_8 and then weighted by quantity. To establish a price excluding conversion cost when it was not specified, the Supply Agency applied in 2006 an estimated average conversion price of EUR 6.37/kgU (USD 8.00/kgU).

The average prices of deliveries under multiannual contracts in 2006 were:

EUR 38.41/kgU contained in U_3O_8	(EUR 33.56/kgU in 2005)
USD 18.55/lb U_3O_8	(USD 16.06/lb U_3O_8 in 2005)

The average price of material delivered in 2006 under spot contracts was as follows:

EUR 53.73/kgU contained in U_3O_8	(EUR 44.27/kgU in 2005)
USD 25.95/lb U_3O_8	(USD 21.19/lb U_3O_8 in 2005)

Spot contracts are those providing for either only one delivery or deliveries extending over a period of a maximum of 12 months, whatever the time between the conclusion of the contract and the first delivery.

The fact that the ESA spot price differs significantly from the spot prices published by RWE Nukem, TradeTech or Ux Consulting may be explained mainly by the timing of spot market deals during the year and the time-lag between contract conclusion and delivery. Since the ESA spot price definition does not include a time limit between contract conclusion and delivery of the material, some spot deliveries, which occurred in 2006, may have been agreed by the contracting parties in previous years.

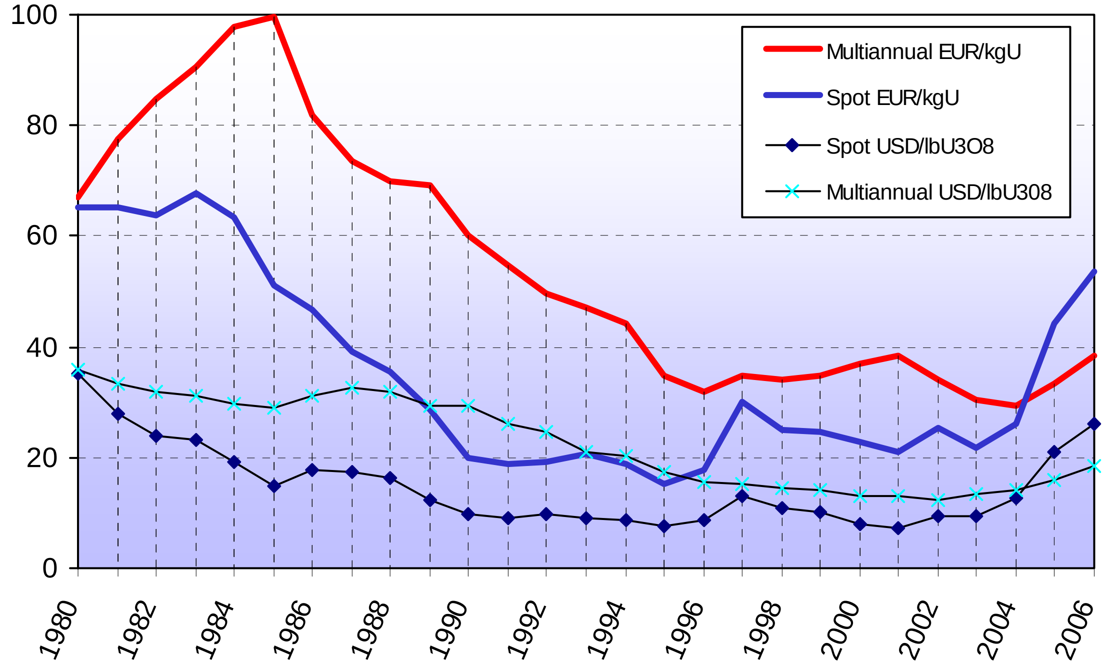
The exchange rate situation was relatively stable in 2006; the US dollar weakened slightly on average compared to 2005, the annual average EUR/USD rate being 1.26 (vs. 1.24 in 2005).

See Annex 4 for detailed price information and Annex 5 for the price calculation methodology.

Price history

Graph 3 shows the ESA average prices for natural uranium since 1980; the corresponding data are presented in Annex 4 (note: the euro replaced the ecu on 1 January 1999 with a conversion rate of 1:1).

Graph 3: Average prices for natural uranium delivered under spot and multiannual contracts, 1980-2006 (EUR/kgU and USD/lbU3O8)



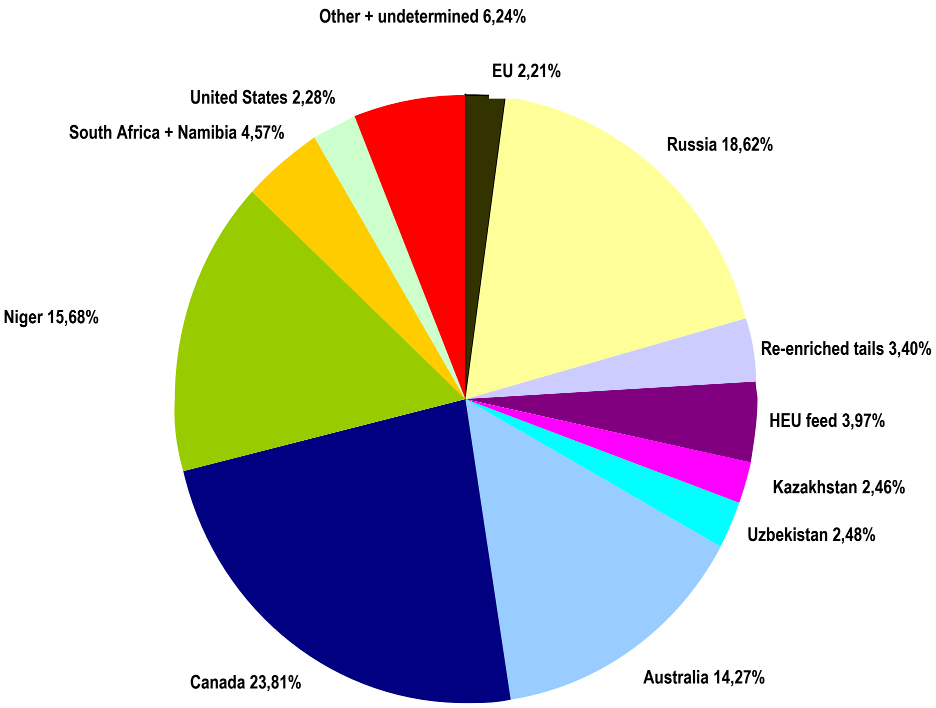
Origins

Canada maintained its leading position in 2006 as a supplier of natural uranium to EU utilities, with 5 100 tU (5 000 tU in 2005) (23.8 %). Australia also maintained its previous level of deliveries with 3 050 tU (3 000 tU in 2005). Deliveries from Niger increased to 3 350 tU (from 2 400 tU in 2005). According to the declarations received from utilities, natural uranium of Russian origin amounted to almost 4 000 tU. This figure is however highly unreliable and would need more detailed analysis, as it would be more than Russia's production of natural uranium. Since many EU utilities are receiving enriched uranium or even complete fuel assemblies from Russia, it is simply impossible to determine the exact mining origin of the uranium contained in the EUP. Uranium declared as 'Russian' may include uranium mined in other countries (i.e. Kazakhstan, Ukraine and Uzbekistan) and part of the high quantity may be explained by the low tails assays used by Russian enrichment industry, thereby 'creating' more uranium. Direct purchases from Kazakhstan have remained relatively low considering the production level and future potential of this country. It is however expected that the amount of uranium from Kazakhstan will increase in coming years with the operation of various joint ventures.

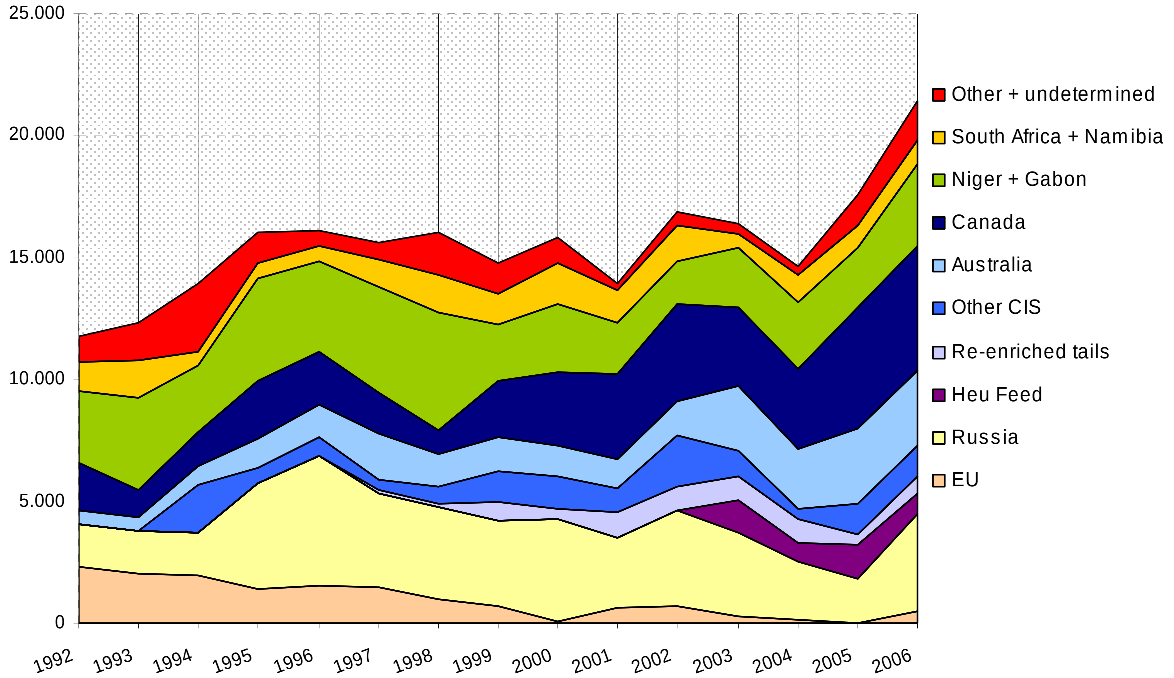
Domestic uranium mining supplied just over 2 % of EU needs, almost all of that coming from the Czech Republic. The Czech Government decided in May 2007 to extend the lifetime of the Rožna mine without time limit, due to the favourable price development. The time of this extension will then depend on yearly reviews of the economic outturns.

The amount of re-enriched tails material was 700 tU and that of HEU feed 850 tU.

Graph 4: Sources of uranium delivered to EU utilities in 2006 (% share)



Graph 5: Purchases of natural uranium by EU utilities by origin, 1992-2006 (tU)



Special fissile materials

Conclusion of contracts

Table 3 shows the number of contracts and amendments relating to special fissile materials (enrichment, enriched uranium and plutonium for power and research reactors) which were dealt with during 2006 in accordance with the Supply Agency's procedures.

Table 3: Special fissile material contracts concluded by or notified to the Supply Agency

Contract type	Number
A. Special fissile materials	
Purchase (by an EU utility/user) – multiannual – spot	 7 23
Sale (by an EU utility/user) – multiannual – spot	 1 20
Purchase/sale (between two EU utilities/end users) – multiannual – spot	 1 6
Purchase/sale (intermediaries) – multiannual – spot	 - 4
Exchanges	17
Loans	4
Total (1)	**83**
Contract amendments	**10**
B. Enrichment contracts (2)	
Multiannual Spot	14 2
Contract amendments	**15**

(1) In addition, there were 74 transactions for small quantities (Article 74 of the Euratom Treaty) which are not included here.
(2) Contracts with primary enrichers only.

Deliveries of low enriched uranium

In 2006, supply of enrichment (separative work) to EU utilities totalled approximately 11 400 tSWU, delivered in 2 070 tLEU which contained the equivalent of some 18 150 tonnes of natural uranium feed [(1)]. Some 71 % of this separative work was provided by EU companies (AREVA-Eurodif and Urenco).

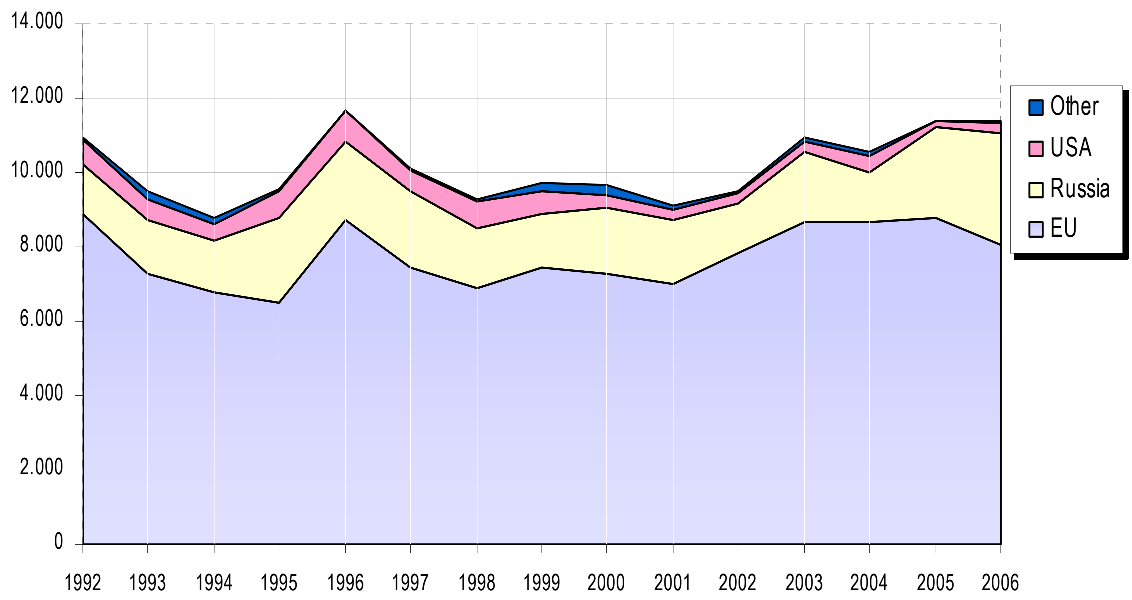
Compared with previous years, the average tails assays specified by utilities have decreased, but at the same time the range has widened to 0.20-0.35. This is an expected and normal result of the rising natural uranium prices and has also led to higher expectations for future enrichment requirements on the part of utilities.

Deliveries of Russian separative work to EU utilities under purchasing contracts represented 3 000 tSWU or 27 % of the total. This represents an increase from the earlier figures for EU-15 but is in line with the figures for EU-25 in the previous year.

Enrichment supplies from the USA accounted for about 2 % of the total in EU-25.

Supply of enrichment to EU utilities by origin since 1992 is shown below.

Graph 6: Supply of enrichment to EU utilities by origin, 1992-2006



(1) The tails assay used for the calculation of the natural uranium feed and separative work components has a significant impact on the values of these components. An increase in the tails assay increases the amount of natural uranium and reduces the amount of separative work required to produce the same amount of EUP. The optimal tails assay is dictated by the prices of natural uranium and separative work. For its calculations the Supply Agency used the contractual tails assay declared by the utilities or, when this was not available, a standard 0.30 %. It should also be noted that enrichers do not always use the contractual tails assay at their plants; as a result, they may become major users or 'producers' of natural uranium according to the circumstances. The real figures for supply and demand of natural uranium and separative work may be influenced in one or the other direction by the real tails assay.

Plutonium and mixed-oxide fuel

The use of MOX has contributed to a significant reduction in requirements for natural uranium and separative work in recent years. However, reprocessing and the use of MOX fuels continue to face difficulties because of the political decisions in some countries to postpone or to abandon this solution for the management of irradiated fuels. Recently, the United States has started to reconsider its position towards reprocessing and may start to develop its fuel cycle operations in this direction.

The quantities loaded into EU reactors and the estimated savings from the use of MOX fuel are shown in Table 4 (no MOX fuel is used in the new Member States). The quantity of MOX fuel loaded was 10 210 kg Pu in 2006, in line with the average of recent years. It should be noted that published figures on natural uranium and separative work savings vary considerably; here, it was assumed that 1 tPu saves the equivalent of 120 tU as natural uranium and 80 tSWU.

Table 4: Utilisation of plutonium in MOX in the EU and estimated natural uranium (NatU) and separative work savings

Year	kg Pu	Savings	
		t NatU	tSWU
1996	4 050	490	320
1997	5 770	690	460
1998	9 210	1 110	740
1999	7 230	870	580
2000	9 130	1 100	730
2001	9 070	1 090	725
2002	9 890	1 190	790
2003	12 120	1 450	970
2004	10 730	1 290	860
2005	8 390	1 010	670
2006	**10 210**	**1 225**	**815**
Total	**95 800**	**11 515**	**7 660**

Chapter 4

Administrative report

Personnel

During year 2006 new staff has been recruited and the number of staff at the Supply Agency is now 17.

Finance

The Supply Agency is financed principally by a subvention from the budget of the Commission, as a result of a Council decision of 1960 to postpone the introduction of a charge on transactions to defray the operating expenses of the Supply Agency as provided by the Euratom Treaty.

Costs relating directly to the Supply Agency's staff and its office are borne by the European Commission.

The Supply Agency's expenditure in 2006 amounted to 182 000 EUR, improving the budgetary execution to 91.4 %.

Activities of the Advisory Committee

The Advisory Committee held two meetings during 2006.

At its May meeting the Committee, in fulfillment of its statutory duties, examined and gave opinions on the Agency's annual report for 2005, its balance sheet and accounts for the same year as well as its budget for 2007.

At its October meeting the Committee, held in-depth discussion on the INB case for the handling of contracts by the ESA, especially the enrichment contracts, and gave opinion on the New Statutes and financial regulation for the ESA which then have been submitted to the Council for adoption.

In February 2007, an informal technical meeting was held at the request of one member of the Committee, in order to discuss the implications of the EU Court ruling in the INB case for the handling of contracts by the ESA, especially enrichment contracts.

Observers from Bulgaria and Romania attended the meetings in 2006, and the Commission gave an update on negotiations between Euratom and third countries.

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This report and previous editions are available from the Supply Agency's website:

http://ec.europa.eu/euratom/index_en.html

A limited number of paper copies of this report may be obtained, subject to availability, from the above address.

Further information

Additional information may be found on Europa, the European Union server at http://europa.eu/index_en.htm. It provides access to the websites of all European institutions and other bodies.

The Internet address of the European Commission's Directorate-General for Energy and Transport is http://ec.europa.eu/energy/index_en.html. It contains information, for example, on the security of energy supply, energy related research, nuclear safety, and electricity and gas market liberalisation.

List of abbreviations

CIS	Commonwealth of Independent States
ESA	Euratom Supply Agency
EURATOM	European Atomic Energy Community
IAEA	International Atomic Energy Agency
(US) DOE	United States Department of Energy
(US) NRC	US Nuclear Regulatory Commission
USEC	United States Enrichment Corporation
EUP	Enriched uranium product
HEU	Highly enriched uranium
LEU	Low-enriched uranium
MOX	Mixed-oxide fuel (fuel of uranium and plutonium oxide)
RET	Re-enriched tails
SWU	Separative work unit
tSWU	1 000 SWU
mSWU	1 000 000 SWU
tU	tonne U (= 1 000 kg uranium)
BWR	Boiling water reactor
EPR	Evolutionary (European) pressurised water reactor
LWR	Light water reactor
NPP	Nuclear power plant
PWR	Pressurised water reactor
RBMK	Light water graphite-moderated reactor (Russian design)
VVER/WWER	Pressurised water reactor (Russian design)
kWh	kilowatt-hour
MWh	megawatt-hour = 10^3 kWh
GWh	gigawatt-hour = 10^6 kWh
TWh	terawatt-hour = 10^9 kWh

Annexes

Annex 1: CIS supplies

A) Russian supply of natural uranium and feed contained in EUP to EU utilities

Year	Deliveries (1)	Exchanges (2)	Subtotal (1) (2)	Re-enriched tails (3)	Total (1) (2) (3)	Total as % of supply
1992	1 800	900	2 700	0	2 700	23
1993	1 700	600	2 300	0	2 300	19
1994	1 700	500	2 200	0	2 200	16
1995	4 300	200	4 500	0	4 500	28
1996	5 100	700	5 800	0	5 800	36
1997	3 900	500	4 400	–	4 400	28
1998	3 900	600	4 500	–	4 500	28
1999	3 500	400	3 900	1 100	5 000	34
2000	4 200	0	4 200	1 200	5 400	34
2001	2 850	200	3 050	1 050	4 100	29
2002	3 900	600	4 500	1 000	5 500	33
2003	3 400	0	3 400	1 200	4 600	28
2004	2 400	0	2 400	900	3 300	23
2005	3 800	0	3 800	500	4 300	23
2006	**4 850**	**0**	**4 850**	**700**	**5 550**	**26**
Total	**51 300**	**5 200**	**56 500**	**7 650**	**64 150**	**28**

NB: For 1997 and 1998, re-enriched tails are included under 'Deliveries' because quantities were small and could not be shown separately for confidentiality reasons.

B) Deliveries to EU-25 utilities of natural uranium and feed contained in EUP from the CIS (tU)

Year	Deliveries to EU utilities (2)			
	Quantity tU	as % of supply (3)	incl. RET (4)	incl. RET as % of supply (3)
1992	2 700	23		
1993	2 700	22		
1994	4 500	32		
1995	5 200	32		
1996	6 800	43		
1997	5 000	32	–	–
1998	5 600	35	–	–
1999	5 100	34	6 200	42
2000	5 800	37	7 000	44
2001	4 100	29	5 100	37
2002	6 900	41	7 900	47
2003	4 500	27	5 700	35
2004	2 900	20	3 800	26
2005	5 050	27	5 550	30
2006	**5 300**	**25**	**6 000**	**28**
Total	**72 150**	**31**		

(1) Operators include producers, users and intermediaries.

(2) Including exchanges but excluding re-enriched tails except for 1997–98 as explained under footnote (4).

(3) Supply to EU utilities covers total deliveries to EU-15 utilities under purchasing contracts during the respective year.

(4) Deliveries of re-enriched tails (RET) to EU utilities started in 1997 but were negligible (< 1 % of total supply) during the first two years. For confidentiality reasons they have been included under ‘Quantity tU’ for 1997 and 1998. The figures include RET acquired as a result of exchanges.

Annex 2: EU-25 reactor needs and net requirements (quantities in tU and tSWU)

A) From 2007 until 2016

Year	Natural Uranium		Separative Work	
	Reactor needs	Net requirements	Reactor needs	Net requirements
2007	21 700	20 200	14 400	13 100
2008	21 900	18 800	14 200	13 200
2009	20 000	16 900	14 200	12 700
2010	21 500	18 500	14 900	13 700
2011	20 000	17 400	13 700	12 700
2012	20 100	18 500	14 200	13 500
2013	20 000	18 600	14 100	13 400
2014	18 100	16 800	13 500	13 000
2015	17 200	16 000	13 800	13 200
2016	17 900	16 700	14 100	13 500
Total	**198 400**	**178 400**	**141 100**	**132 000**
Average	**19 840**	**17 840**	**14 110**	**13 200**

B) Extended forecast from 2017 until 2026

Year	Natural Uranium		Separative Work	
	Reactor needs	Net requirements	Reactor needs	Net requirements
2017	16 800	15 600	13 600	13 100
2018	16 100	14 900	13 000	12 400
2019	16 200	14 900	13 200	12 600
2020	16 000	14 800	12 900	12 300
2021	15 300	14 000	12 400	11 800
2022	15 400	14 200	12 600	12 000
2023	15 200	14 000	12 300	11 700
2024	14 100	12 900	11 500	10 900
2025	14 000	12 800	11 600	11 000
2026	14 000	12 800	11 400	10 800
Total	**153 100**	**140 900**	**124 500**	**118 600**
Average	**15 310**	**14 090**	**12 450**	**11 860**

Annex 3: Fuel loaded into EU reactors and deliveries of fresh fuel under purchasing contracts

Year	Fuel loaded			Deliveries		
	LEU (tU)	Feed equiv. (tU)	Enrich. eq. (tSWU)	Natural U (tU)	% spot	Enrichm. (tSWU)
1980		9 600		8 600	(4)	
1981		9 000		13 000	10	
1982		10 400		12 500	<10	
1983		9 100		13 500	<10	
1984		11 900		11 000	<10	
1985		11 300		11 000	11.5	
1986		13 200		12 000	9.5	
1987		14 300		14 000	17.0	
1988		12 900		12 500	4.5	
1989		15 400		13 500	11.5	
1990		15 000		12 800	16.7	
1991		15 000	9 200	12 900	13.3	10 000
1992		15 200	9 200	11 700	13.7	10 900
1993		15 600	9 300	12 100	11.3	9 100
1994	2 520	15 400	9 100	14 000	21.0	9 800
1995	3 040	18 700	10 400	16 000	18.1	9 600
1996	2 920	18 400	11 100	15 900	4.4	11 700
1997	2 900	18 200	11 000	15 600	12.0	10 100
1998	2 830	18 400	10 400	16 100	6.0	9 200
1999	2 860	19 400	10 800	14 800	8.0	9 700
2000	2 500	17 400	9 800	15 800	12.0	9 700
2001	2 800	20 300	11 100	13 900	4.0	9 100
2002	2 900	20 900	11 600	16 900	8.0	9 500
2003	2 800	20 700	11 500	16 400	18.0	11 000
2004	2 600	19 300	10 900	14 600	4.0	10 500
2005	2 500	21 100	12 000	17 600	5.0	11 400
2006	**2 700**	**21 000**	**12 700**	**21 400**	**7.8**	**11 400**

Annex 4: Supply Agency average prices for natural uranium (EU-15)

Year	Multiannual contracts		Spot contracts		Exch. rate USD/EUR
	EUR/kgU	USD/lb U_3O_8	EUR/kgU	USD/lb U_3O_8	
1980	67.20	36.00	65.34	35.00	1.39
1981	77.45	33.25	65.22	28.00	1.12
1982	84.86	32.00	63.65	24.00	0.98
1983	90.51	31.00	67.89	23.25	0.89
1984	98.00	29.75	63.41	19.25	0.79
1985	99.77	29.00	51.09	15.00	0.76
1986	81.89	31.00	46.89	17.75	0.98
1987	73.50	32.50	39.00	17.25	1.15
1988	70.00	31.82	35.50	16.13	1.18
1989	69.25	29.35	28.75	12.19	1.10
1990	60.00	29.39	19.75	9.68	1.27
1991	54.75	26.09	19.00	9.05	1.24
1992	49.50	24.71	19.25	9.61	1.30
1993	47.00	21.17	20.50	9.23	1.17
1994	44.25	20.25	18.75	8.58	1.19
1995	34.75	17.48	15.25	7.67	1.31
1996	32.00	15.63	17.75	8.67	1.27
1997	34.75	15.16	30.00	13.09	1.13
1998	34.00	14.66	25.00	10.78	1.12
1999	34.75	14.25	24.75	10.15	1.07
2000	37.00	13.12	22.75	8.07	0.92
2001	38.25	13.18	(*) 21.00	(*) 7.23	0.90
2002	34.00	12.37	25.50	9.27	0.95
2003	30.50	13.27	21.75	9.46	1.13
2004	29.20	13.97	26.14	12.51	1.24
2005	33.56	16.06	44.27	21.19	1.24
2006	**38.41**	**18.55**	**53.73**	**25.95**	**1.26**

(*) The spot price for 2001 was calculated on the basis of an exceptionally low total volume of only some 330 tU under four transactions, one of which accounted for two thirds of this quantity. Some 300 tU were delivered as UF_6 without a price being specified for the conversion component. To establish a price excluding conversion costs for these deliveries, the Supply Agency applied an estimated average conversion price of EUR 5.70/kgU (USD 5.10/kgU).

Annex 5: Calculation methodology for ESA U_3O_8 average prices

The Euratom Supply Agency collects two categories of prices on an annual basis:

- ESA weighted average U_3O_8 price for multiannual contracts, paid by EU utilities for their deliveries in a given year;
- ESA weighed average U_3O_8 price for spot contracts, paid by EU utilities for their deliveries in a given year.

The differences between multiannual and spot contracts are defined as follows:

- 'multiannual' contracts are defined as those providing for deliveries extending over more than 12 months;
- 'spot' contracts are those providing for either only one delivery or deliveries extending over a period of a maximum of 12 months, whatever the time between the conclusion of the contract and the first delivery.

Methodology

Prices

Prices are collected directly from utilities or via their procurement organisations, through:

- contracts submitted to the ESA;
- end-of-year questionnaires, completed if necessary by visits to the utilities.

Data requested on natural uranium deliveries during the year

These include the following elements: ESA contract reference, quantity (kgU), delivery date, place of delivery, mining origin, natural uranium price with specification of currency, unit of weight (kg, kgU, lb), chemical form (U_3O_8, UF_6, UO_2), indication of whether the price includes conversion and, if so, the price of conversion, if known.

Deliveries taken into account

The deliveries taken into account are those made under purchasing contracts to the EU electricity utilities or their procurement organisations during the respective year. They include also the natural uranium equivalent contained in enriched uranium purchases.

Other categories of contracts are excluded ([1]).

Deliveries for which it is not possible to reliably establish the price of the natural uranium component are excluded from the price calculation (e.g. uranium out of specification or enriched uranium priced per kg of EUP without separation for the feed and enrichment components).

(1) Such as contracts between intermediaries, sales by utilities, purchases by non-utility industries, barter deals.

Checking

ESA compares the deliveries and prices reported with the data collected at the time of the conclusion of contracts as subsequently updated. It compares, in particular, the actual deliveries with the 'scheduled deliveries' and options. Where there are discrepancies between scheduled and actual deliveries, clarifications are sought from the organisations concerned.

Exchange rates

To calculate the average prices, the original contract prices are converted into EUR per kgU contained in U_3O_8 using the average annual exchange rates as published by the European Central Bank.

Prices which include conversion

For the few prices which include conversion and where the conversion price is not specified, the ESA, given the relatively minor cost of the conversion, converts the UF_6 price to a U_3O_8 price using an average conversion value based on its own sources of information, specialised trade press publications and confirmed by discussions with the converters.

Independent verification

Two members of the ESA staff independently verify calculation sheets from the database.

In spite of all the care, errors/omissions are uncovered from time to time, mostly on missing data, e.g. deliveries under options, which were not reported. As a matter of policy, the ESA never publishes a corrective figure.

Data protection

Confidentiality and physical protection of commercial data is provided through use of stand-alone computers, not connected either to the Commission Intranet or to the outside world (including Internet). Contracts and backups are kept in a safe room, with restricted key access.

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