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Euratom Supply Agency

Annual Report 2003

EURATOM SUPPLY AGENCY

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ANNUAL REPORT 2003

Cover photos: left: Uranotyle (x60) Alburquerque (Badajoz)
right: Torbernite (x20) Navarredonda (Avila)

Photos courtesy of Enusa (1986)

A great deal of additional information on the European Union is available on the Internet.

It can be accessed through the Europa server (http://europa.eu.int).

Cataloguing data can be found at the end of this publication.

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Foreword

The year 2003 has been, in many ways, an important, if not decisive, year for the future of the Euratom Treaty and the European Institutions. The Convention delivered at the Thessaloniki European Council in June 2003 a draft text of the future European Constitution, currently under consideration by the Intergovernmental Conference.

2003 has also been marked in the life of the Supply Agency by two major events: the preparations for the next enlargement of the Union, and the decision taken by the Commission on 11 February, to concentrate all activities related to the implementation of Chapters 3 to 10 of the Euratom Treaty, in Luxembourg.

In relation to the forthcoming enlargement of the Union, the Agency has been aware, right from the beginning, of the importance of a prompt incorporation of the acceding countries' interests amongst the Agency priorities, in order to facilitate their smooth integration, when they become full members of the Union. In this respect different seminars have been organised and bilateral meetings have taken place. Even representatives from acceding countries have participated for the first time, as observers, in the meeting of the Advisory Committee in November 2003.

The works carried out until now in this respect have been satisfactory, and the Agency has paved the way for a solid collaboration at the date of accession.

The second important event has been the decision taken by the European Commission to transfer in 2004 several of its nuclear services to Luxembourg. In the light of this decision and to smooth out the transfer, I have taken the decision, with the consent of the Commission, to establish a branch of the Supply Agency in Luxembourg as of 1 February 2004, in accordance with Supply Agency statutes.

Although I see the difficulties associated with this move, we shall recognise the advantages of concentrating nuclear responsibilities in one single place. In the short-term, I am committed to reduce, as much as possible, the adverse effects of the move on the work that the Agency has to deliver according to Chapter VI of the Euratom Treaty. On the other hand, I intend to consolidate a core team of the Agency in Luxembourg, to be operative as of May 2004.

These introductory remarks allow me also to thank the Advisory Committee Members, its Chairman and the Bureau for the fruitful cooperation with the Agency during this year and in particular for the important work developed in the fields of trade with Russia, security of supply and validation of the price index methodology.

I hope that the new Chairman and the new Bureau to be elected after the accession date will pursue further the existing useful cooperation established since I was designated as acting Director-General of the Supply Agency.

Many thanks to all,

C. Waeterloos

Director-General

Overview

The year 2003 was tense from the point of view of the nuclear fuel supply chain. Several incidents like the flooding of the Mc Arthur River mine in Canada and the temporary closure of the conversion facility of ConverDyn in the USA as well as the confirmation of the closure of the BNFL conversion facility in the United Kingdom in 2006 have influenced the perception of the disruption risks of the market.

The Supply Agency has observed a doubling of Uranium purchases on the market by the European industry in 2003, 18,000 tU (2003) compared with 9,200 tU in 2002. In parallel, the quantity of deliveries under spot contracts represented a significant share of the total (18 %).

Simultaneously with production disruptions, the significant move in the exchange rate between the US dollar and the euro has hindered the profitability and revenues of the front-end cycle industry and more particularly the Uranium mining sector.

All these factors together will have an increasing influence on the nuclear Industry Company's purchasing strategies at short- and medium-term. This all demonstrates the need at European and utility levels for a clear 'security of supply' strategy as advocated by the Supply Agency for many years.

For the first time, important purchasing of Russian HEU feed by the European industry has been reported. This amounts to around 8 % of the Uranium deliveries in 2003.

Russia remained the largest overall supplier to the EU utilities in 2003 (35 % of deliveries to EU), with deliveries in the order of 3,400 tU, plus 1,000 tU in the form of re-enriched tails through the EU enrichers and in addition some 1,300 tU of HEU feed.

For the Supply Agency, the preparation of the EU enlargement in 2004 has been a key factor and intensive preparatory work has been undertaken in full cooperation with the acceding countries. The Uranium market in the new Member States is of utmost importance as well as the situation on security of supply.

During the year, the official announcement of the plan to build a new enrichment facility in France has been made by AREVA. This new facility will be based on the centrifugation technology developed by Urenco through a common company.

The Supply Agency endorses the replacement of the gas diffusion technology of the G.Besse plant in Tricastin, by the new centrifuge enrichment facility. The competition authorities of the European Commission will analyse this project in the light of their own competences.

Chapter 1
General developments

Main developments in the Member States

In Belgium, the law on the gradual phase out of commercial power plants after 40 years of operation has been approved by Parliament and was promulgated on 31 January 2003. The new government, which was installed in July 2003, declared that the government would continue efforts to maintain the nuclear knowledge in the field of nuclear energy.

The Finnish nuclear operator Teollisuuden Voima Oy (TVO) proceeded with its plan to build a new nuclear power unit. In December 2003, after having received a number of bids, TVO chose the French-German consortium Framatome ANP GmbH, Framatome ANP SAS and Siemens AG as the supplier of this new unit. The chosen reactor type is EPR (European pressurised water reactor) with a thermal power of 4,300 MW. The electrical output of the unit will be about 1,600 MW and its planned technical operating lifetime around 60 years. The unit will be built on the Olkiluoto site, where TVO already operates two BWRs.

In France, the AREVA Group signed an agreement with Urenco shareholders, under which it will acquire a 50 % equity interest in Enrichment Technology Company (ETC), subject to approval by competition authorities and relevant governments. This will allow AREVA to launch the construction of its future uranium enrichment plant, Georges Besse II, at the Tricastin site. Production capacity will be increased gradually starting in 2007 and reach its nominal level around 2016.

In Germany, the Stade nuclear power plant was finally shut down on 14 November 2003 for commercial reasons. The actual dismantling work is scheduled to begin in mid 2005 and should be completed around 2015.

In the United Kingdom, the government issued in February 2003 its Energy White Paper, which set out the UK's energy policy to 2050. Whilst the government recognises that nuclear power is an important source of carbon-free electricity, the current economics of nuclear power make it an unattractive option for new generating capacity and there were also important issues for nuclear waste to be resolved. Although there are no proposals for building new nuclear power stations in the White Paper, the Government recognises that at some point in the future new nuclear build may be necessary in order to meet its carbon-reduction targets.

At the end of 2003, the Italian Government indicated, through a specific decree, the site chosen in the south of the country for the definitive repository of low-, medium- and high-level radioactive wastes. A very strong opposition at local level obliged the Parliament to change the decision and to limit the more immediate activities to the choice of a site for the repository of only high-level wastes.

In Sweden, 2003 was marked by high electricity prices due to extremely dry weather and the resulting lack of water in the Swedish and the Norwegian reservoirs. Therefore, electricity production was approximately 8 % lower than the year before and Swedish electricity imports reached their highest level ever (25 TWh).

Initiatives of the EU Commission in the nuclear field

Nuclear package

On 30 January 2003 the Commission adopted two proposals for a Council Directive as regards nuclear safety and radioactive waste management, after the Article 31 Group had given its opinion. Under Article 31 of the Euratom Treaty the Commission consulted the European Economic and Social Committee, which issued on 26 March 2003 a positive opinion on these drafts.

The proposed directives were forwarded to the Council on 2 May 2003. It is normally, according to the Euratom Treaty, up to the Council to get the opinion of the European Parliament. Discussions are ongoing in the Council (Atomic Questions Group). The opinion of the European Parliament on the two proposals was adopted on

13 January 2004. Its opinion supports an adoption of a legally binding instrument under Chapter 3 of the Euratom Treaty. The European parliament proposed amendments which are generally in line with the discussions in the Council.

The first proposal, 'proposal for a directive setting out the basic obligations and general principles on the safety of nuclear installations', was drafted with the main objective to ensure that health protection against ionising radiation will be assured during the whole life of nuclear installations, from design to decommissioning. The proposal sets out basic obligations and general principles contained in the international conventions and gives them force of Community law. To ensure the credibility of the system, the proposal institutes, in a Community framework, a crosschecking of the national safety authorities. Another objective of this initiative is to confirm the necessity to have available adequate financial resources to cover the cost of decommissioning of nuclear installations.

The objective of the second proposal, 'proposal for directive on the management of spent nuclear fuel and radioactive waste', is to place an obligation on the Member States to adopt national programmes for the management of radioactive waste, to adopt common deadlines for the disposal of radioactive waste and to give priority to the solution of deep geological disposal. This proposal also intends to encourage the cooperation between the Member States in common areas of research and technological development.

These two proposals for a directive are legally based on Title II, Chapter 3 of the Euratom Treaty concerning health protection. They supplement the basic standards relating to the health protection of the population and of the workers against the dangers resulting from ionising radiation. The adequacy of the legal basis for these two proposals has been confirmed by the Court ruling C-29/99 of 10 December 2002. The Court of Justice of the European Communities explicitly recognised in this decision the Community's power to legislate in the field of nuclear safety, under Articles 30 to 32 of the Treaty. In particular, the Court ruled that although the Euratom Treaty did not grant the Community competence to authorise the construction and operation of nuclear installations, under Articles 30 to 32 of the Treaty the Community had legislative competence to establish, for the purpose of health protection, an authorisation system which must be applied by the Member States, in addition to the basic standards laid down in accordance with those provisions.

Trade in nuclear materials with the Russian Federation

As indicated in the chapter on 'Bilateral nuclear cooperation agreements', the negotiating directives given to the Commission by the Council in November 2003 will allow a prompt start of the negotiations. As recognised in the mandate, the Euratom Supply Agency, in the light of the powers conferred by Chapter VI of the Euratom Treaty, has a relevant role to play, not only in the framework of the forthcoming negotiation process, but also in the administration of the future agreement.

Euratom Supply Agency representatives will participate in the Commission's negotiating delegation, chaired by the Energy and Transport Directorate-General.

Negotiations will take place in close contact with the Atomic Questions Group of the Council.

International relations

Bilateral nuclear cooperation agreements

Euratom's nuclear cooperation agreements with three major suppliers — Australia, Canada and the United States — continued to be implemented normally. Cooperation under these agreements, which have been running for many years, functions well, and supplies made under them continue satisfactorily.

The good relation between Euratom and the USA in the nuclear area was confirmed during a bilateral consultation meeting as provided by Article 12 of the agreement. The meeting was held on 22 October 2003 in Washington. It was an opportunity for an exchange of views on several subjects of mutual interest, such as: nuclear policy developments, long-term waste repositories, diversification of supply, safeguards, and safety and security of nuclear installations in the light of the 11 September 2001 events.

Concerning the forthcoming EU enlargement, the parties noted that five acceding countries (the Czech Republic, Hungary, Poland, Slovakia and Slovenia) currently have bilateral agreements for cooperation with the USA and that the deliverability of terminating these agreements was acknowledged by both sides. Therefore, such agreements are supposed to be folded into the Euratom–US agreement upon accession. Material and equipment that has been transferred under the bilateral agreements will be added to the inventory of the Euratom–US agreement upon accession.

According to Article XIII of the Euratom–Canada agreement, a consultation meeting was held on 24 October 2003 in Ottawa, Canada, following a quite similar agenda. In agreement with both Canadian and US authorities, it was decided to hold such consultation meetings on a more regular basis.

During the summer of 2003, in the framework of Article IX of the Agreement between the Government of Canada and Euratom for cooperation in the peaceful uses of atomic energy (1959), a temporary arrangement was reached between Canada, Euratom and Russia on the shipment of Canadian obligated uranium tails, located in the EU, to the Russian Federation for upgrading to equivalent natural uranium and LEU. This arrangement is limited in time, until ongoing political consultations result in a definitive solution.

Other important developments in 2003 concerned Uzbekistan, Russia and Japan.

A nuclear cooperation agreement between the Community and Uzbekistan was signed on 6 October 2003. This agreement will, *inter alia*, cover transfers of nuclear material. The agreement is now subject to the ratification process on the Uzbek side.

On 17 November 2003, the Council authorised the Commission, in accordance with the Euratom Treaty, to undertake the negotiation of an agreement on trade in nuclear materials with the Russian Federation. Negotiations will be launched in 2004.

Concerning the agreement with Japan, after scrutiny, the Japanese side proposed some amendments to the text already initialled in 2002. Following discussions on both sides, the amended text has been initialled again on 6 January 2004.

Enlargement of the EU

The preparations for the accession of 10 new Member States entered their final stage during 2003. The relative share of nuclear power in the energy-mix varies greatly across these countries. Five of the new Member States (the Czech Republic, Hungary, Lithuania, Slovakia and Slovenia) have active nuclear power programmes. They account for 19 operating nuclear power reactors (with about 10,600 MW of gross capacity), which brings the EU total to 159 reactors (without research reactors). Of these, Lithuania's reactors are of the Russian RBMK type, and due to be closed in 2005 and 2009, respectively. The Czech, Hungarian and Slovak reactors are of the Russian WWER type, whereas the Slovenian one is a PWR supplied by Westinghouse. Traditionally, the Russian reactors have been supplied with Russian fuel in the form of complete fuel assemblies, and in the past the irradiated fuel was returned to Russia for disposal, but this is no longer the case. For these countries, the accession will bring some changes for their future nuclear fuel procurement, although supply contracts concluded before the accession will continue to be honoured.

For the Supply Agency, the number of members of its Advisory Committee will increase from 51 to 69; also its capital will be raised to EUR 5,440,000. The Supply Agency has already started working with the authorities and the nuclear industries of the new Member States (see more details in Chapter 4). Observers from the new Member States participated in the Advisory Committee meeting in November 2003 for the first time.

General policy in the acceding countries

In the Czech Republic, the government prepared and submitted for discussion in 2003 an upgrade of the national energy policy. The approval of this upgrade is expected in 2004 on the government level. The updated draft of the national energy policy proposes six possible scenarios with different share of nuclear energy in the future.

The Lithuanian Parliament approved the new edition of the National Energy Strategy on 10 October 2002. It was decided that the first unit of Ignalina NPP will be closed before 2005 and the second unit in 2009, while stressing the need for Lithuania to remain a 'nuclear state'; taking into account global nuclear energy development trends, the latest reactor technologies and their technical-economic characteristics. A comprehensive study on the continuity of the use of nuclear energy in Lithuania will be prepared, covering the justification of nuclear safety and acceptability of nuclear energy, including the construction of new nuclear power plants.

The Slovak Government has been focusing on privatising and restructuring the electricity sector, and the privatisation of the distribution companies has been completed since June 2002. From 1 January 2003, URSO (the regulation office) took over regulation of prices in the electricity market.

In 2003 the Slovenian Government endorsed the national energy plan for the period 2000–2020. According to the economic scenario of this plan, total primary energy demand will grow in the period 2000–2020 by 1.1 % and electricity demand by 1.5 % annually. Keeping the nuclear option for electricity generation is included in the plan.

The biggest new Member State, Poland, does not have a nuclear power programme, nor is nuclear energy included in the energy-mix of the country in the energy policy guidelines adopted by the government until 2020.

For details about the new Member States' nuclear policy, see Annex 1 *bis*.

Legal developments

USEC anti-dumping and countervailing duty proceedings against Eurodif and Urenco

In December 2000, the USA opened two parallel highly controversial anti-dumping and anti-subsidy investigations against low-enriched uranium (LEU) from France, Germany, the Netherlands and the United Kingdom. The initiation of these investigations was problematic since the petitioner USEC (the US enrichment company) did not appear to have 'standing' to lodge a complaint. It is essentially a subcontractor who processes the product for US electricity utilities, who were opposed to the investigation, and could be viewed as a service provider rather than a producer of goods.

On 13 February 2002, the US DOC imposed definitive countervailing duties of 12.15 % on imports from France (the Eurodif company) and of 2.23 % on imports from the UK, Germany and the Netherlands (the Urenco company). DOC also imposed definitive anti-dumping duties of 19.95 % on imports of LEU from France, but terminated the case against Germany, the UK and the Netherlands because of *de minimis* dumping margins.

An administrative review of the measures started in March 2003. In parallel, the DOC determinations were challenged before the US courts. On 25 March 2003, the US Court of International Trade (CIT) remanded the following issues to the DOC for further explanation and consideration: (1) DOC's interpretation and application of its 'tolling or subcontractor regulation' for purposes of determining industry support and for purposes of establishing export price and normal value, (2) whether AD and CVD law applies to LEU entering the US pursuant to enrichment contracts (SWU contracts) and (3) whether the government of France has purchased goods, as compared to services, for more than adequate remuneration.

The DOC's remand determination was presented to the CIT on 23 June 2003. The CIT's final decision was taken on 16 September 2003. It concluded that it was legitimate for the DOC to establish domestic support on the basis of the US companies that carried out production activities in the US to the exclusion of utilities procuring LEU under SWU contracts. It also found that the countervailing duty law may apply to imports of LEU under either LEU purchase contracts or SWU enrichment contracts, and upheld the determination that the purchase of enrichment for more than adequate remuneration may constitute a countervailable subsidy. However, the CIT found that LEU purchase contracts and SWU contracts are not equivalent as SWU transactions do not result in a sale of goods within the meaning of the anti-dumping law. Therefore, the CIT found that the anti-dumping law can only apply to LEU transactions.

The CIT has given leave to Eurodif and USEC to appeal its findings to the Federal Appeals Court (CAFC).

Other developments

Joint venture between Areva and Urenco on enrichment technology

The group Areva announced during December that it will build a new uranium enrichment facility to be located in Tricastin (F). On 24 November, Areva and Urenco signed an agreement under which Areva will acquire 50 % of the Urenco Enrichment Technology Company (ETC). The conclusion of this agreement followed the signature of a 'memorandum of understanding' between the two partners in October 2002. Under this agreement, it is foreseen that the ETC will supply Areva with the most performing centrifuges and related technical assistance. The construction of the new plant, called Georges Besse II, is expected to start in early 2005 and production from 2007 on. Nameplate capacity could be reached by 2016. The global financial investment is around EUR 3 billion. The new GB II plant is expected to produce around 7.5 million SWU per year. Areva has highlighted the importance of the modularity of the investment, allowing adaptation of the nameplate production capacity towards the future market needs. The Areva–Urenco agreement is subject to approval by the European Commission competition authorities and the entry into force of an intergovernmental agreement among Germany, the United Kingdom, the Netherlands and France.

LES II

The LES II National Enrichment facility project is managed by a consortium that includes Westinghouse, Entergy, Exelon, Duke Power and Urenco. During 2003, main activities were concentrated on the location and licensing aspects of this new enrichment by centrifugation project. After several difficulties to site the facility in Louisiana and Tennessee due to public acceptance, the consortium has decided to apply to the US Nuclear Regulatory Commission to build the LES II facility in Lea County in New Mexico. The request for license applies to a yearly production capacity of 3 million SWU. It is expected that 30 months will be needed by the US NRC to review the license application.

United States Enrichment Corporation (USEC) centrifuge

In its attempt to increase its enrichment output via centrifuge technology, USEC has declared its intention to build a new centrifuge plant in order to replace the Paducah gaseous diffusion plant. Discussions took place on the potential geographical siting of the new plant as well as the best way to secure the needed financing for the new investment (estimated at 1.5 billion USD for an annual production capacity of 3.5 million SWU). The new centrifuge plant would replace the current Paducah gaseous diffusion plant by 2010. In early January 2004, USEC selected Piketon, Ohio, as the site for its planned commercial American Centrifuge uranium enrichment plant.

New nuclear generation and power plant projects

Nuclear generation continued to make steady progress as utilities continued to upgrade their plants and to improve capacity factors. There were also additional signs for a revival of nuclear power generation, especially in the developing economies of China, Russia and India, but also in the United States to a lesser degree. Several applications for an early site permit were lodged in the US, and many existing power plants received lifetime extensions. After the massive blackout in the eastern US/Canada in August, energy policy debate picked up steam, and more voices were raised in favour of nuclear energy. The proposed new US energy bill included measures to support the nuclear sector, but final approval of the bill was not achieved in 2003. In Europe, the effects of the summer's heat wave and blackouts in Italy, United Kingdom, Sweden and Denmark also activated energy policy discussions. Transmission networks also received more attention following the blackouts; both in Europe and North America, initiatives were taken to encourage adequate investment in transmission infrastructure.

Elsewhere, China has worked out a long-term national plan for nuclear power development to accommodate its huge energy needs while diversifying its energy sources beyond coal. The plan includes building up to 30 new reactors by 2020, in addition to recently finished reactors. Russia has announced plans to double its nuclear generation capacity by 2020 and has revived its uranium exploration efforts. It also has export orders for deliveries of nuclear power plants to China, India and Iran, and is pursuing other markets as well. The Ukraine also has nuclear power plants under construction. Many other countries (Argentina, Brazil, Bulgaria, Canada, Egypt, India, Iran, Japan, South Korea, Vietnam ...) considered reviving or finishing old projects as well as starting new ones.

In addition to securing adequate electricity supply, the need to meet the targets of the Kyoto Protocol on the reduction of greenhouse gas emissions and the instability of oil prices may lead some countries to reconsider the nuclear option. Also, more and more emphasis and hope is placed on the use of hydrogen energy in the future, and nuclear power is increasingly recognised as a means to produce large amounts of hydrogen.

Finland's new reactor

At the end of the year, the Finnish company TVO announced that it had chosen the new EPR (European pressurised water reactor, 1,600 MW) supplied by the consortium of Framatome ANP and Siemens as the fifth reactor to be built in Finland (Olkiluoto 3). This decision follows many years of discussions in Finland and many changes in political sentiment in favour of or against a new reactor. The next step in the construction process, an application for the construction licence was submitted to the Council of State by TVO in January 2004. The current government has declared that it will handle the application without delay. The new reactor should be operational in 2009. The EPR design is based on the latest French and German technology and has an efficiency of about 37 %, which clearly exceeds that of current reactors and which also means that it should use somewhat less uranium – and therefore produce also less waste – per kilowatt-hour.

Storage of spent nuclear fuel in Russia

The Russian President, Vladimir Putin, signed into law on 27 December 2003, a bill to ratify agreements to co-operate with other states in order to enhance radioactive safety in disposing of nuclear submarines and nuclear waste. The bill ratified the multilateral nuclear environmental program (MNEPR) in the Russian Federation Framework Agreement and the protocol on 'claims, legal proceedings and indemnification to the agreement'.

The agreement and protocol, which were both signed by Russia on 21 May 2003, are aimed at 'the development of an organisational and legal basis for long-term cooperation between the Russian Federation and foreign States in seeking to achieve nuclear and radioactive security in the disposal of Russian nuclear submarines, in handling spent nuclear fuel and radioactive waste, at foreign assistance to the Russian Federation in the disposal of decommissioned armaments, and at strengthening the regime of non-proliferation of weapons of mass destruction'.

International Thermonuclear Experimental Reactor (ITER)

On 26 November 2003 and after one year of intensive promotion campaigns of the two European candidatures — Cadarache (France) and Vandellos (Spain) — the European Council of Research Ministers selected unanimously Cadarache as its preferred location for the ITER project.

The agreement was reached on the European preference of Cadarache, along with the agreement to locate the administrative headquarters of the European branch of the project team in Spain.

On 20 December 2003, ministers representing the participants in negotiations on ITER construction — China, the European Union, Japan, South Korea, the Russian Federation and the United States of America — met in Washington, but they were unable to reach a final agreement on the site for ITER, between Cadarache and Rokkasho Muro in Japan.

Transport issues

During 2003, the new IAEA TS-R-1 regulations caused a lot of concern amongst the industry. The most problematic issue has been thermal protection for UF_6 cylinders; EU countries have accepted the use of thermal protection during transport, whereas the Unites States and Russia have been reluctant to accept these provisions and to allow UF_6 cylinders with a thermal protection into their ports.

Even without these regulatory uncertainties, transport of nuclear materials has increasingly become a bottleneck in the wider nuclear fuel cycle. Despite an excellent safety record of nuclear transport, the number of carriers accepting fissile nuclear material is very limited, and many ports refuse to handle such cargo or even to give a transit licence for it. Some countries do not accept vessels carrying radioactive materials into their territorial waters. For large shipping operators, the business of transporting nuclear materials is too small and therefore uninteresting when the strict regulatory requirements affecting it are taken into account. Especially because of the geographic imbalance in conversion capacities between North America and Europe, transportation will become an even more important issue in the future.

Climate change

Emissions trading

The European Commission adopted on the 23 July(1) a new initiative to combat climate change globally. A proposal for a new directive would allow European companies to carry out emissions-curbing projects around the world and convert the credit earned into emissions allowances under the European Union trading scheme. The proposal builds on the so-called market-based flexible ‘joint implementation’ mechanism envisaged by the Kyoto Protocol. The aim is to reach the global emissions reduction targets in a cost-effective way while transferring advanced technology to other industrialised and developing countries. The Commission’s proposal takes into account the obligation for parties to the Kyoto Protocol to achieve a significant part of their Kyoto targets through emission reductions in the European Union, so that the use of the Kyoto flexible mechanisms is supplementary to domestic efforts. The proposal excludes nuclear projects in line with the Kyoto Protocol’s rules and ‘carbon sinks’.

On 13 October 2003, the European Parliament and the Council adopted a new directive(2) establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. This directive allows for gas emission allowances trading in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner. This directive had to be brought into force since 31 December 2003.

(1) Proposal for a directive amending the directive establishing a scheme for greenhouse gas emission allowance. Trading within the Community, in respect of the Kyoto Protocol’s project mechanisms COM(2003) 403 final of 23.7.2003.

(2) Directive 2003/87/EC of 13.10.2003.

The EU sustainable development

Combating climate change is one of the main commitments under the EU's sustainable development strategy as endorsed by the European Council in Göteborg in 2001. The Brussels European Council of March 2003 invited the Member States to accelerate progress towards meeting the Kyoto Protocol targets. Climate change is also one of the four priorities under the Community's sixth environmental action programme, which calls for full implementation of the Kyoto Protocol as a first step towards reaching a long-term target of 70 % in emission cuts. In April 2003, the Commission published the second 'European climate change programme' report, suggesting that plenty of cost-effective measures exist to meet the EU's Kyoto targets. The emission reduction needed to meet the EU's (15) Kyoto target is estimated at around 340 million tonnes of CO_2 equivalent.

Convention on the Future of Europe and Euratom Treaty

Results

The 'EU Convention' including representatives of the current and future EU Member States decided at the end of its long-standing debates to propose to maintain the 1957 Euratom Treaty in its current shape and to retain it as a separate treaty.

The European Commission addressed the issue in its communication of 17 September 2003[3] by declaring that the Convention drew up a Protocol repealing several provisions of the Treaty establishing the European Atomic Energy Community (Euratom). It was drafted on the assumption that the legal personality of this Community would be merged with that of the Union, but the Convention decided to propose that a separate legal personality be upheld for Euratom, failing, however, to make the amendments to the protocol that this change in approach would require. The Commission considers that in the absence of any provisions on the joint institutional framework for the Union and Euratom, of any provision equivalent to the current Article 305 EC and of provisions on the revision and scope of the Euratom Treaty, the legal framework of the Euratom Community remains incomplete and the legal relationship between the Euratom Community and the Union based on the Constitution has not been settled.

On 24 September, the European Parliament called for a revision in depth of the Euratom Treaty. The EP urged the upcoming Intergovernmental Conference to convene a Euratom Treaty revision allowing a co-decision process including the EP. The EP insisted also on some inconsistencies between the Euratom Treaty and the planed EU Constitution in the field of decision-making processes and some jurisdictions.

Intergovernmental Conference

At the end of 2003 no final decision was taken, nevertheless the IGC's main orientation was not to change the substantive provisions, nor the juridical personality of the Euratom Treaty. In November, at the Ministerial meeting of Naples, Austria proposed that a new IGC should be convened in order to review the Euratom Treaty (supported by Hungary). Most members opposed this proposal and it has been decided not to follow the Austrian proposal. Work will continue under the Irish Presidency during the first semester of 2004.

(3) Communication of the Commission on a Constitution for Europe. COM(2003) 548 final of 17.9.2003.

Chapter 2
Nuclear fuel, policies and markets

Nuclear electricity generation and fuel requirements

In 2003, 140 nuclear power reactors with a total net capacity of about 122 GWe were in operation in the European Union, and 19 additional reactors were operating in the 10 acceding countries. The nuclear electricity generated in the Community[4] continued to increase and amounted to 853.5 TWh or 33.54 % of the total (compared with 849.8 TWh in 2002). If fossil sources had been used instead, some 300–600 million tonnes of CO_2 would have been emitted to the atmosphere for the same energy production (depending on the substitution mix).

The world reactor requirements for nuclear fuels amount to some 66,000 tU/year (natural uranium equivalent) and 39,000 tSWU/year (for uranium enrichment)[5]. The requirements of the EU reactors represent just under one third of the world total.

Nuclear fuel cycle

Natural uranium

Supply of natural uranium to the EU utilities remained steady, with most deliveries taking place under long-term contracts. However, the amount of uranium delivered under spot contracts increased significantly relative to past years and reached 18 % of total deliveries. The Supply Agency's average price for deliveries under spot contracts was slightly higher in US dollars (9.46 USD/lbU_3O_8) , but declined in euro prices (EUR 21.75 /kgU) due to variations in the exchange rates.

A similar situation has been observed for multiannual contracts (13.27 USD/lbU_3O_8) and (EUR 30.5 /kgU) (see Annex 5).

Although the trade press has practically stopped publishing different prices for NIS and non-NIS natural uranium, the Supply Agency continued to observe that, on average, NIS prices remained somewhat lower than non-NIS prices.

Exchange rates continued to play a significant role, the fluctuations of the euro against the US dollar and the currencies of the producing countries, made price comparisons difficult at times. In 2003, the euro reached a high level of USD 1.13 on a yearly average basis (+19 % above the 0.95 value of 2002).

Russia's primary production and direct sales of natural uranium remained relatively small. EU imports represented only a few hundred tonnes. However, it remained the largest supplier of uranium mainly in the form of feed contained in LEU. Taking into account the downblended HEU material and the re-enrichment of depleted uranium ('tails'), the total share of Russia in uranium deliveries to EU utilities would amount to some 35 %.

EU indigenous supply continued to decrease. In 2003, Community domestic supply to the EU utilities represented less than 1 %, most of it associated with existing stocks or uranium recovered as a result of the clean-up operations of mines which have been closed.

In 2003, preliminary figures indicate that worldwide uranium production amounted to some 35,250 tU, equivalent to the 35,000 tU in 2002.

(4) *Source*: International Energy Agency – Monthly Electricity Survey – December 2003.

(5) *Source*: World Nuclear Association Report on the Global Nuclear Fuel Market for 2003.

From a geographical point of view:

Production by Energy Resources of Australia Ranger Mine announced an increase of 14 % compared to 2002 (11.32 million pounds of U_3O_8). Olympic Dam output was 7.06 million pounds for 2003, and the Beverley ISL mine remained fairly stable. Australia's uranium production may have slightly exceeded 20 million pounds U_3O_8 for the year 2003, an overall increase of more than 12 %.

Rossing uranium mine announced a production decrease by almost 13 % from the previous years (5.29 million pounds U_3O_8).

Nufcor production of U_3O_8 was reduced by 8 % (1.97 million pounds U_3O_8).

Canadian production data has to take into account the output increase in Rabbit Lake and McClean Lake complex, the reduction of output by Mc Arthur River (because of the flooding incident in April) and the shutdown of Cluff Lake. Cameco produced 18.7 million pounds of U_3O_8 compared with 15.89 million pounds in 2002 (+16.6 %).

Table 1: Natural uranium production in 2003(6)

Country	Tonnes uranium	% share
Canada	10,460	29.7 %
Australia	7,650	21.7 %
Niger	3,150	8.9 %
Kazakhstan	2,840	8.1 %
Namibia	2,040	5.8 %
Uzbekistan	1,600	4.5 %
Russia	3,000	8.5 %
South Africa	760	2.2 %
Others	3,750	10.6 %
TOTAL	35,250	

The overall supply and demand situation remained practically unchanged relative to the last years. Compared with the total worldwide needs of some 66,000 tU/year, primary production remains well below reactor needs. Current mine production covers just 53 % of the reactor requirements, and the balance continues to be made up by stockpiles, recycling and military origin HEU stockpiles.

Conversion

For the global conversion industry, 2003 was marked by two incidents at ConverDyn's Metropolis conversion facility. It was first closed temporarily in September, resumed production of UF_6 in November and was then closed again in late December because of another incident, for an undetermined period of time. The company has to make some repairs and improvements and receive permission from the NRC before restarting production. Originally, it was foreseen to upgrade the plant in 2004 to a sustainable annual capacity of 14,000 tU as UF_6, but now a significant part of this production will not be available to the market in 2004. As the second closure came on 22 December 2003, it didn't have time to impact published prices in 2003, but in January 2004 reported month-end price indicators for conversion rose from USD 5.25 to USD 6.50 per kgU in the North American market and from USD 6.75 to USD 7.50 per kgU in the EU market.

These incidents together with the Tenex/GNSS dispute and a conversion market, which is characterised by a regional imbalance between Europe and North America, have made conversion the bottleneck of the fuel cycle, and this has also put increased pressure on transportation.

(6) Preliminary figures published by producers or estimated.

Enrichment

Supply of enrichment (separative work) to the utilities continued despite the problems in the conversion industry. Enrichment capacity worldwide and in the Community, in particular, exceeds current requirements. As for natural uranium, most of the supply to the EU utilities continued to take place under long-term contracts.

Compared with disruptions in the mining and conversion businesses, the enrichment industry operated in a relatively stable environment but continued to be in the news partly because of trade restrictions and court cases but also because of key decisions on new plants and technology sharing by some of the main players. The ongoing trade disputes in the United States contributed to uncertainty regarding imports into the United States of enriched uranium from Europe and thus left USEC in a privileged position. The Supply Agency continues to monitor the situation with a view to ensuring the viability of the EU industry and the long-term security of supply of the EU users.

As published in the specialist press worldwide, spot price indicators remained around USD 108/SWU throughout 2003, after having increased from some USD 80/SWU in 1999–2000 to over USD 100 in 2001 and up to USD 108 at the end of 2002. Expressed in euro, this SWU price indicator has actually declined over the past two years. However, spot market volume for enrichment was extremely light in 2003 and therefore conclusions cannot really be made on the basis of the spot market SWU price. The tendency to negotiate transactions 'off market' has become even more generalised, which of course reduces transparency, especially regarding prices. Although new contracts in the EU may command somewhat higher prices than those seen in 1999–2000, the Supply Agency observed that the prices were much more stable and remained significantly lower than in the United States.

If the natural uranium price increase persists or spikes further, utilities may adjust their tails assays, which will require more enrichment services. Worldwide, there seems to be enough capacity for this at the moment, as enrichment capacity is expected to increase in the coming years, but this supposes that the new Georges Besse II centrifuge plant, the LES II plant and the new USEC centrifuge plant in the US come on-line as planned.

Fabrication

European Union fabrication facilities continued to provide adequate coverage of the utilities' needs.

Uranium oxide fuel was produced on a steady basis during 2003 with an increased production flexibility of the Framatome–Siemens factories in France and Germany.

MOX fuel fabrication continued in France, Belgium and the United Kingdom.

Plutonium commissioning in the Sellafield MOX plant is currently being carried out. The manufacturing process is subdivided into several major steps, which are sequentially commissioned and progressively challenged with MOX material.

In France, Cogema decided to close down, in July 2003, its MOX factory in Cadarache, after having produced its last MOX fuels for its German clients. In the fall of 2000, due to changes in seismic standards and in agreement with the French nuclear safety regulator ASN (Autorité de Sûreté Nucléaire), Cogema presented proposals to the French ministries of the environment and industry that included the transfer of the site's commercial production operations to the MELOX plant in the Gard department. This involved the request for a complementary licence to increase the production of the Melox facility in Marcoule.

In Belgium, the MOX production by Belgonucleaire in Dessel amounted to 37.1 tonnes for use in Belgian and German nuclear power plants. The year 2003 marked the end of the MOX fabrication with plutonium coming from the UP3 reprocessing contract as foreseen in the Resolution by the Belgian Parliament in December 1993.

In Germany, the former MOX fabrication plant located in Hanau has been packed up and stored inside a warehouse at Siemens in Hanau. At the end of 2003, bilateral discussions between Germany and China led to a general agreement to sell the MOX fabrication plant to China in 2004. This option is still undergoing Parliamentary scrutiny.

Reprocessing

Reprocessing of irradiated fuel continued at the plants at The Hague in France and Sellafield in the United Kingdom. Under the amended German Nuclear Energy Act, shipments from Germany for reprocessing abroad will not be permitted from mid 2005. Instead, the spent fuel elements are to be taken to decentralised on-site interim storage facilities and transferred directly to final storage later after suitable processing. The recycling of uranium recovered from the reprocessing of the Belgian spent fuel in The Hague is now completed.

Instead of having the reprocessed uranium re-enriched by conventional enrichment, some utilities, often in partnership with European fabricators, are sending the material to Russia where it is blended with HEU of military origin. After blending, the material is sent back to the EU in the form of EUP for further fabrication of fuel elements.

Taking into account the non-proliferation policy of the EU and the actual circumstances of the European market, the Euratom Supply Agency is temporarily endorsing this practice.

Secondary sources of supply

<u>Supplies derived from disarmament of nuclear weapons</u>

December 2003 was a 10-year milestone for the implementation of the Megatons to Megawatts programme between the USA and the Russian Federation. The Megatons to Megawatts programme has the objective to contribute to non-proliferation of nuclear weapons by utilising Russian weapons grade uranium in US commercial reactors.

An equivalent to 8,000 nuclear warheads have been eliminated and converted into peaceful energy. Since 1994, USEC fuel purchases are 5,932.7 tons of LEU derived from the recycling of 201.5 tons HEU. This amount represents about 40 % of the complete programme. This is for the period 1995–2003 an estimated amount of 157.8 million pounds U_3O_8 equivalent, 60,000 tons uranium in conversion services and 36.9 million SWU.

The agreement foresees that some natural uranium should go back to Russia for the requirements of the Russian atomic energy programme.

The USEC privatisation act requires that the US President reports to the Congress each year on the effects the LEU delivered under the Russian HEU Agreement is having on the US front end cycle industry. In summary, the USDOE reported that the uranium feed component had a slightly negative impact on the uranium market. The report pointed out that world uranium production satisfies only 55 % of world demand, and that the natural uranium feed component and other secondary uranium sources have been expected to play a key role in filling the production shortfall.

The current Megatons to Megawatts programme will end in 2013. An important uncertainty remains on the potentiality of a second HEU deal after 2013. The disappearing of such an important secondary source of uranium could very quickly be anticipated by the price evolution of the uranium market.

<u>Natural uranium feed</u>

The sale of the natural uranium feed corresponding to the LEU delivered to USEC is subject to a commercial agreement concluded in 1999 between Cameco, Cogema and RWE Nukem on one side and Minatom and Tenex on the other. This agreement gave the western companies the right to purchase from Tenex part of the natural uranium feed component derived from the downblended Russian HEU. Tenex had also contracted with the Swiss company Globe Nuclear Services and Supply (GNSS) to sell the Tenex share of the US quota to US utilities, equal to about 41 % of the total US quota or 35,600 tU, over the period 1999 to 2013.

In November 2003, Tenex announced that it was terminating its contract with GNSS, after having sold its previous stake in the company. The legal dispute that was triggered by this announcement is likely to go on for a considerable period of time, but this event has caused great uncertainty over the availability of this material to the western market. Currently, GNSS seems unable to keep its delivery commitments, and although Tenex has announced that it will meet those commitments in some fashion, at least in the short-term there is a disruption in deliveries. Although the issue concerns mostly US utilities, which had been receiving this material in the past and which are also relying more on spot market purchases than European utilities, the ensuing spot price increase has repercussions on the global market. Beyond 2007–08, the material in question is likely to be returned to Russia and used for its own growing needs instead of being available to the western market.

MOX from military plutonium

In mid-1998, Russia and the USA declared 34 tonnes of military origin plutonium as surplus and reached an agreement on the disposition of this excess material. Within the framework of this US-Russian programme on weapons-grade plutonium disposition, Cogema group has been awarded a contract to fabricate the first 4 MOX lead test assemblies for use in US commercial reactors. The lead test assemblies will be partly fabricated in the MOX plant in Cadarache and assembled in Melox Marcoule.

In the USA, the Catawba-1 nuclear reactor has been identified as the sole unit to be considered by Duke Energy for burning 4 MOX fuel lead test assemblies produced from surplus weapons grade plutonium. Duke hopes to have the NRC licence by the end of 2004. If tests are successful, further batch loading of MOX fuel could start at Catawba and Mc Guire plants in 2008–09. Reactor reloads of about 20 % in MOX could be extended to 40 % later on.

In Russia, the disposal of surplus plutonium will be concentrated on the fabrication of MOX fuel. A MOX fuel production plant has to be built in Tomsk region of Central Siberia. It has been agreed that the US Government will contribute around 20 % of the 1 billion USD construction costs. In November 2003, Minatom declared that it has suspended the implementation of the agreement due to serious financial problems on the Russian side. The first MOX fuel elements would be produced for use into WWER 1000 reactors (Balakovo).

A first batch of MOX fuel made from weapons plutonium has been successfully burned in the Beloyarsk-3 fast reactor. About 10kg of MOX was involved.

Research reactors' fuel cycle

Research reactors continued to be supplied regularly with fresh fuel during the year.

According to the contract that the Supply Agency negotiated with the US-DOE, the supply of HEU for the Joint Research Centre High Flux Reactor (JRC HFR) until its conversion to LEU has taken place.

International cooperation continued in order to find new processes, which would allow the fabrication of fuels with LEU to replace HEU without major penalties to the operators. Work continued in preparation of the conversion of the JRC HFR in the Netherlands and the CEN-SCK BR2 in Belgium to low enriched uranium.

Cogema continued to offer to reprocess HEU fuels by diluting them with commercial LEU fuels at its plant in The Hague. Cogema also initiated feasibility studies to reprocess low U-Mo fuels.

Security of supply

Following the recommendations of the Advisory Committee in 2002, the Supply Agency and Advisory Committee set up two task forces, one of them concentrating on security of supply. The task force met several times during 2003 and has undertaken a wide-ranging analysis of all elements related to security of supply in the nuclear fuel cycle. While its work is still ongoing, the aim is to finalise in 2004 a report on security of supply, with recommendations for appropriate actions to be undertaken by different actors in order to prevent problems in the nuclear fuel cycle.

In the medium-term, worldwide supply is still sufficient to meet the requirements at all stages of the nuclear fuel cycle. However, both the short-term and the long-term outlook are more worrying. Several recent incidents in the mining and conversion industry and the GNSS/Tenex dispute have demonstrated the precarious balance of the supply chain. While there have been no real shortages, some changes to delivery schedules have been necessary, and the situation in early 2004 looks more uncertain than in a long time. The prolonged reliance on secondary sources and on drawing down inventories clearly has its limits. In this respect, a totally liberalised electricity market may have also some effects, as utilities cut costs everywhere, including investments in inventories.

Even if the recently encountered short-term problems are quickly solved and there are no further disruptions, the situation in the long and even medium-term continues to give cause for concern. The natural uranium market remains characterised by a large gap between world consumption and production, which is compensated by secondary sources of supply. The recent Tenex/GNSS dispute has put a question mark on the continued availability of the Russian HEU feed material to the western market. Increasing the quantities and extending the US–Russia HEU agreement beyond 2013 now seem more unlikely than just a year ago. With the increasing uranium price, utilities are likely to reduce tails assays, which appears to save uranium but requires more enrichment services and also reduces the potential for recovering uranium from re-enrichment of tails, which has been a considerable source in the recent past.

Despite the uranium price rise in US dollars during 2003, the situation of major producers in Canada, Australia, South Africa or Namibia has not improved to the same extent because a major part of their costs occurs in the relatively stronger currencies while most sales are made in US dollars. In case of South Africa and Namibia, the situation has even worsened and may lead to closure of the Rossing mine by 2007 because of its unprofitability. Some new exploration has recently emerged in North America, Kazakhstan, Uzbekistan and Russia but many of these are rather small-scale operations. The biggest potential for new mines is still in Canada and Australia, but environmental concerns and local resistance in Australia limits new mining development there. In any case, the time lag between discovering a deposit and starting actual production (often 10 years) means that periods of imbalance between supply and demand may occur, causing shortages and considerable price increases.

Many market participants consider conversion the weakest link of the fuel cycle. For the moment, world conversion capacity still exceeds net primary uranium production, but after the planned closure of the BNFL plant in the United Kingdom in 2006, there will be a significant geographic imbalance and a potential shortfall in the western market. The EU will be reduced to one supplier and most of the capacity will be available in North America, which will require the transportation of large quantities of UF_6 to the enrichers in Europe. Transportation will become an even more important aspect affecting the nuclear fuel cycle. In addition, the recent incidents at the ConverDyn Metropolis facility have added to the uncertainty over western conversion capacity. In general, many of the world's fuel cycle facilities are becoming old and getting licenses for new facilities is often difficult.

The situation with enrichment is considerably better from an EU standpoint. There are two enrichers with four plants in the Community with a capacity largely exceeding requirements. In the future, both Community enrichers will use the same technology, when the French diffusion process will be replaced by centrifuge technology. In the United States both the LES partnership and USEC are likely to build new plants before the end of the present decade.

A common theme for the nuclear fuel industry is the limited number of companies involved. This means that lasting problems with any one of them could seriously affect the whole industry. This is already evident in light of the ConverDyn incidents. On the other hand, there are some concerns about this oligopolistic situation, which may reduce competition.

Secondary supplies will continue to represent a very important source, and especially in the United States there is some further potential, as strategic government inventories might be used in case of major shortages. This uncertainty regarding the availability of secondary supplies has unfortunately discouraged uranium producers from developing new mines, as secondary supplies have kept prices low for many years. However, ultimately demand will have to be covered by primary supply. This seems even more crucial at a moment when many big countries (especially China and Russia) are planning to significantly increase their nuclear power generation.

Contract information received by the Supply Agency clearly confirms that in 2003 utilities increased their buying activity and exercised options to buy more material under current contracts. Contracting was at the level of utilities' actual needs, which means that previous inventory reductions seem to be over.

ESA recommendations and diversification policy

The Supply Agency continues to recommend to EU utilities that they maintain an adequate level of strategic inventories, according to their individual circumstances. In some cases of very low inventories, an increase would seem prudent. On the other hand, a sudden rush by all utilities to increase their inventories would just put more pressure on prices. Some utilities may prefer to hold U_30_8 or UF_6, others fabricated fuel assemblies or a combination thereof. While fabricated fuel is the most expensive form, it is also the least exposed to disruptions. Furthermore, it is recommended that utilities cover most of their needs under long-term contracts with diversified primary production sources at equitable prices.

The Supply Agency continues to monitor the market through its contractual role and its close relations with the industry in order 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.

The Supply Agency is awaiting the finalisation of the works of the task force on 'security of supply' in order to define follow-up measures to decrease the risk of disruption at EU level.

Chapter 3
EU supply and demand in 2003

This chapter aims at presenting an overview of supply and demand for nuclear fuels in the European Union. As before, this 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 quantities, origins and prices of acquisitions of natural uranium and separative work.

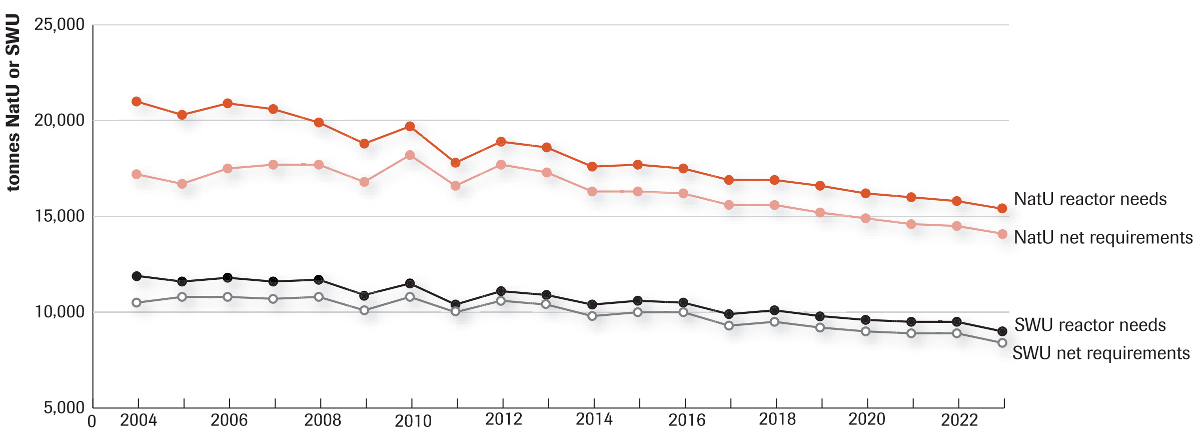
Fuel loaded into reactors

During 2003, about 2,800 tU of fresh fuel were loaded in EU reactors (including Magnox reactors) containing the equivalent of 20,700 tU as natural uranium and 11,500 tSWU; most tails assays were in the range of 0.25–0.35 %. This represents a decrease of some 3 % relative to the previous year.

Reactor needs/net requirements

Estimates of future EU reactor needs and net requirements for uranium and separative work, based on data supplied by EU utilities, are shown in Graph 1 (see Annex 3 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.

Graph 1: Reactor needs and net requirements for uranium and separative work



Average reactor needs for natural uranium over the next 10 years will be 19,700 tU/year, while average net requirements will be about 17,300 tU/year. Relative to 2002, average future reactor requirements decreased by some 400 tU/year.

Average reactor needs for enrichment over the next 10 years will be 11,300 tSWU/year, while average net requirements will be in the order of 10,600 tSWU/year. Relative to 2002, future enrichment needs decreased by some 200 tSWU/year.

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 2003 is shown in table 2. Transactions totalled approximately 29,200 tU, some 18,000 tU of which were the subject of new purchase contracts by EU utilities (spot and multiannual). Amendments to existing contracts resulted in an increase of some 11,300 tU of the total quantities contracted.

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

Contract type	Number	Quantity (tU)[a]
Purchase sale by an EU utility/user		
– multiannual[b]	16	15,700
– spot[b]	15	2,300
Other purchase sale		
– between EU utilities (spot)	2	
– between intermediaries[c] (multiannual)	4	
– between intermediaries[c] (spot)	4	5,600
Exchanges and loans[d]	20	5,600
TOTAL[e]	61	29,200
Amendments to purchasing contracts[f]	13	11,300

(a) In order to maintain confidentiality the quantity has been indicated only when there were at least 3 contracts of each type, but all quantities have been included in the total.
(b) 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.
(c) Purchases/sales contracts between intermediaries – both buyer and seller are not EU utilities/end-users.
(d) This category includes exchanges of ownership and U_3O_8 against UF_6. Exchanges of safeguard obligation codes and international exchanges of safeguard obligations are not included.
(e) The total includes 9 contracts of less than 10 tU each.
(f) The quantity represents the net increase (or decrease) in material contracted for.

Some 5,600 tU transacted related to purchases between producers, intermediaries or between EU utilities. An additional 5,600 tU have been transacted under exchanges and loans. In comparison with last year, the total amounts contracted have increased significantly. Quantities under new purchasing contracts by utilities doubled compared to 2002 and were in-line with the Community's yearly net requirements.

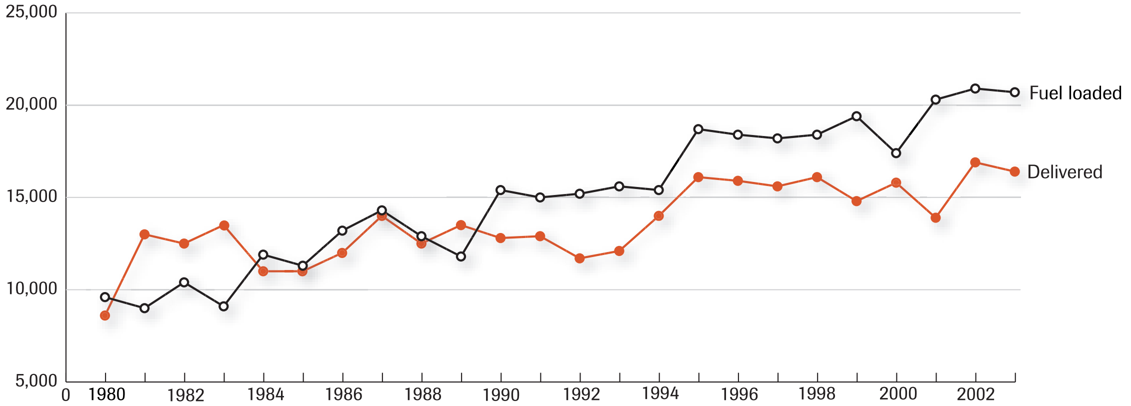
Volume of deliveries

During 2003, natural uranium deliveries to EU utilities amounted to approximately 16,400 tU compared with 16,900 tU in 2002. Deliveries under spot contracts represented a significant share of the total (18 % compared to 8 % in 2002).

The deliveries taken into account are those made to the EU 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 4. The difference between deliveries and the amount of fuel loaded can be partly explained by the use of reprocessed uranium and drawing down of inventories.

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

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). To calculate the average price, the original contract prices are converted (using the average annual exchange rates as published by Eurostat) 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 2003, an estimated average conversion price of EUR 5.3/kgU (USD 6.0/kgU).

Prices for deliveries under multiannual contracts (i.e. providing for deliveries extending over more than 12 months) were expressed in four different currencies, EUR, GBP, US dollar, Canadian dollar.

The average price of such deliveries in 2003, rounded to the nearest 1/4 euro was:

EUR 30.50/kgU contained in U_3O_8 (EUR 34/kgU in 2002).

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.

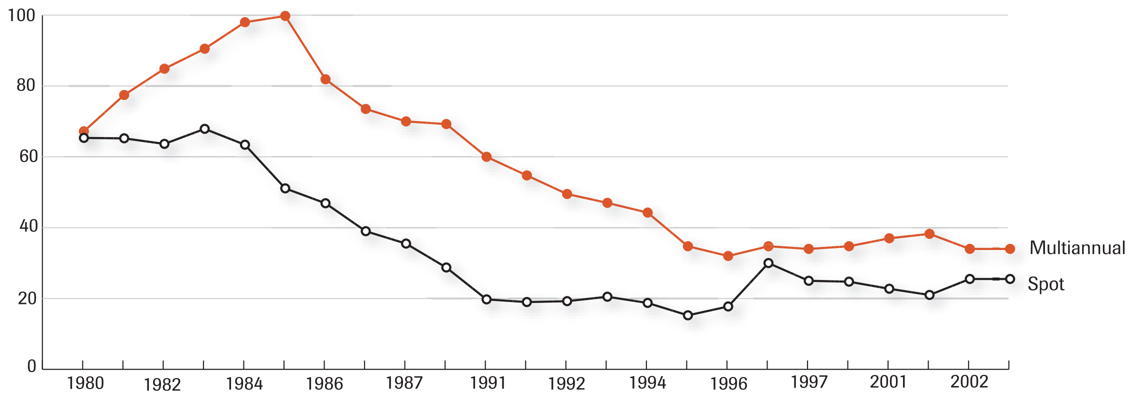
The average price of material delivered in 2003 under spot contracts was as follows:

EUR 21.75/kgU contained in U_3O_8 (EUR 25.50/kgU in 2002)

Price history

Graph 3 shows the ESA average prices for natural uranium since 1980; the corresponding data are presented in Annex 5 (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, 1980–2003 (EUR/kgU)



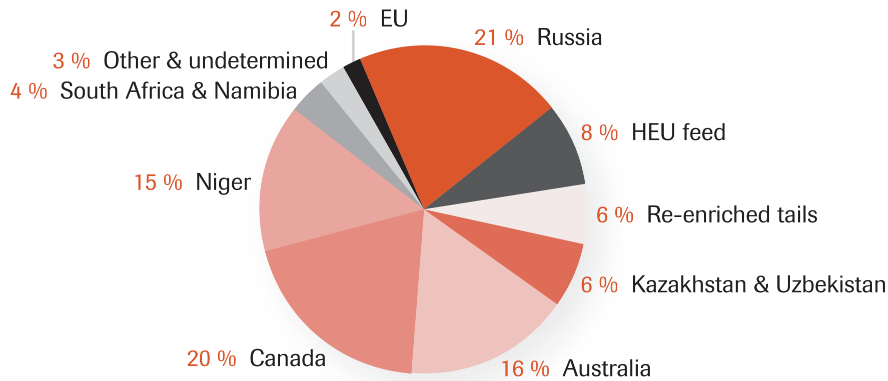
Origins

EU utilities or their procurement organisations obtained in 2003 the vast majority of their supplies from 10 countries outside the EU. Supply from within the EU represented only some 2 %.

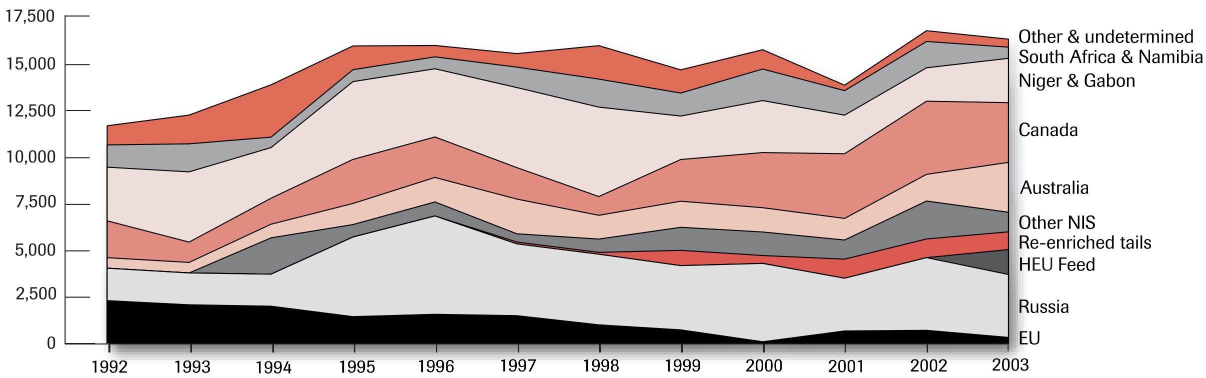
Russia remained the largest overall supplier to the EU utilities in 2003, with deliveries in the order of 3,400 tU, plus 1,000 tU in the form of re-enriched tails (RET) through the EU enrichers. Most transactions for the supply of Russian natural uranium were linked to enrichment contracts. In addition some 1,300 tU of HEU feed were delivered to EU utilities.

Canada was the second largest supplier to the EU utilities with deliveries in the order of 3,200 tU, it was followed by Australia and Niger (see Graph 4).

Graph 4: Origins of natural uranium delivered to EU utilities in 2003 (% share)



Graph 5: Purchases of natural uranium by EU utilities by origin, 1992–2003 (tU)



The NIS countries remained the largest regional source of supply of natural uranium to the EU with their share amounting to 27 % of deliveries in 2003. EU utilities took delivery from this source of about 4,500 tU as natural uranium or feed contained in EUP, excluding re-enriched tails (see Annex 2).

Physical imports of NIS origin material

Total physical imports from the NIS of natural uranium, re-enriched tails and feed contained in EUP increased to some 9,200 tU in 2003 (8,600 tU in 2002).

As mentioned above, physical imports of Russian material continued to be essentially in the form of feed contained in EUP or re-enriched tails (natural UF_6 equivalent) for western enrichers, imports of fresh natural uranium represented only a few hundred tonnes. Total NIS natural uranium imports were reduced from some 4,000 tU in 2000 to some 2,700 tU in 2002 and to a low level of 900 tU in 2003. For the period 1992–2003, imports of natural uranium and feed contained in the EUP from the NIS as well as tails re-enriched in Russia for EU enrichers amounted to a cumulative total of 131,800 tU. From these, 58,900 tU were delivered to EU utilities during the same period (see Annex 2).

Special fissile materials

Conclusion of contracts

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 2003 in accordance with the Supply Agency's procedures is shown in Table 3.

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

Contract Type (a)	**Number**
A. Special fissile materials	
Purchase (by an EU utility/user)	
– multiannual	4
– spot	9
Sale (by an EU utility/user)	
– multiannual	1
– spot	7
Purchase sale (between two EU utilities/end-users)	
– multiannual	-
– spot	6
Purchase sale (intermediaries)	
– multiannual	6
– spot	17
Exchanges	17
Loans	4
TOTAL, including (b)	71
– Low-enriched uranium	40
– High-enriched uranium	5
– Plutonium	20
Contract amendments	5
B. Enrichment contracts (c)	
Multiannual	8
Spot	1
Contract amendments	8

(a) See explanations under Table 2, as appropriate.
(b) Some contracts may involve both LEU and plutonium or HEU and plutonium. In addition there were 58 transactions for small quantities (Article 74 of the Euratom Treaty) which are not included here.
(c) Contracts with primary enrichers only.

Deliveries of low enriched uranium (LEU)

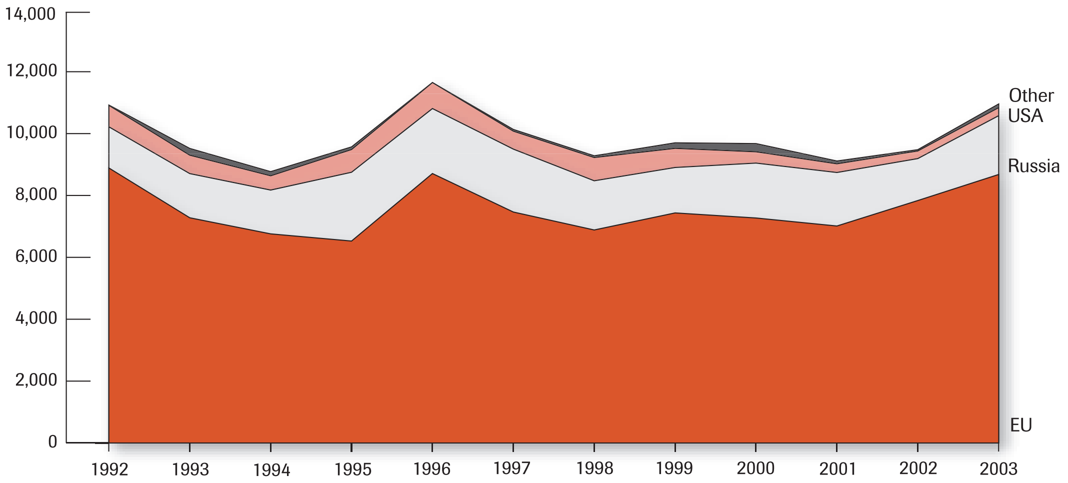
In 2003, supply of enrichment (separative work) to EU utilities totalled approximately 11,000 tSWU, delivered in 2,100 tLEU which contained the equivalent of some 17,800 tonnes of natural uranium feed[7]. Some 79 % of this separative work was provided by EU companies (Eurodif and Urenco).

Deliveries of Russian separative work to the EU utilities under purchasing contracts represented 1,900 tSWU or 17 % of the total. However, taking into account the re-enrichment of tails for Eurodif and Urenco, the total imports of Russian enrichment by the EU and therefore the volume of trade with Russia, would amount to more than double this figure.

Supplies from the USA accounted for only some 2 % of the total.

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

Graph 6: Supply of enrichment to EU utilities by origin, 1992–2003 (tSWU)



Enriched uranium for research reactors

Enriched uranium for research reactors is normally supplied in two enrichment assays: just under 20 % (LEU) and about 90 % (HEU). Although the quantities involved represent a minor amount in terms of EU needs for enriched uranium, LEU and HEU supply is very important to the scientific community and for the production of isotopes for medical and industrial applications.

Supply of LEU to research reactors continued unhindered. Reactor requirements for HEU were met, but the source of future supplies continued to be the object of considerable attention. The Supply Agency continued to provide support to reactor operators in the procurement of fuels.

(7) The tails assay used for the calculation of the natural uranium feed and separative work components has a significative 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

In 2003, transactions involving plutonium were again mainly related to its use for MOX fuel fabrication, and the Supply Agency concluded 20 such contracts.

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.

The quantities loaded into EU reactors and the estimated savings from the use of MOX fuel are shown in Table 4. The quantities of MOX fuel loaded continued to increase and reached a high 12,120 kg Pu in 2003. 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 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
	66,470	7,990	5,315

Commission authorisations for export

The authorisation of the Commission is required for the export of nuclear materials produced in the Community, according to the provisions of Article 59(b) of the Euratom Treaty (and Article 62.1 (c) in the case of special fissile materials). Requests for these authorisations are submitted to the Commission by the Supply Agency. In 2003, no such request was submitted to the Commission.

Chapter 4
Administrative report

Personnel

The staff establishment of the Supply Agency at the end of 2003 was 18.

Move of the supply agency to Luxembourg

On 11 February 2003 the Commission adopted a communication on 'a long-term solution for the site of Luxembourg'. This communication designs an overall solution for the Commission services located in Luxembourg. As part of this overall solution, the decision was taken to reinforce the services of the Directorate-General of Transport and Energy in Luxembourg, by concentrating all activities related to the implementation of Chapters 3 to 10 of the Euratom Treaty in Luxembourg, including the Euratom Supply Agency as responsible for Chapter VI.

In the light of the provisions of the Statutes of the Euratom Supply Agency and in order to allow the transfer of staff of the Supply Agency to Luxembourg and the recruitment of vacant posts there, the Agency set up a branch in Luxembourg as of 1 February 2004. Following Article XI of the Statutes of the Agency, such a decision was taken by the Director-General of the Agency, upon consultation of the Advisory Committee at its plenary meeting held in Brussels on 17 November 2003. The Advisory Committee expressed a negative opinion on the initiative. Nevertheless, the Commission gave its consent to the creation of such a branch in Luxembourg on 8 January 2004, since this intention of the Agency makes possible to implement the Commission decision of 11 February 2003.

On 30 January 2004, the Director-General of the Supply Agency took the decision concerning the establishment of a branch of the Supply Agency in Luxembourg as of 1 February 2004. The full text of this decision is enclosed in Annex 8.

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.

The Supply Agency's expenditure in 2003 amounted to EUR 122,235.21.

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

In 2003, the Supply Agency received supplementary financing from the Commission's Enlargement DG for organising a seminar for the acceding and candidate countries, as part of the preparations for enlargement (Travel, Accommodation and Conference Facility, TAC).

Activities of the Euratom Supply Agency

Seminar with acceding countries' representatives

The Supply Agency organised in June a one-day seminar for representatives (both from the industry and governments) of the acceding and candidate countries in order to present its role, activities and procedures, the supply policy it applies, and to raise the new Member States' awareness about their obligations once they join the EU, and to discuss the nuclear fuel supply situation in these countries.

The seminar covered the powers, functioning and policy of the Supply Agency, emphasising the objective of regular and equitable supply and diversification of sources of supply; external activities of the agency, covering the Euratom cooperation agreements with third States and possibilities for ESA assistance to the industry in case of disputes with parties from third States; the supply provisions of the Euratom Treaty and the different procedures related to supply contracts. The Advisory Committee and its role and working procedures were also presented. Finally, the necessary adaptations to the Agency's Statutes following the enlargement, namely the number of the members of the Advisory Committee and the contributions to the ESA Capital, were discussed.

In the second part of the seminar, the acceding and candidate countries' representatives gave short presentations on the nuclear fuel cycle in their respective countries (see Annex 1 *bis* for details).

Seminar with 'energy attachés'

Another seminar was organised in November for the Energy Attachés of the acceding and candidate countries' Missions to the EU, in order to make also these diplomatic Missions aware of the ESA's role and working procedures and of the Euratom obligations following enlargement, to strengthen working relations with the new Member States and to gather more information about their situation.

Activities of the Advisory Committee

The Advisory Committee held two meetings during 2003.

In early 2003, a meeting was organised by the Agency between the enlarged bureau of the Advisory Committee (AC) and Commission's Vice-President Ms Loyola de Palacio. The main aim of the meeting was to discuss the recommendations issued by the AC on the future role of the ESA and on the future of the Euratom Treaty.

At its March meeting, the Committee, in fulfilment of its statutory duties, examined and gave opinions on the Supply Agency's annual report for 2002, its balance sheets and accounts for the same year as well as its budget for 2004. The outcome of the future of the European Convention and of the Euratom Treaty was discussed.

The Committee agreed on a proposal to create a task force to assist the ESA with the implementation of the recommendations made by the Committee in its paper of 14 February 2002. Priorities have been set for the future work of the ESA and the task force[8]. It was agreed that two working groups should compose the task force.

During its November meeting, the Committee welcomed observers from acceding countries who were taking part in the Advisory Committee for the first time.

The ESA proposed to prolong the current term of the Chairman and of the Executive Bureau until 30 April 2004. A new appointment procedure would be launched following enlargement, with a view to being able to include, where appropriate, official representatives from the new Member States in the executive bureau.

(8) See Chapter 4, item Joint ESA/AC activities.

The chairmen of the two working groups of the task force reported to the Committee members on the status of their work. The Committee approved the proposed methodology for calculating the average price of natural U_3O_8 and recommended retaining it. On the proposed methodology for calculating average SWU prices in Europe, a consensus could not be reached at this time. A new roundtable on the opportunity to publish such average SWU prices will be convened after an interval of between 12 and 24 months. On the security of supply activities, the Committee stressed the importance for the industry of the ongoing work and requested preliminary conclusions at the next meeting of the Committee in spring 2004.

Concerning the future negotiations between Euratom and Russia on nuclear trade, the Council has adopted a mandate and it is planned to embark on negotiations during the spring of 2004(9). The Committee stressed the importance for it to be involved in providing support to the ESA during the negotiations.

The Supply Agency expresses its appreciation to the Committee and its enlarged bureau for its excellent and fruitful cooperation and assistance during the year and more particularly for the support provided through the task force members.

Joint ESA/Advisory Committee activities

The policy of diversification of sources of supply — setting-up of a dedicated working group

The Advisory Committee during its meeting of 25 March 2003, accepted the proposal by the ESA to create a joint working group, whose mandate is to help the ESA to establish an action plan dealing with ‘security of supply’.

This working group convened three times during 2003 in order to analyse the main components related to security of supply in the nuclear fuel cycle. Following a mandate received by the AC of November 2003, it will continue its work in 2004.

The working group prepared a first list of potential risks with regard to disruptions in the supply of nuclear fuel within the EU. This risk analysis would include a review of the risk owners, the best ways to prevent/mitigate the risks as well as a probability for occurrence and consequence impact. A market analysis based on available data on future demand and supply taking into account the enlargement of the EU has been realised. A first comprehensive report will be presented to the AC of March 2004 and a final report is expected during the last quarter of 2004.

Calculation methodology for average natural uranium and SWU prices

The Advisory Committee accepted on the 25 March 2003, the proposal made by the Agency to consider the establishment of an agreed Euratom methodology for the calculation and publication of average prices for uranium and separative work.

A specially dedicated working group was set-up and convened in April and October 2003 in order to analyse the situation.

The working group analysed the ESA’s methodology for calculating weighted average U_3O_8 prices for multi-annual contracts and for spot contracts, paid by EU utilities for their deliveries in a given year. The working group analysed the price collection method, the type of data requested and the type of deliveries. The way internal checking and verification of data is realised as well as how exchange rate problems are solved, has been reviewed by the experts.

The group of experts recommended to the ESA to continue with its regular visits to utilities and to discuss their contract portfolio and requirements. It has been recognised that a good relationship has to be maintained with the utilities to provide a reliable view of the supply, demand and price situation. The way confidentiality and physical protection of data is provided has been discussed.

(9) See Chapter 1, item ‘Trade in nuclear materials with the Russian Federation’.

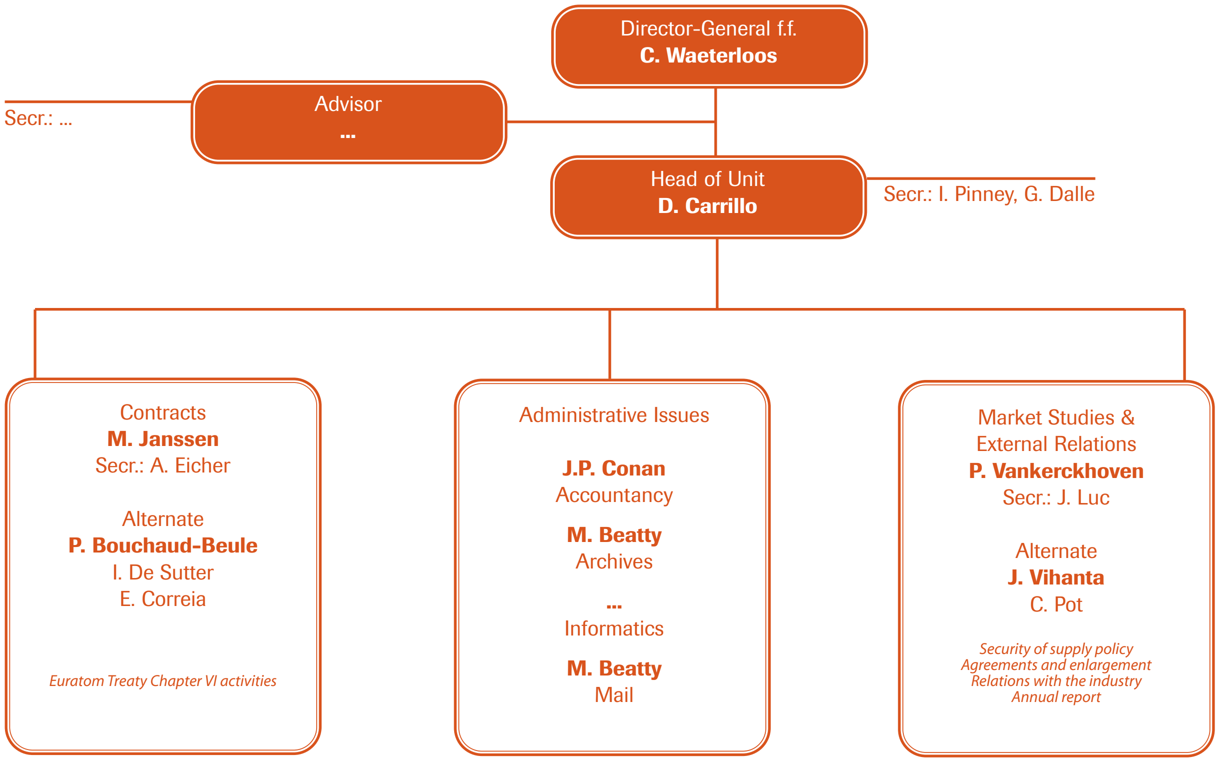
The working group reported to the Advisory Committee in November 2003, indicating that it has reviewed the methodology used by the ESA to collect average U_3O_8 long-term and spot prices and that it was of the opinion that the methodology is sound and that publication in the annual report of these prices should be maintained.

The Advisory Committee approved the working group conclusions and recommended retaining it (methodology described in Annex 5).

On the proposal to establish a sound methodology for publishing average SWU prices, the working group examined a proposal for a methodology prepared by the ESA. After very fruitful discussions, the experts were not in a position to come to a common position on the proposal due to the current trade case with USEC (see Chapter 1.4), concerns about commercial confidentiality and the foreseen important investments in the sector for the coming years (see Chapter 1.5).

The Advisory Committee noted the impossibility to come to a consensus at this time. A new roundtable on the opportunity to publish average SWU prices will be convened after an interval of 12 to 24 months.

Organisational chart



Advisory Committee of the Supply Agency

Chairman: L.-F. Durret (Areva, France)

Vice-Chairmen: G. Pauluis (Synatom, Belgium); J.-L. De Guzman Mataix (Permanent Representation of Spain to the EU)

Working party

Chairman: I. Mikkola, (TVO, Finland)

Vice-Chairmen: M. S. Travis, (Rio Tinto Mineral Services, United Kingdom); W. Sandtner (Federal Ministry of Economics and Labour, Germany)

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This report and previous editions are available from the Supply Agency's website:
http://europa.eu.int/comm/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 at Europa, the European Union server at http://europa.eu.int/index_en.htm giving access to the websites of all European institutions and other bodies.

The address of the European Commission's Directorate-General for Energy and Transport is http://europa.eu.int/comm/energy/index_en.html, where information can be found on e.g. the Green Paper on the security of energy supply, and on electricity and gas market liberalisation.

Additional information about EU policies regarding climate change can be found at the website of the European Commission's Directorate-General for Environment:
http://europa.eu.int/comm/environment/climat/home_en.htm

The United Nations' climate change site is to be found at http://unfccc.int/index.html.

List of abbreviations

EU	European Union
ESA	Euratom Supply Agency
Euratom	European Atomic Energy Community
EBRD	European Bank for Reconstruction and Development
IAEA	International Atomic Energy Authority
JRC	European Commission Joint Research Centre
NIS	New Independent States
US(A)	United States of America
(US) DOC	United States Department of Commerce
(US) DOE	United States Department of Energy
(US) NRC	US Nuclear Regulatory Commission
USEC	United States Enrichment Corporation
EUP	Enriched uranium product
LEU	Low-enriched uranium
HEU	Highly-enriched uranium
MOX	Mixed oxide fuel (fuel of uranium and plutonium oxide)
RET	Re-enriched tails
SWU	Separative work unit
tSWU	tonne separative work (= 1,000 SWU)
tU	tonne U (= 1,000 kg uranium)
LLW, ILW, HLW	Low-, Intermediate-, High-level waste
NPP	Nuclear power plant
BWR	Boiling water reactor
HFR	High flux reactor
LWR	Light water reactor
PBMR	Pebble bed modular reactor
PWR	Pressurised water reactor
RBMK	Light water graphite-moderated reactor (Russian design)
VVER/WWER	Pressurised water reactor (Russian design)
AVLIS/SILVA	Atomic vapour laser isotopic separation
kWh	Kilowatt-hour
MWh	Megawatt-hour $= 10^3$ kWh
GWh	Gigawatt-hour $= 10^6$ kWh
TWh	Terawatt-hour $= 10^9$ kWh

Annexes

Annex 1: Developments in Member States (10)

België/Belgique — Belgium

Energy policy

In the Flemish region the whole electricity market has been liberalised. In the Walloon and Brussels Capital region, consumers of more than 10 GWh/year are allowed to choose freely their producer.

The law on the gradual phase out of commercial power plants after 40 years of operation has been approved by Parliament and was promulgated on 31 January 2003.

The law on the management of the financial provisions for the dismantling of the nuclear power plants and for the management of the spent fuel has been approved by Parliament and was promulgated on 11 April 2003. The law places the provisions under the supervision of a committee of high government representatives. It must guarantee the availability of the financial provisions in all possible circumstances at the moment they are needed.

In execution of the law of 24 December 2002, which foresees to cover, amongst other things, the restoration of the old Eurochemic plant and the old waste department of the CENoSCK by an extra charge on the electricity consumed in Belgium, the royal decree of 24 March 2003 foresees a financing of EUR 38 million for the year 2003 and charges Ondraf to elaborate five-year financing plans, the first to be made for the period 2004–08. This plan has been introduced and, after modification, approved by the Government. The royal decree of 19 December 2003 fixes a yearly financing amount of EUR 55 million.

The new government, which was installed in July 2003, declared that the government will continue to do efforts to maintain the nuclear knowledge in the field of nuclear energy.

Nuclear electricity generation

In 2003, the seven Belgian PWR reactors, with a net capacity of 5,761 MWe (including the French share of Tihange 1) produced about 44.6 TWh, which is almost the same level as in 2002. It represents a share of 55.4 % of total electricity production, which is 1.9 % lower than in 2002.

Fuel cycle developments

The production of MOX fuel by Belgonucleaire in its Dessel plant amounted to 37.1 tonnes in 2003, which will be used in Belgian and German nuclear power plants. For the Belgian nuclear plants, the year 2003 marked the end of the MOX fabrication with the plutonium coming from the UP3 reprocessing contract, as foreseen in the resolution by the Belgian Parliament in December 1993. Eight fresh MOX fuel elements were loaded in 2003 in Doel 3, bringing the cumulative total of loaded fresh MOX elements for the whole of Belgium to 120.

The recycling of uranium recovered from the reprocessing of the Belgian spent fuel in The Hague is completed. In total, eight reloads have been manufactured with re-enriched reprocessed uranium for the Doel 1 unit.

In the course of 2003, one new shipment of vitrified high-level waste took place from The Hague to the temporary storage building of the Belgoprocess site at Dessel. At the end of December 2003, 196 canisters of vitrified high-level waste were stored at Belgoprocess.

(10) This annex comprises contributions made by the Member States.

For the geological disposal of conditioned spent fuel and high-level, medium-level and long-lived waste, a detailed R&D programme has been approved for the period 2004–08 between Ondraf and the waste producers. Its financing has been assured. At the end of 2003, the supercontainer concept was retained as reference solution for the disposal of vitrified high-level waste. The general ideas for the disposal gallery, the so-called Praclay-project, intended to demonstrate the feasibility of the underground disposal concept for vitrified high-level waste, have been approved. The design of the project has started. It is intended to do a large scale heater test and plug test in the first place.

The Nuclear Energy Agency has published its report on its international peer review of the SAFIR 2 report of Ondraf/NIRAS giving an overview of the scientific results obtained so far on geological disposal research and future R&D orientations. The report confirms the excellent results of the Belgian programme, supports the future R&D orientations, but formulates also a number of complementary recommendations, which have been taken into account in the elaboration of the detailed 2004–08 programme.

During 2003, 146 spent elements were placed in 5 dry storage containers in the interim storage building at Doel. This brings the total to 1,300 spent fuel elements placed in 46 containers. At Tihange, 156 spent fuel elements were placed in the wet storage building, which brings the total to 1,151 units.

With respect to the disposal of low-level and short-lived waste, the local partnerships at Mol and Dessel have made considerable progress in the elaboration of their integrated projects, incorporating the disposal facility in a broader development of the region. They have the intention to introduce their reports in 2004. At Fleurus-Farciennes, a local partnership was created in February 2003. It will only be ready with its integrated project in the beginning of 2005.

Research

In the framework of the contract between CEN•SCK and Cogema for the reprocessing of the spent BR2 fuel, two new shipments to The Hague have taken place. Most elements of the past production have now been transferred to France.

The CEN•SCK has continued its R&D related to the development of the Myrrha-project, a multi-purpose irradiation tool in the form of an accelerator driven system, which will also be able to transmute long-lived radioactive waste into shorter-lived waste. When the R&D is sufficiently advanced, a decision will have to be taken on the detailed design of the machine.

Danmark – Denmark

The nuclear research facilities previously operated by Risø National Laboratory have been closed and were – together with the waste management system – in September 2003, transferred to a new organisation: Danish Decommissioning (DD), created under the Ministry of Science, Technology and Innovation according to a decision by the Danish parliament. DD is situated at the Risø site but is independent of Risø National Laboratory. DD takes care of planning and practical work in connection with decommissioning of the nuclear facilities. Practical work is planned to start in 2004. In the future a Danish repository for low- and intermediate level waste will be needed for waste from the decommissioning and for the already stored waste. A stakeholder working group for establishment of procedures in this context is being set up.

The three nuclear research reactors have all been shut down: The 10 MW heavy water moderated DR3 reactor, used for basic research, silicon doping and isotope production, was closed permanently in 2000. The last of the remaining irradiated fuel was transferred to the USA in 2002 according to agreement with the US DoE. A small fabrication plant for DR3 fuel elements has also been closed. A few unirradiated elements and some remaining enriched uranium silicide powder have been sold. In 2003 the enriched uranium sulphate solution was drained from the small homogeneous reactor, DR1 and is presently in storage. The third research reactor, DR2, was already closed in 1975 and has been decommissioned to stage 2. Also the Risø hot cells used for post irradiation examination have been closed and partly decommissioned. The only nuclear facility presently in operation is the waste treatment plant and the associated facilities for waste storage.

Low-level waste (LLW) and intermediate-level waste (ILW) from DD, Risø National Laboratory and other Danish users of radioactive materials are collected and treated at the waste management plant and stored in two intermediate storage facilities situated at Risø. A new storage hall for decommissioning waste is to be erected.

Liquid ILW is treated by evaporation and bituminisation, and the product is stored in drums. Solid LLW is compacted in drums. Other containers will be used for the decommissioning waste. The storage facilities for low-level waste contains about 4,850 drums. After closure of the nuclear facilities, work with activity has been minimal at the Risø site. Activity stored as radioactive waste in 2003 was therefore mostly from external sources such as hospitals, industry, laboratories and other users of radioactive isotopes. Future waste will be dominated by the decommissioning.

The storage facility for ILW is also used for long-lived LLW. At the end of 2003 about 160 m^3 long-lived ILW and LLW are stored in the facility. This includes 233 kg of experimentally produced and irradiated fuel from post irradiation examination carried out from 1970 to 1990 in the Risø hot cells.

Deutschland – Germany

Germany's 19 nuclear power plants produced about 165 TWh of electricity (gross) in 2003. This represents a slight increase of 0.3 % compared with 2002, despite the approximately eight-month outage of the Biblis A power station owing to problems with the sump strainer. The availability of all the other power stations was again high. The share of nuclear power in the public electricity supply is still about one-third, and over 50 % in the case of the base load.

The Stade nuclear power plant was finally shut down on 14 November 2003 for commercial reasons. This pressurised water reactor with an output capacity of 640 MW produced around 150 TWh of electricity between 1972 and 2003, and supplied process heat to a nearby salt works. The application to decommission and dismantle the plant was made in July 2001. The actual dismantling work is scheduled to begin in mid 2005. Dismantling of the plant is expected to be completed around 2015. Decommissioning is not the result of the legislation on phasing out nuclear energy – as falsely claimed – but is based on a commercial decision by the operator.

The first European pressurised water reactor (EPR), a joint development by German and French operators and manufacturers, is now to be built. The Finnish energy utilities opted for the EPR at the end of 2003 in preference to the international competition; the plant is scheduled to come on stream in 2009. The development of an innovative boiling water reactor equipped with passive safety equipment for accident detection and control has been virtually completed.

The transport of spent fuel elements for reprocessing in France and the UK continued without incident. A total of 87 casks were shipped free of contamination and without technical problems.

Under the amended Nuclear Energy Act, shipments for reprocessing abroad will not be permitted from mid 2005. Instead, the spent fuel elements are to be taken to decentralised on-site interim storage facilities and transferred directly to final storage later after suitable processing. One such on-site interim storage facility is already in operation; the licences for all the other facilities for which authorisation was requested have been available since the end of 2003. The situation is similar in respect of the interim storage facilities intended as a provisional solution which – with one exception – all have a licence and are already in operation.

In 2003, a further 12 casks with vitrified highly radioactive waste from the reprocessing facility in France were delivered in a single shipment to the intermediate storage facility for fuel elements in Gorleben. This brings the number of casks in the storage facility to 44. The capacity at which the central intermediate storage facility for fuel elements at Ahaus operated remained unchanged in 2003.

The Urenco uranium enrichment plant in Gronau reached in 2003 a capacity of 1,650 tonnes separative work per annum. The plant continues to operate at almost full capacity.

The ANF fuel element production plant at Lingen, a subsidiary of Framatome ANP GmbH, operated at a very high capacity as in the previous year. The annual production capacity of 650 tonnes of uranium fuel rods and fuel elements was almost fully utilised.

The pilot conditioning installation at Gorleben was ready for operation in 2003. Activities of the type for which the plant is intended did not take place.

Appeals are continuing against the planned Schacht Konrad final repository, which was approved in May 2002 but not enforced with immediate effect. The appeals have a suspensory effect. The German Government had stated that it would not begin converting the mine to a final storage facility until the legal position was settled. The mine would be maintained in operational order until then.

The situation as regards the planned Gorleben final repository remains unchanged. Underground exploratory work has been suspended for at least three years, but for no more than 10 years. In the meantime, the mine has been kept in operational order. The exploration results so far do not exclude its suitablility as a final repository. The German Government is currently examining alternative final storage sites; however, the financing arrangements are still unclear.

Plans for the decommissioning of the Morsleben final repository are still being drawn up, and preparations for the planning procedure required for this are still in progress.

The dismantling of the MOX plant and the uranium processing plant at Hanau is progressing according to plan. Any waste generated is stored – processed – in an on-site interim storage facility set up especially for the purpose. The dismantling work at the Karlsruhe reprocessing plant involves complex licensing procedures, but is not encountering any major technical problems. Construction of the vitrification plant at Karlsruhe for the solidification of highly active liquid waste is proceeding largely according to schedule.

España – Spain

Energy policy

The Royal Decree 1349/2003 on the management of the activities of the Empresa Nacional de Residuos Radiactivos S.A.(11) (Enresa) and on its financing was adopted on 31 October 2003. This royal decree codifies in a single text the previously dispersed rules that regulate the activities of the company and its financing and adapts these rules to current reality with the aim to increase knowledge about it and facilitate its implementation. Among the most significant aspects of the royal decree is the updating of Enresa's assignments and the amendment of the criteria for the preparation of the general radioactive waste plan (plan general de residuos radiactivos). It should also be mentioned that the redefinition of payment modalities for services, and a review of the financial assets in which the Fund for the financing of the activities included in the general radioactive waste plan, can be applied.

Nuclear fuel cycle

<u>Front end of the fuel cycle</u>

On 14 July 2003, the Ministry of Economy approved an Order declaring the ending of the uranium concentrate production at the Quercus plant, property of ENUSA S.A. The industrial production of the plant ceased at the end of 2000, and during 2001 and 2002, the plant was only dedicated to activities of residual production.

In 2003, the Juzbado (Salamanca) nuclear fuel factory, property of ENUSA S.A., produced fuel elements for both the national market and for export. The production amounted to 738 fuel elements, with a total content of 200.8 tons of uranium. Of these fuel elements 256 are of PWR type, 380 of BWR type and 102 of VVER type. Fuel elements have been exported to Belgium, Finland, France, Germany and Sweden, and bars with gadolinium to the United States. Of the total production, 446 fuel elements containing 92.5 tons of uranium have been exported. Spain participates through ENUSA with a share of 10 % in the mine that Cominak exploits in Niger. ENUSA also markets 10 % of its production. Spain participates, as well, in Eurodif with a share of 11.1 % held by ENUSA.

(11) National Radioactive Waste Company.

Back end of the fuel cycle

The medium and low activity solid radioactive waste storage installation at Sierra Albarrana (El Cabril), owned by Enresa, continues its storage activities. During 2003 the installation received 311 shipments, and 392 containers have been placed in storage. By 31 December 2003 there were 4,346 containers in storage, and approximately 50 % of the installation's capacity was in use.

In mid 2003, Enresa requested authorisation for an additional storage installation for very low activity radioactive waste, at the Cabril site, composed of four cells with a total capacity of 130,000 m^3 of this kind of waste. Including this additional installation it is expected that the Cabril installation will reach saturation around 2026.

In 2003, 4 dual use metallic containers for storage and transport of spent fuel elements were delivered. These containers, used in the storage installation of the nuclear power plant of Trillo, are manufactured in the facilities of Equipos Nucleares, S.A. of Cantabria.

Dismantling

The dismantling at level 2 of the nuclear power plant Vandellós I reached its end by mid 2003. At the moment, it is awaiting the public authorities' authorisation for launching the latency phase and the partial release of the site for other uses. During 2003, the work was concentrated on final dismantling of active parts and on construction of facilities for the latency phase.

Research reactors

In Spain there are no nuclear research reactors in operation; those previously in operation are in various phases of dismantling and the spent fuel of the reactors has already been returned abroad.

The Order adopted on 23 December 2003 by the Ministry of Economy declared the closure of the experimental nuclear reactor ARGOS of the Universidad Politécnica de Cataluña at Barcelona, and the site has remained without any radiological restrictions.

Preparatory work for the dismantling of the nuclear research reactor ARBI of the Labein Foundation at Bilbao was undertaken in 2003. The decommissioning was authorised in May 2002 and the decommissioning work itself is expected to start in mid 2004 and will take approximately four months.

Regarding the nuclear research reactor JEN-1 in the Centro de Investigaciones Energéticas, Medioambientales y Tecnológica (CIEMAT) at Madrid, a programme for the improvement of the CIEMAT facilities (PIMIC) is currently under way. It covers the dismantling of this reactor as well as other closed down and obsolete facilities, the modernisation of buildings and facilities, and the cleaning-up of infrastructures in the centre. During 2003, preparatory work for this programme PIMIC was undertaken.

There are no plans to construct new research reactors.

France

Highlights

At 31 December 2003, the French nuclear facilities numbered 58 pressurised water reactors in operation (34 of 900 MW, 20 of 1,300 MW and 4 of 1,450 MW) and one fast breeder reactor (Phénix, 250 MW) also dedicated to research.

Concerning the organisation of the French nuclear industry, no significant modification is to be acknowledged after the achievement of the organisation of the group AREVA during 2002.

Nuclear power and electricity generation

Gross national consumption of electricity in 2003 rose to 461.7 billion kWh, an increase of 2.1 % compared with 2002. The export balance amounted to 66.1 TWh (2002: 76.8 TWh).

Total net production of electricity rose to 541.6 billion kWh, i.e. 1.4 % more than in 2002.

420.7 billion kWh were produced by nuclear power stations, representing 77.7 % of domestic production. Thermal production from fossil fuels was 56.7 TWh, representing an increase of 6.3 % compared with 2002. Hydroelectric production decreased by 2.0 % compared with 2002 and amounted to 64.2 TWh.

As regards nuclear operation, 2003 showed an increase in availability factor, which was 82.7 % compared to 82.0 % in 2002.

The peak of domestic consumption of 80.2 GW was reached on 8 January 2003.

At the end of 2003, 20 reactors were operating with MOX fuel.

Uranium mining

The total share of Cogema marketed production for 2003 amounted to about 5,540 tU.

In Canada, the share of Cogema marketed production was 3,414 tU. The McClean mill performed at nominal capacity throughout the year. Due to McArthur flooding, Cogema’s share of McArthur River production was only 1,623 tU for 2003.

In Niger, the share of Cogema marketed production for 2003 was 2,035 tU, close to the 2002 figure.

Conversion

In 2003, the two Comurhex plants of Malvesi and Pierrelatte operated satisfactorily, and produced around 13,000t. Comurhex passed the audit for certification ISO 9001 (V2000) and has obtained renewal of the ISO 14001 certification for environmental issue.

Uranium enrichment

In 2003, the Georges Besse Gaseous Diffusion Enrichment Plant has operated satisfactorily at three quarters capacity, and Eurodif supplied more than one fifth of the world enrichment needs, serving more than 30 customers, in a market of about 38 million SWU/year, slightly increasing.

Climate variations during the 2003 winter and summer had significant impacts on electricity demand in France and gave Eurodif, as a major electricity consumer, the opportunity to contribute to efforts of its electricity suppliers to regulate the demand, making the best use of its energy flexibility, while providing undisrupted deliveries to its SWU customers.

The AREVA Group signed an agreement with Urenco shareholders on 24 November 2003, under which it will acquire a 50 % equity interest in Enrichment Technology Company (ETC). ETC comprises all of Urenco's centrifuge design, manufacturing and installation activities as well as its R&D in the production of enriched uranium by centrifugation for the fabrication of nuclear fuel. This agreement is subject to approval by competition authorities and the signing of an agreement between the governments of Germany, the Netherlands, the United Kingdom and France.

By taking a 50 % stake in ETC, AREVA will have the necessary means to launch the project to construct its future uranium enrichment plant. This plant, to be named Georges Besse II in memory of Eurodif's founder, will be built at the Tricastin site. Production capacity will be increased gradually starting in 2007 and reach its nominal level around 2016, with uninterrupted service provided to clients throughout that period.

Mox fuel fabrication

In 2003, Cadarache MOX fuel pellets production amounted to 17.2 tHM (tons of heavy metal) and Melox production amounted to 111.7 tHM.

Commercial production of MOX fuel in Cadarache has been stopped by 31 July 2003 due to evolution of antiseismic standard.

The corresponding capacity of fabrication has been transferred to the Melox plant, which has been granted the authorisation to increase its level of production from 101 tHM to 145 tHM by decree of 4 September 2003.

Reprocessing

The plants in The Hague operated very satisfactorily during 2003: 1,115 tonnes of oxide fuel were reprocessed. The cumulative quantity of spent fuel reprocessed in the The Hague plants is 19,422 tonnes since 1976.

During the year 2003, the return of residues to the foreign customers (Japan, Germany, Switzerland, and Belgium) rose to 536 canisters.

Nuclear waste management

The site for disposal of very low level radwaste (VLLW) opened in Morvilliers (Aube) in summer 2003. The National Safety Authority does not accept any generic clearance level for radioactive waste, meaning that concrete, rubble, soil and various industrial-type wastes coming from nuclear waste zones of a nuclear installation are considered radioactive and must go into special disposal centres. The Morvilliers centre is sized to accept about 650,000 m^3 of waste over the next 30 years. In this centre, the radioactive inventory is low enough to exempt it from licensing as a 'basic nuclear installation (BNI)'. It has been licensed under French regulations covering hazardous installations, which are under the jurisdiction of the environment ministry. This licensing process allows approval by the Prefect rather than Ministers (who must authorise a BNI).

Concerning high-level long-lived waste management, in accordance with the law of 30 December 1991, ANDRA, the French national radwaste agency, is studying the feasibility of a repository in a deep geological formation. An underground research laboratory is under construction in a clay formation, the Meuse/Haute-Marne Underground Laboratory located in Bure (Meuse Department). Although the Agency does not have a similar site in granite formation, it continues its investigations in accordance with the quadrennial contract it has signed with the State.

Ireland

Nuclear power is not for electricity production in Ireland. Irish legislation prohibits the use of nuclear fission for the generation of electricity. Ireland's nuclear policy objectives place a heavy emphasis on the enhancement of nuclear safety, radiation protection and emergency preparedness worldwide.

In Ireland's view, any perceived benefits of nuclear energy are far outweighed by the related public health, safety and environmental risks. The risks of operating nuclear power plants, and of associated activities such as the reprocessing of spent fuel; discharges of radioactive materials to the marine and terrestrial environment; the transportation of nuclear fuel, and the unresolved problems of management of nuclear waste, render nuclear energy as totally unsustainable and economically uncompetitive.

In the implementation of its nuclear policy, the Irish Government is advised and assisted by the Radiological Protection Institute of Ireland (RPII)

Italia – Italy

Italy has no nuclear power stations, and at present nuclear power is not an option in Italian energy policy.

In Italy only some small research reactors are in operation. Among them the most important is the TRIGA reactor operated by ENEA, the state agency for energy, environment and innovation, and used for scientific programmes relating to the testing of materials and for the production of radio elements.

The main activities in the nuclear power field are carried out in Italy for the treatment and conditioning of all radioactive wastes produced in the past and for the dismantling of old nuclear power stations and nuclear fuel cycle facilities.

In 2000 a decree was promulgated in order to cover the costs of these activities through an extra charge on the electricity consumed in the country.

The national operator for the decommissioning of the four old nuclear power stations (Caorso, Garigliano, Latina and Trino) is SOGIN, whose capital stock is entirely held by the Italian State. The corresponding decommissioning programme calls for the completion of activities by the end of 2020, assuming availability of the national repository for radioactive wastes, and for release of the sites free of all radiological restraints.

During 2003 a consortium set up by SOGIN and ENEA – the owner of nuclear fuel cycle facilities (pilot reprocessing and MOX fabrication plants; industrial fuel fabrication plant through the branch FN SpA) – has operated for the decommissioning of such facilities. The target is to complete the activities by the end of 2016. During the second half of 2003, SOGIN and ENEA decided to concentrate in SOGIN, as soon as possible, the decommissioning activities related to the nuclear fuel cycle.

As far as the nuclear fuel cycle is concerned, the unique Italian activity is the participation to the Eurodif initiative with a share of 8.125 % held by ENEA.

At the end of 2003, the Italian Government indicated, through a specific decree, the site chosen in the south of the country for the definitive repository of low-, medium- and high-level radioactive wastes. A very strong opposition, at local level, forced the Parliament to change the decision and to limit the more immediate activities to the choice of a site for the repository of only high-level wastes.

Nederland – the Netherlands

Nuclear electricity and consumption

The Netherlands has one operating nuclear power plant, Borssele NPP (450 MW). This unit achieved a load factor of 96 %.

The national consumption of electricity reached 105.7 TWh, an increase of 1.5 % over 2002. Of this, 84 % was covered by national electricity generation, the balance was covered by imports. Borssele NPP contributed 4.3 % to the national electricity generation.

The utility operating the Borssele NPP, EPZ, has an unlimited operating license. The government coalition which took office in May 2003 has stated that the Borssele NPP (commercial since 1973) should not be operated beyond 2013.

Fuel cycle developments

The utility EPZ, owner and operator of the Borssele NPP, has a contract with Cogema for reprocessing of its spent fuel. During the 2003 annual refuelling, re-enriched reprocessed uranium was loaded in the reactor. This re-enrichment was performed by the Russian process of blending with highly enriched uranium.

During 2003, defuelling of the shut-down 59 MW boiling-water reactor of Dodewaard was completed. This reactor will now be conditioned for 40 years safe enclosure pending final dismantling. The Dodewaard irradiated fuel has been transferred to the BNFL plant for reprocessing.

Enrichment

On 1 October 2003, Urenco completed the legal formalities relating to its reorganisation.

Urenco now formally consists of two companies: an enrichment company called: Urenco Enrichment Company (UEC) and a technology company called Enrichment Technology Company (ETC). Both are owned by the existing holding company Urenco Ltd, in Marlow, UK.

Under an agreement signed on 24 November 2003 by Areva and the shareholders of Urenco, Areva will acquire a 50 % equity stake in ETC. ETC comprises all of Urenco's design and manufacturing activities in the field of centrifuge equipment and installations for uranium enrichment as well as its related R&D. This collaboration is subject to competition clearance and an intergovernmental agreement between the governments of the Netherlands, Germany, the United Kingdom and France.

Urenco and Areva will continue to compete in the provision and marketing of uranium enrichment services.

By the new partnership, the Areva Group will be enabled to use ETC's centrifuge technology to replace its gas diffusion enrichment plant operated at Tricastin in France. The joint venture will supply Areva the centrifuges and technical assistance needed for its construction.

On 15 December 2003, the licence application for the LES enrichment facility was submitted to the US Nuclear Regulatory Commission.

Furthermore it has been decided to move the envisaged LES-site from Tennessee to New Mexico.

A licensing procedure to enable Urenco Nederland in Almelo to increase the enrichment capacity to 3500 tSWU/a is in progress (current licence limit is 2800 tSWU/a).

Nuclear research

No new developments have taken place. The information submitted for the ESA's annual report of 2002 is still valid.

Nuclear waste policy

On 30 September 2003 Queen Beatrix opened the HABOG intermediate storage facility for high-level waste. It is designed to hold all fuel from the Dutch research reactors in Petten and Delft and all residues from reprocessed fuel from the Dodewaard and Borssele power reactors for the next 100 years.

Although a decision on the final solution for long-lived residues has not been taken, the Dutch government is following a strategy of eventual retrievable disposal in suitable rock formations deep underground, and to this end finances a contribution to international research by the Dutch nuclear research and consultancy group, NRG.

Österreich – Austria

1. Nuclear policy

Austria does not operate any nuclear power plant. The underlying policy dates back to November 1978, when a referendum on the putting-into-operation of a nuclear power plant in the village of Zwentendorf (Lower Austria) yielded a negative result. As a consequence, on 15 December 1978, the Austrian parliament promulgated a law on the prohibition of the use of nuclear fission for energy supply in Austria (BGBl. No 676/1978, 'Bundesgesetz über das Verbot der Nutzung der Kernspaltung für die Energieversorgung in Österreich'). This Austrian position vis-à-vis nuclear power was strengthened by the Chernobyl accident in 1986, which substantially increased the opposition of all political parties and the public at large against nuclear power. In 1999 this ban of nuclear power was further strengthened by elevating it to the level of constitutional legislation (BGBl. I No 149/1999, 'Bundesverfassungsgesetz für ein atomfreies Österreich').

2. Research reactors

2.1. Atominstitut (Atomic Institute)

The 'Atominstitut' of the Austrian Universities, belonging administratively to the Technical University Vienna, operates a TRIGA Mark II research reactor. It has a maximum steady state thermal output of 250 kW and pulsing capabilities up to 250 MW. In operation since March 1962, the reactor has been used exclusively for basic and applied academic research and teaching purposes. Being the closest research reactor to the IAEA headquarters, it is also frequently used by IAEA staff for development and calibration of safeguards instruments. The total number of fuel elements in the core is presently 81, the estimated total activity of these fuel elements after one year of cooling time is 2.85 E15 and after 10 years approximately 1.81 E14 Bq. The Atominstitut has a total spent fuel storage capacity of 168 fuel elements.

2.2. Reaktorinstitut Graz (Reactor Institute)

The Graz Reactor Institute has operated a nominal 10 kW Siemens Argonaut reactor since 1965. The Uranium fuel enrichment levels are 20 % and 90 %. The reactor is mainly used for training purposes within the framework of the Graz Universities' education programme. The available fuel reserves will last until 2005.

3. Decommissioning

The ASTRA research reactor at the Austrian Research Centre Seibersdorf (ARCS), a 10 MW thermal water-cooled and moderated swimming-pool type reactor, was in operation from 1960 until its final shut down in July 1999. All the remaining spent fuel from this reactor was transferred to Savannah River (USA) in May 2001 for final storage. Respective information regarding the decommissioning procedure and the impact on the environment and other EU-Member States has been sent to the EU-Commission and has been accepted by the Commission. Required environmental impact assessment was successfully finished at the end of 2002. Currently the reactor is in the process of decommissioning. All radioactive material will be removed from the reactor building. Thereafter the non-contaminated reactor building will be used as an intermediate storage for conditioned radioactive waste.

4. Radioactive waste in Austria

4.1. General aspects

Radioactive waste generated in Austria is collected, processed, and stored by Nuclear Engineering Seibersdorf (NES), an enterprise of the ARCS. According to the Austrian Radiation Protection Act, the costs of radioactive waste management are borne by the waste producer. Fees for waste processing and interim storage as well as a contribution to a final disposal fund established by the government are payable upon delivery of the waste to NES. Regarding final disposal of radioactive waste, the Radiation Protection Act, in line with the IAEA Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, stipulates that international cooperation is to be taken into consideration.

As Austria does not operate nuclear power plants, there is no production of high-level waste (HLW). Consequently, there is no need for intermediate or final storage of HLW. The relatively small quantities of spent fuel (SF) resulting from the operation of the remaining Austrian research reactors are covered by a framework contract for 'US-origin nuclear fuel' and will be returned to the United States.

4.2. Facilities for radioactive waste management

Low- and intermediate-level waste (LILW) from hospitals, industry, and research laboratories (15 t/year) is collected, processed, and stored by NES. The company is equipped with facilities for treatment and conditioning of LILW, e.g. incinerator, super-compactor, and wastewater treatment facility. Cementing is the conditioning method of choice. In 2003, a modern automated clearance unit has been acquired by NES. The unit is used for clearance of slightly radioactive material from the decommissioning operations on-site. On the basis of a new Agreement between the Republic of Austria, the community of Seibersdorf, and NES, the interim storage facility in Seibersdorf is scheduled to be operated until 2030, with a total capacity of 15,000 200-L drums of conditioned waste (10,000 in the existing storage buildings and 5,000 in the decontaminated building of the ASTRA reactor). The arrangement of the drums in this long-term interim storage prior to final disposal (transfer storage) will enable individual drum inspection which is currently not the case. Rearrangement of drums into transfer storage will begin in 2005.

Portugal

Energy policy considerations

Portugal is pursuing its policy of increasing the share of domestic sources of energy in the total primary energy supply, mainly renewables, in order to reduce its dependence on imports and greenhouse gas emissions.

As far as the electricity sector is concerned, a steady increase in the use of natural gas and windpower is underway.

It should be emphasised, within the EU programme, to build the internal market of energy and the cooperation between Portugal and Spain to develop and consolidate an Iberian Electricity Market (MIBEL).

An Agreement between the two countries was signed on 20 January 2004, formally creating this market.

Electricity capacity and production

As far as the electricity system is concerned, total installed capacity in 2003 was on the level of 11.3 GWe with a small increase in the contribution of renewables.

Net domestic production was in the order of 43 TWh.

Nuclear electricity generation

There is no plan to implement a nuclear power programme.

Fuel cycle developments

Yellow cake production has ceased and no production took place in 2003.

Research reactor

The RPI (Reactor Português de Investigação) is currently running on two shifts per day basis, its utilisation is dominantly research, of which a significant portion is for graduation.

The reactor is still running on highly enriched uranium and it will be converted to LEU in accordance with the US foreign research reactor spent fuel take-back programme. Procurement and final destination of such fuel are under consideration.

Thermal neutron activation analysis work is present in about 60 % of the reactor operating time. Most of the reactor users are from ITN (Instituto Tecnológico e Nuclear), however, in some 20 % of the operating time, users from other organisations are involved. Of those ones, the most significant is CERN for which studies on the behaviour of electronic circuits and components in fast neutrons fields are being conducted.

Suomi/Finland — Finland

Olkiluoto 3

The Finnish nuclear operator Teollisuuden Voima Oy (TVO) proceeded with its plan to build a new nuclear power unit. In December 2003, after having received a number of bids, TVO chose the French-German consortium Framatome ANP GmbH, Framatome ANP SAS and Siemens AG as the supplier of this new unit. The chosen reactor type is EPR (European Pressurised Water Reactor) with a thermal power of 4,300 MW. The electrical output of the unit will be about 1,600 MW and its planned technical operating lifetime around 60 years. The unit will be built on the Olkiluoto site, where TVO already operates two BWRs.

On 8 January 2004, TVO submitted to the Government an application for a construction licence for this new unit. The granting of the construction licence is scheduled to take place at the beginning of 2005. The construction of the plant unit will probably take approximately four years.

Nuclear power generation

There are four nuclear power plant units in operation in Finland: two BWRs in the municipality of Eurajoki in Olkiluoto, and two PWRs in Loviisa. The total amount of electricity produced by the four nuclear power units in 2003 was 21.8 TWh (net). This corresponds to about 27.3 % of the electricity generation and little less (25.8 %) of the electricity supply in Finland in 2003. The load factors of the units varied between 97.0 % and 87.9 %.

Procurement of fresh fuel

For the security of supply reasons, there are stocks of fuel assemblies at both Loviisa and Olkiluoto power plants and the fuel purchases have been well diversified.

Nuclear waste policy and developments

The planning of a final disposal facility for spent nuclear fuel progressed according to the established schedule. The facility will be constructed by Posiva Oy, a company jointly owned by the two Finnish nuclear power companies. The next step in the project is the construction, starting in 2004, of an underground research laboratory on the future site in Olkiluoto. According to the plans, the construction licence for the final disposal facility itself will be applied for by the end of 2012.

The two existing on-site final disposal facilities for low- and medium-level radioactive waste operated normally.

Research reactors

The only research reactor in Finland, a 250 kW Triga Mark II reactor in Espoo, near Helsinki, was as before, used for boron neutron capture therapy (at the reactor site), research, education and isotope production.

Statistical information

Number of units in operation: 2 PWR, 2 BWR

Total nuclear generation capacity (net): 2,656 MW

Electricity generated by these units in 2003: 21.8 TWh

Sverige – Sweden

Total electricity generation and consumption

The total electricity generation in Sweden in the year 2003 was preliminary 132 TWh and the consumption was 146 TWh. The consumption decreased by 2 % compared to the year before, mostly because the temperature was over average for Sweden and also due to high electricity prices.

These high electricity prices are explained by the lack of water in the Swedish and the Norwegian reservoirs. 2003 was an extremely dry year and the production of approximately 132 TWh was 8 % lower than the year before (143.4 TWh). Sweden had the highest electricity import ever; 25 TWh, while the export was 11 TWh.

Production figures by source 2003 (compared to the year 2002), TWh:

Hydro power	53 (66.1)
Wind power	0.6 (0.6)
Nuclear power	65.7 (65.6)
Other thermal power	13 (11.2)

Average hydro power generation is 65 TWh with normal hydrological conditions. 2003 was an extremely dry year.

Nuclear electricity generation

Sweden has 11 nuclear power reactors at 4 different sites; Ringhals, Barsebäck, Oskarshamn and Forsmark. Ringhals made an all time high result and Forsmark did the second best result ever, in terms of electricity generated. Both Barsebäck and Oskarshamn had technical problems that decreased their production (see the following points).

Nuclear policy

After a series of decisions and negotiations with the owner, Barsebäck 1 was shut down on 30 November 1999 according to the 1998 Act. In 2000, it was decided that the conditions for closure of Barsebäck 2 will not be fulfilled before 2003. In 2002, a 'negotiator' was appointed with a mandate to discuss with the industry and other stakeholders the conditions of a gradual phase-out of nuclear power, including the closure of Barsebäck 2, and other issues needed for securing long-term cost-effective and sustainable energy supply for Sweden. He will report to the Parliament on the Barsebäck 2 closure by the end of April 2004 with the understanding that the principles for the overall future of the nuclear phase-out will follow shortly thereafter. The prerequisite to shut down any nuclear unit remains securing long-term cost-effective alternative energy supply sources as replacement.

Nuclear fuel cycle developments

OKG Aktiebolag has permission from the state to use MOX fuel based on the plutonium coming from reprocessing of OKG spent fuel sent to BNFL in the 1970s and the 1980s. The work is ongoing to decide the design of this fuel and also to make the necessary preparations for the transport. The MOX fuel is planned to be inserted after 2005.

Nuclear waste management

The Swedish Nuclear Fuel and Waste Management Co (SKB) is responsible for all handling, transportation and storage of spent fuel and radioactive waste outside the nuclear power plants.

In the early 1990s, SKB initiated an active programme for siting a spent nuclear fuel repository. Feasibility studies of eight sites were completed in 2001. During 2002, site investigations for a deep repository for spent nuclear fuel commenced in Oskarshamn and Östhammar. They have advanced in 2003 according to plan. They are intended to provide the information required to propose the localisation of the repository to one of the sites, and the data needed for the design of the facility and the safety assessment.

In the spring of 2003, SKB (Swedish Nuclear Fuel and Waste Management Co) initiated early consultations with the county administrative boards and concerned private individuals. When it has been concluded, SKB will compile a consultation report. An extended consultation with environmental impact assessment will then be conducted.

SKB plans to submit applications for the encapsulation plant in 2006 and applications for the deep repository in 2008. If the licence for the deep repository is then decided upon in 2010, SKB expects to be able to deposit the first canister with spent fuel in 2017.

A high-level conference on the global efforts to dispose of radioactive materials in geological repositories, Stockholm International Conference on Geological Repositories: Political and Technical Progress (7–10 December 2003), was arranged and hosted by SKB in cooperation with IAEA, NEA, the European Commission and EDRAM.

United Kingdom

Energy policy considerations

In February, the Government issued its Energy White Paper, which set out the UK's energy policy to 2050. The White Paper set out four goals — to reduce CO_2 emissions by 60 %, to maintain the security of energy supplies, to promote competitive markets in the UK and beyond and to ensure every home is adequately and affordably heated. The Government's priority is to strengthen the contribution that energy efficiency and renewable energy sources make to meeting its carbon commitment but the Government does not believe it is equipped to set targets for the composition of the fuel mix.

Whilst the Government recognises that nuclear power is an important source of carbon-free electricity, the current economics of nuclear power make it an unattractive option for new generating capacity and there were also important issues for nuclear waste to be resolved. Although there are no proposals for building new nuclear power stations in the White Paper, the Government recognises that at some point in the future new nuclear build may be necessary in order to meet its carbon targets. The White Paper made it clear that before any decision to proceed with the building of new nuclear power stations there would need to be the fullest public consultation and the publication of a White Paper setting out the Government's proposals.

In June, the Government published its proposals to establish the Nuclear Decommissioning Authority (NDA) in the draft Nuclear Sites and Radioactive Substances Bill. The draft bill implements the policies set out in the 2002 White Paper **Managing the Nuclear Legacy: A strategy for action**. The NDA will be a new public body that will provide strategic direction for the more effective management of the UK's GBP 50 billion nuclear 'legacy.' It will initially take responsibility for 20 UK civil public sector nuclear sites, currently owned by BNFL and UKAEA, and secure their safe, secure, cost-effective and environmentally responsible decommissioning and clean-up.

The bill also allows for the NDA to take responsibility for managing the clean-up of nuclear sites operated by or on behalf of the Ministry of Defence (MoD) and sites operated in the private sector, should this prove to be necessary at a future date. Public consultation on the draft bill lasted for three months.

The Energy Bill, which was published on 27 November, incorporates the revised provisions of the draft Bill. The Government's objective is to set up a legally established NDA by October 2004, to become fully operational by April 2005. Formal notification for approval of State aids for the NDA was submitted to the European Commission on 19 December.

In November 2003, the Government published a public consultation document into its proposed modernisation of its policy for decommissioning the UK's nuclear facilities, which requested comments by the end of February 2004. The Government hopes to announce its resulting policy during the first half of 2004

In July 2003, the Secretary of State announced a Joint Strategic Review of BNFL's businesses, following the ruling out of a flotation of the company after the establishment of the NDA. This review was carried out jointly by BNFL and the Government during the summer, and the conclusions were announced in Parliament on 11 December 2003.

In the period up to the establishment of the NDA in April 2005, BNFL and its Board will continue to have responsibility for the safe and efficient running of its existing sites and for the financial performance of the company and its subsidiaries. When the NDA is established, the vast majority of the existing BNFL UK workforce will continue to be employed by companies that operate current BNFL sites. Initially, the two largest site licensee companies will be British Nuclear Fuels plc (which will continue to have the licence for the Sellafield site) and Magnox Electric plc.

Nuclear electricity generation and consumption

The UK's nuclear power stations supplied 81.90 TWh in 2003, compared with 81.08 TWh in 2002. This represented 22 % of total electricity supplied in 2003 (the same as in 2002).

Fuel cycle developments

British Energy (BE) continues to make progress on the solvent restructuring plan it announced on 28 November 2002. Following the company's announcement on 14 February 2003 that it had reached agreement in principle with its financial creditors on its restructuring plan, the Government made a State aids submission to the European Commission on 7 March. The Commission announced on 23 July that it was opening a formal investigation procedure into the Government's aid to BE, and that procedure is continuing. The Electricity Miscellaneous Provisions Act, which will enable the Government to carry forward its part of the proposed restructuring or, if it fails, to acquire BE or its assets, received Royal Assent on 8 May. On 1 October, BE announced that it had formally agreed with creditors the terms of its proposed restructuring. The restructuring will only be implemented once all the conditions of the formal agreements to the proposed restructuring, including State aids approval, are met. The Government remains well prepared for administration in case the proposed restructuring fails for any reason.

In July, BNFL announced two major developments in its efforts to dramatically cut annual technetium-99 discharges from its Sellafield reprocessing complex to the sea, ahead of a reduction in the discharge authorisation in 2006. The company announced that it had successfully started diverting current arisings of the magnox reprocessing liquid waste that contains Tc-99 to a nearby high-level waste storage facility. This means the material can eventually be vitrified to avoid processing the waste through the Enhanced Actinide Removal Plant (EARP) leading to discharges of Tc-99. As for the liquid waste from past reprocessing operations, now stored in tanks downstream, BNFL began a full-scale trial in EARP in October to determine the effectiveness of a chemical removal process known as TPP. That trial concluded in December and the results will be published in 2004.

Also in July, BNFL were given the regulatory go-ahead to decommission the Magnox station, Hinkley Point A. The task of asbestos removal has started under one of the largest contracts of its type ever let in the UK. This operation will take four years and require the use of specialist personnel to keep within strict guidelines laid down by the UK's Control of Asbestos at Work Regulations. Hinkley Point A is the first nuclear station to be decommissioned under guidelines set out by legislation introduced in 1999.

On 1 October 2003, Urenco completed the legal formalities relating to its reorganisation.

Urenco now formally consists of two companies: an enrichment company called: Urenco Enrichment Company (UEC) and a technology company called Enrichment Technology Company (ETC). Both are owned by the existing holding company Urenco Ltd, in Marlow, UK.

Under an agreement signed on 24 November 2003 by Areva and the shareholders of Urenco, Areva will acquire a 50 % equity stake in ETC. ETC comprises all of Urenco's design and manufacturing activities in the field of centrifuge equipment and installations for uranium enrichment as well as its related R&D. This collaboration is subject to competition clearance and an intergovernmental agreement between the governments of the Netherlands, Germany, the United Kingdom and France. Urenco and Areva will continue to compete in the provision and marketing of uranium enrichment services. By the new partnership the Areva Group will be enabled to use ETC's centrifuge technology to replace its gas diffusion enrichment plant operated at Tricastin in France. The joint venture will supply Areva the centrifuges and technical assistance needed for its construction.

On 15 December 2003 the licence application for the LES enrichment facility was submitted to the US Nuclear Regulatory Commission. Furthermore, it has been decided to move the envisaged LES-site from Tennessee to New Mexico.

At the end of 2003, Urenco's total capacity was 6,550tSWU, which was split between the sites as follows: Almelo 2,150tSWU, Capenhurst 2,750tSWU and Gronau 1,650tSWU.

Research reactors

The UK currently has one operating civil nuclear research reactor, belonging to Imperial College, part of London University. Others await decommissioning, are in the process of being decommissioned, or have been fully decommissioned.

Ellas – Greece

No new developments were reported on matters relevant to the Supply Agency‘s annual report.

Annex 1 *bis*

Developments in the acceding States(12)

Ceská Republika – Czech Republic

National nuclear energy policy

In 2003, the Czech Government submitted for discussion an upgrade of the national energy policy. The approval of this upgrade is expected in 2004 on the government level.

The updated draft of the national energy policy proposes six possible scenarios with different shares of nuclear energy in the future.

Nuclear power generation

There are six nuclear power plant units in operation in the Czech republic. Four of those units in NPP Dukovany in South Moravia are VVER-440/213 type of reactors and two in NPP Temelin in South Bohemia are VVER-1000 type reactors.

Total nuclear generation capacity and power generated in 2003:

NPP	Total generation capacity (MWe)	Electricity generated in 2003 (TWh)
Dukovany	4 x 440	13.76
Temelín	2 x 1,000	12.11
NPP´s in all	3 760	25.87
Czech Republic in all	17 342.5	76.588*

* Generation capacity for the Czech Republic is in gross, total production in net. Net generation capacity according to UCTE and ETSO methodology is 16,169 MW.
Total amount of electricity produced from NPP's in 2003 corresponds to 33.78 % of net electricity generation and 43.26 % of electricity consumption in the Czech Republic.

Nuclear fuel cycle development

The total uranium annual requirements of Czech NPP´s are in the range of 680–700 MT and 400,000 SWU of enrichment services. The vast majority of these uranium needs was in the year 2003 covered from domestic sources; mainly from uranium production of the state enterprise DIAMO and recently also by purchases of some limited quantities of uranium concentrates from government stockpiles. The remaining domestic uranium production has been contractually fully committed until 2006 on the basis of a long-term agreement with joint-stock company ČEZ, a. s. – the NPP´s owner.

Radioactive waste policy and development

All radioactive waste repositories in the Czech Republic, which are in operation, i.e. the repositories Dukovany, Richard near Litoměřice and Bratrstvi in Jachymov, were put into state ownership on 1 January, 2000. The repositories, which had been operated by private operators, have been transferred under the management of the State organisation Radioactive Waste Repository Authority. RAWRA is now responsible for the safe operation of all repositories.

(12) National Radioactive Waste Company.

On 15 May 2002 the government of the Czech Republic approved a document entitled the 'Concept of radioactive waste and spent fuel management in the Czech Republic'. This document was prepared in 2000 by the Ministry of Industry and Trade in cooperation with many other organisations, including state administration, regulatory bodies, waste generators etc. In 2001 the concept was subjected to an environmental impact assessment (as stipulated in Act No. 244/1992 Coll.).

For RAWRA the concept has become the basic strategic document according to which RAWRA will carry out its obligations.

The document covers the management of all categories of radioactive waste and aims at optimising the currently existing system for low- and medium-level short-lived waste. The construction of a deep geological repository is recommended in the concept as being the best option for the disposal of spent nuclear fuel and high-level radioactive waste. However, the long-term safety of such a repository must be proved before building permission can be granted. Consequently, the deep geological repository development programme will continue aimed at selecting a final site and verifying its suitability; the programme should include a sufficiently long period of time during which the results of tests and experiments can be verified in an underground laboratory.

The decision made in the concept to construct a deep geological repository could be reversed: the concept includes support for research focused on transmutation and a new evaluation of management options, scheduled in 20 years' time.

Research reactors

There are three research reactors operating in the Czech Republic. Two are located in the Nuclear Research Institute in Řež near Prague and one small educational reactor at the Technical University in Prague.

National uranium mining activities

The government controls the state uranium industry in the Czech Republic. The State-owned enterprise DIAMO s.p. (placed in Strážpod Ralskem) has exclusive rights for uranium exploration, mining and processing. The total uranium production in 2003 was 451.724 tons U (343.262 tons from underground mining, 107.546 tons from *in-situ* leach and 0.915 tons from environmental restorations).

Only one underground mine remains in operation at present: 'mine Rož ná' in western Moravia. The government has decided on full depletion of uranium reserves in that deposit until 2005.

Mining and milling of uranium ores in the Czech Republic has led to serious impacts on the environment, the removal of which will require a long-lasting remediation procedure. The remediation activities represent an integrated process including planning, administration, environmental impact assessment, decommissioning, waste rock management, water treatment and long-term monitoring. The major part of environmental projects (more than 90 %) is being funded from the state budget; they will continue until approximately 2040 and will cost around CZK 50–60 billion (EUR 1.55–1.85 billion). Yearly costs for uranium environmental remediation, social programme and social security are in the range of CZK 2 billion (around EUR 62 million).

Eesti — Estonia

Electricity capacity and production

The New Electricity Market Act in Estonia has stipulated reciprocity principles for imported supplies of electricity. Electricity can be imported to Estonia, if in the country of origin:

The environmental requirements applied to power plants are at least the same as in Estonia;

the electricity market is opened at least on the same level as in Estonia;

electricity pricing principles are similar to the rules established in Estonia.

By invoking the last clause, Estonia aims to avoid unfair competition in the electricity market, which has been created by market distortions in some neighbouring countries (for example, the covering of closure costs of nuclear power plants, public service obligation on security of supply, etc.). These distortions have been one of the main concerns of Estonia when introducing the principles of electricity market in the region, e.g. as regards the surrounding states.

Restrictions on imports of electricity will not apply to the supplies of electricity from the Nordic power markets to Estonia via the planned submarine interconnection Estlink (between Estonia and Finland). Electricity from the Nordic market is considered by Estonia to be produced on the same grounds as in Estonia.

Currently the Estonian power market is opened for customers consuming annually over 40 GWh (representing around 10 % of the market).

During accession negotiations the parties have agreed that in Estonia, Article 19(2) of Directive 96/92/EC shall not apply until 31 December 2008.

The balance in supply with primary energy in Estonia was the following in 2002: oil-shale 61 %, gas 13 %, wood and peat 12 %, motor fuels 11 %, fuel oils 3 %, coal and coke almost 0 %. The balance in consumption of fuels for electricity and heat generation was the following in 2002: oil-shale, 67 %, natural gas, 15 %, firewood, 6 %, shale oil, 4 %, heavy and light fuel oil, 3 %, peat, 1 %, coal, 0 % and other fuels, 4 %.

Nuclear electricity generation

Estonia has no plans to implement a nuclear power programme.

Nuclear facilities in Estonia

Development of the long-term strategy for the management of the two reactor sarcophagi at Paldiski is currently under development and there is an ongoing Phare project 2002/000/632.03 under the horizontal programme for Community support in the field of nuclear safety for 2002 for Estonia, 'Safe long-term storage of the Paldiski sarcophagi and related dismantling activities'. It has been decided to store the sarcophagi safely and to examine possibilities for the final repository.

Kypros – Cyprus

Cyprus does not operate nuclear power plants nor uranium or thorium mines and has no active R&D programme in this field. The country has no indigenous primary energy resources and is therefore almost totally dependent on imported energy. In 2002, imports of oil products, coal and pet coke for home consumption amounted to EUR 470 million, representing about 12 % of the country's domestic imports. Energy is, therefore, of vital importance to the island's economy.

The energy consumption is predominantly oil–based (90 %). The only other form of commercial energy used is coal and pet coke, for cement production (6 %). The contribution of renewable energy sources for meeting the country's energy needs is about 4 %, mainly from solar energy. However, in accordance with the Renewable Energy Action Plan of the country (2002–10) their contribution to the national energy balance will increase to 9 % by 2010. As mentioned above, nuclear energy is not used and there are no plans for future use of nuclear energy in Cyprus.

The total final energy consumption in the Government controlled area of Cyprus in 2002 was 1.76 million to which corresponds to a per capita annual consumption of 2.5 toe (tonnes of oil equivalent).

Electricity power generation is currently oil–based and uses about a third of oil imports. However, there are plans for importation and utilization of LNG for electricity generation by 2008.

Faced with the above situation, the government of Cyprus has proceeded with the formulation of a comprehensive energy policy. The main objectives of the island's energy policy are:

- securing energy supply;
- meeting energy demand;
- energy conservation and development of renewable energy sources;
- mitigation of energy consumption impact on the environment;
- compliance with the requirements of the *acquis communautaire* in the energy sector.

Latvija – Latvia

Nuclear facilities and users of fissile materials

Research reactor:

- was put into operation on 26 September 1961;
- initial fuel EK–10 (10 % U-235);
- after reconstruction in 1985 – IRT-3M (90 % U-235);
- permanent shut-down 1998;
- 28 spent IRT-2M cassettes and 49 spent IRT-3M cassettes at present.

Critical assembly:

- Riga critical assembly in operations 1965–90.

Minor users of fissile materials (e.g. University)

Legal framework

Act on radiation safety and nuclear safety:

– fully modified in 2000;

– establishes new regulatory framework;

– base for adoption of regulations.

Safeguards regulations:

– fully modified in 2002;

– implementation of EU safeguards regulation and requirements from additional protocol;

– will be modified before May 2004 (to exclude duplications with EU regulation).

NPT and safeguards agreements:

– NPT ratified in 1992;

– safeguards agreement in force since 1994;

– additional protocol in force since 2002.

Plans for future and estimate for needs of fissile materials

Decommissioning of research reactor:

– started in 1999;

– shall be finished before 2009;

– spent fuel should be sent for reprocessing and/or disposal.

Needs for fissile materials:

– only minor users.

Commission Regulation No 17/66/Euratom will be applied (small quantities of ores, source materials and special fissile materials)

Lietuva – Lithuania

Energy policy

The Parliament of the Republic of Lithuania approved the new edition of the **National Energy Strategy of Lithuania** on 10 October 2002. It was decided that the first Unit of Ignalina NPP will be closed before 2005, and the second Unit in 2009, accordingly, while stressing the need for Lithuania to remain a 'nuclear State'; taking into account global nuclear energy development trends, the latest technologies of reactors and their technical-economic characteristics, a comprehensive study on the continuity of the use of nuclear energy in Lithuania will be prepared, covering the justification of nuclear safety and acceptability of nuclear energy, including the construction of new nuclear power plants (reactors).

In May, an agreement for the performance of such a study was signed. The objective of the study is to evaluate possibilities to continue the use of nuclear energy in Lithuania, political, social, economical and environmental preconditions in the context of reliability of electricity supply, safety, electricity prices, macro economical expansion, EU politics and international environmental obligations.

In case of failure to secure the necessary financing from the EU and other donors, the operation of Ignalina NPP Units 1 and 2 will be extended in accordance with their safe operation period. The adopted plan of technical-environmental and social-economic implementation measures of the Ignalina NPP Unit 1 decommissioning laid down the relevant timetable as well as indicated the responsible organisations and financing sources.

On 3 July 2003 the amendments of Nuclear Energy Law were adopted. The main purpose of the changes was to harmonise this law with European Union legislation and recommendations of the International Atomic Energy Agency.

Lithuania ratified the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management on 18 December 2003.

On 3 October 2003, an agreement was signed between the Government of the Republic of Lithuania and the Government of the Republic of Latvia on early notification of nuclear accidents, exchange of information and cooperation in the field of nuclear safety and radiation protection.

Nuclear power and electricity generation

Lithuania operates one nuclear power plant — Ignalina NPP, which contains two RBMK-type reactors with a nominal capacity of 1,500 MW(e) each. Both Units of Ignalina NPP are down rated to about 1,300 MW(e) for safety reasons. In 2003, Ignalina NPP produced about 15.5 TWh. This is about 10 % higher than in 2002. It represents a share of 79.9 % of Lithuania's total electricity production.

Fuel cycle and radioactive waste management

All the nuclear fuel is supplied by Russia. Spent nuclear fuel is stored in the water pools next to the reactors and in interim storage for spent fuel on the site of the Ignalina NPP. Interim storage consists of twenty Castor casks and forty Constor casks manufactured by GNB in Germany. A new interim spent fuel storage will be built on Ignalina NPP site as a pre-decommissioning project. It is planned to start operation of the first store of this storage in 2005 and to finish by 2011.

Radioactive Waste Management Agency (RATA) is an operator of a radioactive waste disposal facility of Radon type near Maišiagala, which was taken over from the Institute of Physics. In March 2003, RATA got a licence for managing the institutional radioactive waste. For improving the Maišiagala repository, RATA drafted a project proposal for PHARE programme safety assessment and upgrading of Maišiagala repository in Lithuania. The agreements on the implementation of the project are to be signed by November 2004.

RATA together with the Lithuanian Geological Survey and the Lithuanian Energy Institute have prepared a programme for assessing the possibilities of the disposal of spent nuclear fuel and long-lived radioactive waste for the years 2003–07. The studies envisaged in the programme are to show whether it is technologically possible to dispose spent nuclear fuel in Lithuania, and what would be the cost of such disposal.

Following the Framework Agreement signed in 2001 between the Republic of Lithuania and the European Bank for Reconstruction and Development, the Grant Agreement No 003 between Ignalina NPP and EBRD concerning a project of high- and intermediate-level long-lived radioactive waste storage facility was signed on 20 May 2003.

In May 2003, the Lithuanian Government approved the plan to build a solidification complex for liquid radioactive waste. The complex will contain a cement solidification facility for treatment and cement solidifying of liquid radioactive waste generated during the operation and decommissioning of Ignalina NPP and a temporary storage building designated for temporary storage of the cement solidified radioactive waste for up to 60 years.

Magyarország – Hungary

Nuclear facilities

Facility: Paks Nuclear Power Plant

This plant is one of the major facilities generating electric energy in Hungary.

Location: Paks

Type: VVER-440/213

Capacity: 4x460 MWe

First criticality: Unit 1 1982; Unit 2 1984; Unit 3 1986; Unit 4 1987

Facility: Training Reactor of the Budapest University of Technology and Economics

The main task of the Training Reactor is to train undergraduates and PhD students of the Budapest University of Technology and Economics, and students of other higher educational institutions.

Location: Budapest

Operator: Institute for Nuclear Techniques, Budapest University of Technology and Economics

Type: Pool

Capacity: 100 kWth

First criticality: 1971

Facility: Budapest Research Reactor

The research reactor operated at the KFKI Atomic Energy Research Institute in Budapest is one of the most important nuclear research facility in Hungary.

Location: Budapest

Type: Tank

Capacity: 10 MWth

First criticality: 2 MW (1959), 5 MW (1967), 10 MW (1993, after reconstruction)

Facility: Interim Spent Fuel Storage Facility

The facility was designed to store, for a fifty-year period, the spent fuel assemblies produced during the whole lifetime of the four units of Paks Nuclear Power Plant.

Location: Paks

Operator: Public Agency for Radioactive Waste Management (PURAM)

Type: modular vault dry storage

Capacity: storing spent fuel for 50 years

Operating from the end of 1997

Nuclear electricity generation and consumption

The total production of electricity in Hungary in 2003 was 33.69 TWh. The net import of electricity was 6.93 TWh.

The four nuclear power reactors of the Paks NPP generated 11.013 TWh, compared with 13.9 TWh in the previous year (– 6.7 %). Oil and gas fired electricity production reached 11.9TWh (+ 2.9 %), while coal fired power plants produced 9.7TWh (+ 2.6 %).

The average availability of the nuclear power station was high except for Unit 2 of the Paks NPP which has been continuously shut down since 29 March 2003 due to the serious incident which occurred on 10 April during an out-core fuel element cleaning process. The restoration work in the vicinity of Unit 2 is foreseen to be finished in the first quarter of 2005.

All supplies of nuclear fuel materials and services were made in time and without any problems, as were all transports of radioactive waste and spent fuel.

Nuclear fuel cycle developments

Existing low and intermediate level radioactive waste disposal site

Prior to 1976 radioactive waste was disposed of at an experimental facility located in Solymár, near Budapest. Following the commissioning of a new radioactive waste management and disposal facility at Püspökszilágy in 1976, all the waste from Solymár was removed and transported to Püspökszilágy and the Solymár site was reclaimed. The Püspökszilágy facility is a near surface, concrete trench type facility designed to condition and dispose of institutional radioactive waste. The disposal area had to be extended as the original capacity was filled. This additional capacity ensures disposal availability for institutional radioactive waste for several decades. The Püspökszilágy disposal site has temporarily received and disposed of operational radioactive waste from the Paks NPP – with short interruptions – until 1996. Up to that time 1580 m^3 solid and solidified NPP waste has been emplaced here.

Site selection for a new low and intermediate level radioactive waste repository

From 1993 onwards, a national project is in progress to perform site exploration for a new L/ILW repository. Prospective near surface and underground disposal sites were evaluated in a four stage screening process. As a result, a granite formation at Bátaapáti (Üveghuta) site was selected for the repository.

Spent fuel management and closure of the fuel cycle

Up until now, no final decision has been made in Hungary with regard to the possibilities for closure of the nuclear fuel cycle. Under the present circumstances the direct disposal seems to be more expedient, but Hungary adopted the 'wait and see strategy'.

Fuel for Paks NPP – just as for all other east European VVERs – has been supplied by the Soviet Union and later by Russia. In the framework of a contract with the Soviet Union (later Russia) all spent fuel was taken back for reprocessing and no reprocessing waste of any kind was sent to Hungary. In 1995 the likely interruption of the spent fuel reshipment lead to a fairly immediate problem in Hungary. The spent fuel ponds became nearly full by the end of the 1995 refuelling, and future acceptance of spent fuel by Russia under previous conditions became uncertain. Therefore, the Paks NPP awarded a contract for the construction of a modular vault dry storage system at the NPP's site. The dry storage facility was commissioned in 1997 and due to its modular structure its total capacity will be enough for all the spent fuel elements generated during the full operational time of the Paks NPP.

Investigations for HLW disposal

As of now, there is no decision on the back-end of the fuel cycle, but – in order to calculate the future costs of radioactive waste and spent fuel management, as well as to assure the necessary funding – some assumptions need to be made. As a reference scenario the postulation of direct disposal of the spent fuel assemblies in Hungary was accepted.

It is obvious that in the foreseeable future a strategy for the fuel cycle back-end should be elaborated. In the course of the elaboration of the strategy it is worthwhile to examine various possibilities, including the shipment of spent fuel abroad.

For future disposal of high-level radioactive waste, preparations should be accelerated to construct a repository in a geological formation providing long-term isolation. Such a geological formation might well be the Boda Claystone Formation – a uranium ore-bearing sandstone formation mined for 42 years – if further investigations confirm its suitability. The repository may also be used either for direct disposal of spent fuel or for high-level radioactive wastes from reprocessing.

Polska – Poland

Poland does not possess any nuclear power plants, neither in operation nor under construction. According to the 'Energy policy guidelines for Poland until 2020', adopted by the Government, nuclear energy is not included in the fuel-energy balance of the country within this time horizon.

The demand structure for primary energy carriers in 2003 in Poland was as follows (approximated data): [PJ]

Total demand of Poland	Hard coal	Brown coal	Oil	Natural gas	Renewable energy	Other fuels
3,850	1,900	520	800	440	150	40

In recent years, a slow drop in consumption of hard coal has been noted and an increase in consumption of natural gas. In coming years, the above structure will however not undergo substantial changes.

The electricity production structure is also dominated by coal and looks as follows (data from 2002): [GWh]

Total electricity production: covering	From hard coal	From brown coal	In hydro power plants	From other sources including autoproducers
144,070	83,447	48,906	3,895	7,822

Total available capacity in the Polish power system at the end of 2002 amounted to 33,615 MWe.

Poland has one research reactor in operation, at the Centre Swierk near Warsaw. This reactor, called MARIA (a multipurpose high flux research reactor), is a water and beryllium moderated reactor of a pool type with graphite reflector and pressurised channels containing concentric six-tube assemblies of fuel elements. It has been designed with a high degree of flexibility. The fuel channels are situated in a matrix containing beryllium blocks and enclosed by lateral reflector made of graphite blocks in aluminium cans. The MARIA reactor is equipped with vertical channels for irradiation of target materials, a rabbit system and six horizontal neutron beam channels.

The main reactor features are as follows:

- production of radioisotopes;
- testing of fuel and structural materials for nuclear power engineering;
- neutron radiography;
- neutron activation analysis;
- neutron transmutation doping;
- research in neutron physics.

In 2003 the reactor completed 40 operation cycles at power levels from 30 kW to 17.5 MW. The operation time was 4010.5 h. According to the plans, the MARIA reactor will be kept in operation up to 2020. The 84 fresh fuel assemblies (with 1200 g of uranium enriched to 36 %) are contracted with TVEL Company (Russian Federation).

Taking into account the long storage time in wet conditions, the spent fuel with significant release of fission products should be stored in dry condition. The encapsulation technology of MR spent fuel in helium has been elaborated and applied. The encapsulation technology for Ek-10 and WWR spent fuel is under elaboration. Two scenarios are considered for future management of spent fuel in Świerk Research Centre: design of the dry storage facility or reshipment to country of origin (Russian Federation).

Slovenija — Slovenia

Slovenia has one nuclear power plant in commercial operation since 1983, the NPP Krško.The NPP Krško is a pressurised water reactor plant of 676 MW(e), delivered and constructed by Westinghouse, and is jointly owned with the Republic of Croatia. The operational and safety record of Krško NPP is good and complies with all international standards and highest safety requirements. The safety status of the plant has been supervised by the Slovenian Nuclear Safety Administration as well as by international expert missions organised by IAEA, EU, WANO, etc. Apart from power generation, Slovenia has a research reactor TRIGA Mark II used mainly for R&D and for training activities.

Energy policy

The government of Slovenia laid down its energy policy objectives and main priorities for the development of energy sector in its **Resolution on the Strategy of Energy Use and Supply of Slovenia** (adopted in January 1996) and with the new energy law (September 1999). In 2003, the Slovenian Government endorsed the national energy plan (NEP). The time horizon of NEP is 2000–20. The adopted economic scenario foresees that beyond Slovenia's accession to EU, the GDP will grow 4 % annually. After 2009 it will stabilise around 2.2 % per annum until 2020.

According to economic scenario in NEP, as the main driving force for energy demand, total primary energy demand will grow in the period 2000–20 by 1.1 % annually. Electricity is foreseen to grow 1.5 % annually.

Nuclear power plants: status and operations

In 2002, the NPP Krško produced 5.03 TW·h or about 39 % of total electricity generation of the country. The load factor was 85 %. In 2003, the NPP Krško produced 4.96 TWh of electricity. Domestic and international institutions, including IAEA, were involved in safety missions to the NPP and they all rated the level of safety as good and the level is still improving. The designed lifetime is 40 years. Table 8 shows its current status.

Status of nuclear power plants

Station	Type	Capacity	Operator	Status	Reactor Supplier
KRSKO	PWR	676	NEK	Operational	Westinghouse
Station	Construction date	Criticality date	Grid date	Commercial date	Shutdown date
KRSKO	30 March 1975	11 September 1981	2 October 1981	1 January 1983	

Source: IAEA Power Reactor Information System as of 31 December 2002.

Operation of NPPs

The Krško plant, the only NPP in Slovenia, has been in commercial operation since 1983. The unit is essential to electricity production in Slovenia. However, operation of Krško to the year 2023 is one of the long-range energy considerations.

Fuel cycle and waste management

Waste production

The NPP Krško is the main producer of all waste categories in Slovenia. The contribution of other producers is relatively small.

Waste storage

The operational waste from the nuclear power plant is stored in LILW storage at the Krško site. It is operated by the plant operator. The LILW storage at NPP Krško is close to being filled to capacity. With the waste volume reduction and improvements in waste treatment and the reduction of waste production, the storage still meets the requirements, but a long-term solution is needed.

Similarly to the low- and intermediate-level waste, storage for spent fuel is sited at the location of the NPP and managed by the plant operator. The spent fuel pool has recently been successfully re-racked to provide sufficient capacity for plant lifetime and even for possible lifetime extension. After re-racking the original 828 positions for spent fuel assemblies in the pool were increased to 1,694 positions. At present 707 positions are occupied. The discharge rate is ~ 36 fuel assemblies per fuel cycle.

Current policies and practices

Long-term waste management

The disposal solutions for LILW or spent fuel are available neither in Slovenia nor in Croatia. In both countries the site selection processes for the LILW repositories were initiated in the early nineties and developed to different stages but so far neither of the countries has succeeded in confirming the site. Simultaneously with the site-selection process, the conceptual design of a repository for LILW is being prepared and the performance and safety assessment of the disposal facility is being developed.

On the other hand, the final solution for spent fuel remains undefined. The debate is still being carried on at the strategic level. The only document treating the long-term management of spent fuel is **'The strategy for long-term spent fuel management'**, which was prepared by ARAO and adopted by the Slovenian government in 1996.

Strategy for long-term spent fuel management

The strategy for long-term spent fuel management analyses different possibilities of long-term management and possible final solutions for spent fuel. The preparation of the strategy was strongly influenced by the small quantities of spent fuel generated in Slovenia, the expected phase-out of nuclear energy and at that time the still unresolved question of ownership of the NPP Krško.

In 2003, the pool capacity was already increased.

Research and development

The Institute Jozef Stefan is the largest scientific and research institution in the country with over 740 staff, active in nuclear physics, solid state physics, chemistry, reactor physics and engineering, energy and process control. The facilities include a research reactor and a laboratory for nuclear spectroscopy based around a 2 MV Van de Graaff accelerator, which continues to receive assistance through the TC programme. The Institute also operates a Nuclear Training Centre in premises completed in 1988. It provides training for NPP Krško personnel, organises radiological protection courses and carries out public information activities. The centre also regularly organises and hosts training activities and workshops for the IAEA. The Institute plans to establish a multipurpose irradiation facility with TC assistance.

The Institute Jozef Stefan has been operating a 250 kW(th) TRIGA Mark II research reactor since 1966. In 1992, the reactor was refurbished including the core, electronics and electrical systems and ventilation, and upgraded with 2 MW(th) pulsed mode capabilities. In August 1999, 219 spent fuel elements were returned to the USA which financed the operation. About 60 fuel elements remain in the core with about 20 fresh fuel elements in reserve. A new fuel element storage area is nevertheless available. At the end of the 1980s, the reactor was operating some 4,000 hours per year and producing isotopes for medical use. The decline of the research and the reduced cost-effectiveness of producing isotopes for medical applications locally meant a substantial reduction in reactor use. Current applications are neutron activation analysis (NAA), operator training, neutron radiography, and research.

Fuel assembly purchase process in NPP Krško

Introduction

Krško is nuclear power plant operated by the Nuklearna Elektrarna Krško, which utilises a Westinghouse nuclear steam supply system. This unit is designed to produce 1994 MW of thermal core power, which results in 703.8 MW of gross electrical power. The reactor is a closed cycle, pressurised, light water moderated and cooled system.

NEK strategy of uranium supply

NEK has a strategy of no uranium stock or reserves. All materials necessary for fuel assembly fabrication and utilisation is supplied on time, three months before startup of reactor. Reliability of supply is a key issue in assessing procurement strategy. Security, diversification of the supply, contract flexibility and timely supply are one of the main goals and critera for the choice of the contractors.

NEK is contracting uranium and services as a package. Book transfer is requested between different suppliers. There is no physical deliveries between parties involved. Material shall comply with the NEK defined QA requirements. NEK has mid-term contracts with fixed or market related pricing. The contracts are requirement based. There are three main phases related to the process of purchase of fuel assemblies in NPP Krško and are subject to three different agreements as follows:

– contract for the purchase of natural uranium Hexafluoride (UF_6);

– contract for the purchase of uranium enrichment services and;

– contract for nuclear fuel fabrication.

The first phase is purchase of UF_6. Globe Nuclear Services and Supply GNSS is contracted and the product is supplied to the United States Enrichment Corporation USEC for enrichment. Annual requirements for the Natural Uranium Heksafluoride are about 140 tonnes and requirements for enrichment is about 80 kSWU per 12-month cycle. There is a good historical relationship between NEK, GNSS and USEC.

The uranium procurement phase is a part of the reload design process.

Reload design process

Fuel Reload Design Process is specified in the agreement between NPP Krško and Westinghouse (contract for nuclear fuel fabrication and associated services between NPP Krško and Westinghouse Electric Company). NPP Krško has a lifetime contract with Westinghouse for nuclear fuel fabrication and related services.

Slovensko – Slovakia

The Slovak electricity market has gone through significant changes over the past decade. The Slovak Government has been focusing on privatising the electricity sector and liberalising the industry by introducing an appropriate legislative framework.

The privatisation programme for the electricity sector was approved by the Slovak Government through its decree in September 2000. In order to facilitate the privatisation and liberalisation of the electricity owned sector, Slovenský energetický podnik (SEP), the formerly utility owned by the State was transformed into a joint stock company Slovenské elektrárne (SE) in November 1994 and has subsequently been unbundled into generation, transmission and distribution companies. The privatisation of the distribution companies has been completed since June 2002.

In parallel with the privatisation programme, the SE has been restructured and prepared for privatisation. The restructuring of SE was completed on January 2002, when the former transmission division SEPS separated from SE as an independent system operator for the Slovak national grid.

Regarding the regulation of generation in the new market, from 1 January 2003, URSO (the regulation office) has taken over regulation of prices in electricity market. The price for electricity is being split between a charge for power and a charge for ancillary services.

Regulated prices would be adjusted in the following period according to a formula.

Nuclear electricity generation

In Slovakia there are six reactors of PWR- type (2 WWER 440, model V230 and 4 WWER 440 model 213) in operation. Their total net capacity is 2,640 MWe. In 2003, these reactors produced about 17.8 TWh. Electricity generation from nuclear power represents 57 % of total electricity production in Slovakia.

Fuel cycle developments

Procurement of new nuclear fuel

All the fuel for the operation of the six VVER 440 units in Slovakia has been fabricated in the Russian Federation. The fuel supplier provides completed fuel assemblies, including nuclear material, its conversion and enrichment. Present fuel contract is valid for Bohunice units 1 and 2 to the end of their operation (2006, resp. 2008) and until the end of 2004 for Bohunice units 3 and 4 and Mochovce units 1 and 2. All six units use advanced fuel with an average enrichment of 3.82 % U 235.

In 2002, Slovenské elektrárne (SE, a.s.) opened an international tender for fuel supplies for a period of 5 years starting from the year 2005. Based on the evaluation of submitted bids the Russian supplier will continue to supply fresh nuclear fuel in 2004 for Bohunice units 3 and 4 and Mochovce units 1 and 2. The supplied fuel will be of a new generation (new mechanical and nuclear design with burnable Gd absorber) and should result in better efficiency and lower annual consumption of nuclear materials.

Spent fuel

The basic policy of spent fuel and radioactive waste management has been established by the resolutions of the Slovak Government, adopted and updated as necessary by the SE, a. s. management.

The operation of nuclear reactors in Slovakia follows an open fuel cycle since the WWER-440 reactors are not licensed to utilise MOX fuel. Discharged spent fuel is stored for 3 years in spent fuel pools of the main generation building. Further long-term storage of spent fuel (40 to 50 years after its removal from the reactor) is required prior to its final disposal in a repository.

An interim spent fuel wet storage facility (ISFS) has been in operation at Bohunice site since 1987. ISFS has already been reconstructed in order to increase its storage capacity and to enhance its seismic resistance. The enlarged storage capacity will be sufficient for all spent fuel from Bohunice reactors produced during their whole operation period and for Mochovce until 2015. A project of spent fuel storage facility at Mochovce site (ISFS - EMO) is currently in the first stage of investment implementation. According to current intentions, the facility will probably be based on the dry storage technology.

By the end of 2003, all Slovak WWER 440 units had used 8,800 fuel assemblies; from this amount approximately 700 assemblies were exported to the Russian Federation. 6,500 pieces are stored in wet ISFS located at the Bohunice site. The remaining about 1,600 spent fuel assemblies are cooled down and stored in pools adjacent to the reactors.

All spent fuel assemblies from A1 reactor unit (HWGCR reactor, in operation since 1972 till 1977) were transported to the Russian Federation by July 1999.

Final disposal of the spent fuel is expected to be in deep underground geological repository. Activities on the selection of an adequate site are thus continuing.

Reprocessing of spent fuel from Bohunice and Mochovce NPPs is not included in the concept of spent fuel management.

Possibilities of transporting the spent fuel into foreign countries for final disposal or reprocessing and the possibility of an international or regional solution to the final spent fuel disposal and new technologies in the area of spent fuel management have to be verified.

Management of Radwaste

The current policy of radioactive waste management in Slovakia was approved by a Resolution of the Slovak government.

In 1996 the new plant SE-VYZ – subsidiary of SE,a.s – was established to ensure and perform activities concerning decommissioning of the nuclear facilities and radioactive waste and spent fuel management.

The plant activities are being financed from the SE, a.s. budget and from the State fund for decommissioning of nuclear power installations and radioactive waste and spent fuel management. The State Fund was established by the Act No 254/1994 Coll. with effect from 1 January 1995. The basic resources of the fund are contributions of operators of nuclear facilities.

The following technologies for radioactive waste treatment and conditioning are currently available, certified for permanent operation:

- Bohunice Radwaste Treatment Center;
- bitumenation plants;
- active waters purification plant;
- vitrification plant;
- facility for fragmentation of metal waste.

Radioactive waste storage

The National Radwaste Repository, located near Mochovce NPP, is a near surface facility designed for the disposal of solid and solidified low and intermediate-level radioactive waste. The capacity is 7200 containers of radioactive waste (produced by operation and decommissioning of NPP A-1 and institutional waste).

Annex 2: NIS supplies

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

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	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
Total	40,250	5,200	45,450	5,550	51,000	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) Physical imports by EU operators, and acquisitions by EU utilities of natural uranium and feed contained in EUP from the NIS (tU)

Year	**Physical imports**	**Acquisitions**[a]			
		Quantity tU	as % of supply[b]	incl. RET[c]	incl. RET as % of supply[b]
1992	9,500	2,700	23		
1993	12,100	2,700	22		
1994	12,200	4,500	32		
1995	12,100	5,200	32		
1996	17,600	6,800	43		
1997	12,200	5,000	32	--	--
1998	11,600	5,600	35	--	--
1999	9,400	5,100	34	6,200	42
2000	8,700	5,800	37	7,000	44
2001	8,600	4,100	29	5,100	37
2002	8,600	6,900	41	7,900	47
2003	9,200	4,500	27	5,700	35
Total	131,800	58,900	33		

NB: (a) Acquisitions cover deliveries to EU utilities including exchanges but excluding re-enriched tails except for 1997–98 as explained under (c).
(b) Supply to EU utilities covers total deliveries to EU utilities under purchasing contracts during the respective year.
(c) 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 'acquisitions' for 1997 and 1998. The figures include RET acquired as a result of exchanges.

Annex 3: EU reactor needs and net requirements (Quantities in tU and tSWU)

(A) From 2004 until 2013

Year	Natural uranium		Separative work	
	Reactor needs	Net requirements	Reactor needs	Net requirements
2004	21,000	17,200	11,900	10,500
2005	20,300	16,700	11,600	10,800
2006	20,900	17,500	11,800	10,800
2007	20,600	17,700	11,600	10,700
2008	19,900	17,700	11,700	10,800
2009	18,800	16,800	10,900	10,100
2010	19,700	18,200	11,500	10,800
2011	17,800	16,600	10,400	10,000
2012	18,900	17,700	11,100	10,600
2013	18,600	17,300	10,900	10,400
Total	196,500	173,400	113,400	105,500
Average	19,700	17,300	11,300	10,600

(B) Extended forecast from 2014 until 2023

Year	Natural uranium		Separative work	
	Reactor needs	Net requirements	Reactor needs	Net requirements
2014	17,600	16,300	10,400	9,800
2015	17,700	16,300	10,600	10,000
2016	17,500	16,200	10,500	10,000
2017	16,900	15,600	9,900	9,300
2018	16,900	15,600	10,100	9,500
2019	16,600	15,200	9,800	9,200
2020	16,200	14,900	9,600	9,000
2021	16,000	14,600	9,500	8,900
2022	15,800	14,500	9,500	8,900
2023	15,400	14,100	9,000	8,400
Total	166,600	153,300	98,900	93,000
Average	16,700	15,300	9,900	9,300

Annex 4: Fuel loaded into EU reactors and deliveries of fresh fuel under purchasing contracts

Year	Fuel loaded			Deliveries		
	LEU (tU)	Feed equivalent (tU)	Enrichment equivalent (tSWU)	Natural U (tU)	% spot	Enrichment (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	
1988		12,900		12,500	4.5	
1989		11,800		13,500	11.5	
1990		15,400		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	8,800
1995	3,040	18,700	10,400	16,100	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	10,100
1998	2,830	18,400	10,400	16,100	6	9,200
1999	2,860	19,400	10,800	14,800	8	9,700
2000	2,500	17,400	9,800	15,800	12	9,700
2001	2,800	20,300	11,100	13,900	4	9,100
2002	2,900	20,900	11,600	16,900	8	9,500
2003	2,800	20,700	11,500	16,400	18	11,000
Total	28,070	362,500	134,500	326,600		128,400

Annex 5: Supply Agency average prices for natural uranium

Year	Multiannual contracts EUR/kgU	Multiannual contracts USD/lbU_3O_8	Spot contracts EUR/kgU	Spot contracts USD/lbU_3O_8	Exchange rate USD/EUR
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[a]	7,23[a]	0,90
2002	34,00	12,37	25,50	9,27	0,95
2003	30,50	13,27	21,75	9,46	1,13

(a) 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 6: 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 by:

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

– contracts submitted to the ESA;

– end of the year questionnaires, completed if necessary by visits to the utilities.

Data requested on natural uranium deliveries during the year include the following elements:

ESA contract reference, quantity (kgU), delivery date, place of delivery, mining origin, Nat U 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.

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 also include the natural uranium equivalent contained in enriched uranium purchases.

Other categories of contracts are excluded[13]

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).

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 Eurostat.

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.

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

General remarks

ESA needs to visit regularly the utilities and to go over their contract portfolio, discussing the situation on each contract and how the utility intends to cover its requirements.

A good relationship has to be maintained with the utilities. It is essential that these contacts be maintained to provide a reliable view of the supply, demand and price situation.

Confidentiality and physical protection of 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.

Annex 7: Mandate of task forces

During its meeting of 25 March 2003, the ESA Advisory Committee accepted the proposal made by the Agency to create a joint working group to assess 'the impact of all steps of the fuel cycle from the security of supply perspective'. This proposal was in line with the recommendations made by the Advisory Committee in its paper adopted on 14 February 2002 entitled 'the Role of the Euratom Supply Agency and the Advisory Committee'.

The mandate of the task force 'security of supply' is to help the ESA to establish an action plan to deal with the selected recommendations and provide technical assistance in its implementation, in particular on the following areas:

– analysis of market data and review of the scenarios of supply and demand;
– identification and monitoring of market trends;
– assess the security of supply through the different stages of the fuel cycle, considering possible scenarios, and review the question of stocks of natural and enriched uranium as well as fabricated fuel.

The mandate of the task force 'price' is to consider the establishment of an agreed Euratom methodology for the calculation and publication of average prices for natural uranium and separative work.

Annex 8: Decision of the Director-General of the Euratom Supply Agency concerning the establishment of a branch of the Euratom Supply Agency in Luxembourg

The Director-General of the Euratom Supply Agency

Having regard to the Treaty establishing the European Atomic Energy Community (Euratom), in particular Chapter VI,

Having regard to the Statutes of the Agency, in particular Articles III and XI,

Acting in accordance with the powers conferred under Articles IX and XI of the Statutes,

Whereas:

- On 11 February 2003 the Commission adopted a communication on 'A long-term solution for the site of Luxembourg' (PV 1600). This communication designs an overall solution for the Commission services located in Luxembourg. As part of this solution, the services of the Energy and Transport DG in Luxembourg shall be reinforced by concentrating all activities related to the implementation of Chapters 3 to 10 of the Euratom Treaty in Luxembourg.
- The Euratom Supply Agency established by Article 52 of the Euratom Treaty has legal personality and enjoys financial autonomy. Under Article VIII of the Statutes of the Agency, it is under the supervision of the Commission. Since December 1999, it is administratively attached to the Directorate-General for Energy and Transport.
- Given the fact that the Agency interacts with the two Directorates dealing with nuclear energy issues in the Energy and Transport DG and in order to facilitate the day-to-day contacts, it appears necessary that the Agency be present at the same location as these two Directorates, i.e. in Luxembourg.

Article III of the Statutes of the Agency provides that:

- the seat of the Agency shall be established in the town in which the Commission has its seat;
- the Agency may, with the consent of the Commission, establish branches.
- The Advisory Committee of the Agency delivered its opinion at its Plenary meeting held in Brussels on 17 November, 2003.
- The Commission has given its consent to the establishment of a branch of the Agency in Luxembourg by Decision of 8 January 2004[14]

<u>Has decided as follows:</u>

As of 1 February 2004 the Euratom Supply Agency establishes a branch in Luxembourg.

Done at Brussels, 30 January 2004

For the Euratom Supply Agency

Christian Waeterloos

Director-General

(14) Adopted by written procedure No E/2714/2003 (30 December, 2003).

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