EURATOM SUPPLY AGENCY

ANNUAL REPORT

1998

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SUMMARY

This report for 1998 highlights the main developments in the nuclear fuels markets relating to the supply of nuclear fuel to the EU and the Supply Agency's activities in connection therewith. It also gives an overview of developments relating to the nuclear fuel cycle industry in the EU and of the production of electricity from nuclear power in the Member States during 1998.

Total world production of natural uranium in 1998 (33.600 tU) was slightly lower than in 1997 (35.800 tU). However, in spite of reduced world production of natural uranium, supply and demand have been balanced over the last few years.

As in previous years the gap between natural uranium production and consumption in the Western world was closed by secondary sources of supply: draw-down of inventories held by utilities, governments and nuclear fuel companies, re-enrichment of depleted uranium (tails) and, to a lesser extent, uranium and plutonium from reprocessing.

EU utilities continued to diversify their sources of supply. The number of new contracts or renewals of existing ones remained relatively high in the EU. The Supply Agency continued to recommend to EU users to maintain a portfolio of diversified long term contracts with primary producers.

The prospect of sales of uranium inventories remained one of the major issues affecting the nuclear fuels market during the year. The sale of the feed component of the downblended Russian highly enriched uranium (HEU), as provided for in an intergovernmental agreement between Russia and the USA did not materialise in 1998, but the negotiations appear close to finalisation. Uncertainties about sale intentions of the United States Enrichment Corporation (USEC) for large amounts of uranium, which had been transferred from the United States Department of Energy (US DOE) as part of the corporation's privatisation, contributed to a perception of potential market oversupply and to difficulties in the HEU feed negotiations.

The method and rate of disposal of these large inventories, particularly those accumulated for military purposes in the past, are important factors influencing the stability of the natural uranium, conversion and enrichment markets. In order to balance supply and demand, major producers attempted to redress the situation by cutting production and delaying projects for new mines.

The New Independent States (NIS) together were the largest source of supply of natural uranium to the EU, in a buyers' market characterised by a further decrease of spot prices.

The Supply Agency average price for deliveries of natural uranium during the reported year was slightly lower than in 1997.

Conversion, enrichment and fabrication services were regularly available, and capacity remains sufficient to meet demand. The utilisation of Mixed Oxide (MOX) continued in the EU. In France, four new reactors were authorized to use MOX fuel. The EU MOX fabrication industry provided fuel also for Japan and Switzerland.

The role that nuclear energy can play in the avoidance of CO_2 emissions was highlighted again in the 4^{th} Conference of the Parties on climatic change held in Buenos Aires in November 1998, following on from the Kyoto Conference of 1997. In the EU, the 34% share of nuclear energy of total electricity generation avoids the emission of some 700 million tonnes of CO_2 each year.

In May 1998, the Council of Ministers approved a mandate for the negotiation of a nuclear co-operation agreement with Japan. During 1998, discussions with Russian authorities continued on various aspects of nuclear co-operation, including trade. In December 1998, the European Commission proposed to the Council the negotiation with Ukraine of a global nuclear co-operation agreement.

ZUSAMMENFASSUNG

Dieser Bericht für 1998 hebt die wichtigsten Entwicklungen auf den Kernbrennstoffmärkten, soweit sie sich auf die Versorgung der Europäischen Union mit Kernbrennstoff beziehen, sowie die im Zusammenhang damit stehenden Aktivitäten der Versorgungsagentur hervor. Er gibt des weiteren einen Überblick über Entwicklungen in der Industrie des Kernbrennstoffkreislaufs in der EU und über die Elekrizitätserzeugung aus Kernenergie in den Mitgliedsstaaten im Jahre 1998.

Die Welt-Gesamtproduktion von Natururan im Jahre 1998 (33.600 T U) war etwas niedriger als im Jahre 1997 (35.800 T U). Trotz diesem Rückgang in der Natururanförderung weltweit waren Angebot und Nachfrage in den letzten Jahren ausgeglichen.

Wie in den Vorjahren wurde die Differenz zwischen Naururanförderung und Verbrauch in der westlichen Welt durch sekundäre Versorgungsquellen gedeckt : Rückführung der Lagerbestände bei den EVUs, den Unternehmen des Brennstoffkreislaufs und den Regierungen, Wiederanreicherung abgereicherten Materials (Tails) und, weniger bedeutsam, Uran und Plutonium aus der Wiederaufarbeitung.

Die Versorgungsunternehmen der EU sorgten weiterhin für eine Streuung ihrer Versorgungsquellen. Neue Verträge bzw. Verlängerungen bestehender Verträge blieben zahlenmässig auf relativ hohem Niveau. Die Versorgungsagentur hat den Verbrauchern in der EU weiterhin empfohlen, ihre Versorgungsstrategien auf diversifizierte langfristige Verträge mit Produzenten zu stützen.

Die Aussicht auf den Verkauf vorhandener Uranlagerbestände blieb einer der wichtigsten Faktoren, die den Kernbrennstoffmarkt über das Jahr hin beeinflusst haben. Der Verkauf der in dem aus russischem HEU gewonnenen LEU enthaltenen Natururankomponente entsprechend einem Regierungsabkommen zwischen Russland und den USA wurde zwar im Jahre 1998 nicht realisiert, doch scheinen die Verhandlungen einem Abschluss näher zu kommen. Ungewissheiten hinsichtlich der Verkaufsabsichten der United States Enrichment Corporation (USEC) für umfangreiche Uranbestände, die ihr im Rahmen der Privatisierung vom US Department of Energy (US-DOE) überlassen worden waren, trugen zu der Auffassung bei, dass auf dem Markt möglicherweise eine Überversorgung herrsche, und führten zu Schwierigkeiten bei den Verhandlungen über die HEU-Natururankomponente.

Die Art und Weise und das Tempo, mit dem diese grossen Bestände, insbesondere die in der Vergangenheit für militärische Zwecke angelegten Bestände auf den Markt gebracht werden, haben bedeutenden Einfluss auf die Stabilität der Märkte für Natururan, Konversion und Anreicherung . Um Angebot und Nachfrage auszugleichen, haben sich wichtige Produzenten darum bemüht, die Lage durch Produktionseinschränkungen und zeitliche Verschiebung neuer Bergbauprojekte in den Griff zu bekommen.

Die Neuen Unabhängigen Staaten (NUS) waren zusammengenommen für die EU die wichtigste Versorgungsquelle für Natururan auf einem Käufermarkt, der von einem weiteren Rückgang der Spot-Preise gekennzeichnet war.

Der von der Versorgungsagentur errechnete Durchschnittspreis für Natururan lag im Berichtsjahr geringfügig unter dem Preis für 1997.

Konversion, Anreicherung und Brennelementfabrikation waren regelmässig verfügbar ; die Kapazitäten bleiben ausreichend, um die Nachfrage zu decken. Der Einsatz von Mixed Oxide (MOX) in der EU ging weiter. In Frankreich wurde für vier weitere Kernkraftwerke die Genehmigung zum Einsatz von MOX-Brennelementen erteilt. Die MOX-Fabrikanten in der EU versorgten auch Japan und die Schweiz mit Brennelementen.

Die Rolle, die die Kernenergie bei der Vermeidung von CO2-Emissionen spielen kann, wurde bei der 4. Konferenz der Vertragsparteien des Rahmenübereinkommens über Klimaänderungen, die in der Nachfolge der Konferenz von Kioto von 1997 im November 1998 in Buenos Aires stattfand, erneut unterstrichen. In der EU wird dank des Anteils der Kernenergie an der Gesant-Elektrizitätserzeugnung in Höhe von 34% jedes Jahr der Ausstoss von 700 Millionen Tonnen CO2 vermieden.

Im Mai 1998 billigte der Ministerrat ein Mandat für Verhandlungen über ein nukleares Kooperationsabkommen mit Japan. Während des Jahres wurden die Gespräche mit den russischen Stellen über verschiedene Aspekte der nuklearen Zusammenarbeit, Handelsprobleme eingeschlossen, weitergeführt. Im Dezember 1998 schlug die Europäische Kommission dem Rat Verhandlungen mit der Ukraine über ein globales nukleares Kooperationsabkommen vor.

RESUME

Ce rapport pour 1998 souligne les principales évolutions des marchés des combustibles nucléaires en relation avec l'approvisionnement de l'Union européenne, ainsi que les activités de l'Agence d'approvisionnement en la matière. Il fournit aussi un panorama des développements relatifs à l'industrie du cycle du combustible nucléaire dans l'Union européenne ainsi que de la production d'électricité d'origine nucléaire dans les Etats membres.

En 1998, la production mondiale d'uranium naturel (33.600 tonnes d'U) a été légèrement inférieure à celle de 1997 (35.800 tonnes d'U). Cependant, et malgré cette réduction de la production mondiale d'uranium naturel, l'approvisionnement et la demande ont été équilibrés durant ces dernières années.

Comme lors des années précédentes, la différence entre production et consommation d'uranium naturel au sein du monde occidental a été comblée via des sources secondaires : réduction des stocks détenus par les électriciens, les industriels du combustible nucléaire et les gouvernements, réenrichissement d'uranium appauvri (rejets) et, dans une moindre mesure, retraitement d'uranium et de plutonium.

Les producteurs d'électricité de l'Union européenne ont continué de diversifier leurs sources d'approvisionnement. Le nombre de nouveaux contrats ou les renouvellements de contrats existants est resté relativement élevé au sein de l'Union européenne. L'Agence d'approvisionnement a continué de recommander aux utilisateurs européens un portefeuille diversifié de contrats à long terme avec des producteurs primaires.

La perspective de ventes de stocks d'uranium a constitué le point essentiel affectant le marché des combustibles nucléaires durant l'année. La vente de la composante d'alimentation de la dilution de l'uranium hautement enrichi (UHE) russe, tel que prévu dans un accord inter-gouvernemental entre la Russie et les USA ne s'est pas matérialisée en 1998, mais les négociations semblent être sur le point d'être finalisées. Les incertitudes quant aux intentions de vente par l'United States Enrichment Corporation (USEC) de fortes quantités d'uranium ayant fait l'objet de transfert du United States Department of Energy (US-DOE) en tant que part dans la privatisation de la compagnie, ont contribué au sentiment de possible pléthore du marché et aux difficultés lors de négociations sur la matière d'alimentation pour l'UHE.

La méthode, et le taux d'écoulement de ces stocks élevés, et spécialement les stocks accumulés pour des besoins militaires dans le passé, constituent un facteur important influençant les marchés de l'uranium naturel, de la conversion et de l'enrichissement. En vue d'équilibrer l'approvisionnement et la demande, ces principaux producteurs ont essayé de redresser la situation en coupant la production et en reportant les projets de nouvelles mines.

Les Etats nouvellement indépendants (ENI), dans leur ensemble, ont constitué la plus importante source d'uranium naturel pour l'Union européenne dans un marché caractérisé par une baisse supplémentaire des prix du marché ponctuel.

Le prix moyen de l'Agence pour les livraisons d'uranium naturel au cours de l'année de référence est resté légèrement plus bas qu'en 1997.

Les services de conversion, d'enrichissement et de fabrication ont été régulièrement disponibles et leur capacité reste suffisante pour répondre à la demande. L'utilisation des MOX s'est poursuivie dans l'Union européenne. En France, quatre nouveaux réacteurs ont reçu l'autorisation d'utiliser du combustible MOX.

L'industrie européenne de fabrication de MOX a, par ailleurs, fourni du combustible au Japon et à la Confédération helvétique.

Le rôle que l'énergie nucléaire peut jouer pour éviter les émissions de CO_2 a été de nouveau souligné lors de la 4ème Conférence sur les changements climatiques qui s'est tenue à Buenos Aires en novembre 1998 à la suite de la Conférence de Kyoto de 1997. Dans l'Union européenne, les 34% que représente le nucléaire dans la production d'électricité évite l'émission de quelque 700 millions de tonnes de CO2 par an.

En mai 1998, le Conseil des Ministres a approuvé les termes d'un mandat de négociation en vue d'un accord de coopération avec le Japon. Toujours en 1998, les discussions se sont poursuivies avec les autorités russes sur différents aspects de la coopération nucléaire, commerce compris. En décembre 1998, la Commission européenne a proposé au Conseil la négociation d'un accord de coopération nucléaire global avec l'Ukraine.

CHAPTER I

GENERAL DEVELOPMENTS

SUPPLY SITUATION

NATURAL URANIUM

Supply of natural uranium to the EU utilities continued in a regular manner. As in previous years the EU utilities continued to cover most of their natural uranium requirements through long term contracts with producers. Deliveries under 'Spot' contracts represented only 6% of the total supply. Russia and Niger were the largest suppliers.

Surprisingly, in what was generally perceived as a low activity market, the number of new contracts (or renewal of existing ones), as well as the quantities concerned, remained relatively high for the EU. 13 multiannual contracts for 8 200 tU were concluded by the Agency in 1998. In addition 2 600 tU were contracted under amendments to existing multiannual contracts. The utilities maintained their policy of long term relationships with primary producers and continued to diversify their sources of supply.

Although the spot market represents a relatively small proportion of the transactions of uranium world-wide, the spot prices continued to be the major indicators affecting the prices of the much larger long-term market. The spot prices published in the trade press for "non-NIS" production dropped from some US$12/lbU308 (uranium ore concentrates) to US$ 9 during the year. The spot price for "NIS" material dropped from about US$ 9.5 to US$ 8.5. As the gap between these prices diminished, it became less significant commercially.

Total world production of natural uranium was approximately 33 600 tU in 1998, compared with 35 800 tU in 1997. This reduction was essentially attributable to a decrease in Western World production to 27 000 tU, from 29 000 tU in 1997, while production in the rest of the world (China, NIS, Central and Eastern Europe) remained in the order of 6 600 tU. EU production decreased further from 1050 tU in 1997 to 800 tU in 1998; this trend will continue, as ENUSA announced the closure of its mine in Spain within the next two years, and uranium mining in France is expected to be terminated in the near to medium future.

A number of producers of natural uranium including Cameco, Cogéma, Energy Resources of Australia, Rio Tinto and several US producers announced in 1998 cutbacks in actual and planned production due to weak market conditions (low price and reduced demand). However, Western Mining (Australia) is reportedly about to complete the expansion of the Olympic Dam mine, which will increase significantly Australia's uranium and copper production from 2000 onwards. Following the resolution of environmental questions, ERA intends to continue construction and environmental work at the Jabiluka mine.

In spite of the continued large gap between world consumption and production, there has been no shortage of natural uranium, indeed the competition amongst sellers and the downward pressure on prices during the year indicated the reverse. Studies by the Supply Agency and the Uranium Institute[1] indicate that, in spite of reduced world production of natural uranium, supply and demand have been balanced over the last few years by the large exports from the New Independent States (NIS) countries (see below) and a limited use of inventories by the utilities.

Just before the privatisation of United States Enrichment Corporation (USEC), the United

[1] The Uranium Institute Market Report "The Global Nuclear Fuel Market – Supply and Demand 1998-2020".

States Department of Energy, (US DOE) announced the transfer of 25 000 to 35 000 tU as natural uranium to the new company, which it indicated would be sold on the market before 2005, with sales starting by the year 2000. This represents a large and unexpected new source of material, which risks jeopardising market stability and the high enriched uranium (HEU) feed negotiations between Russia and the western companies.

The announcement was firmly criticised by Russia, the US Senate and by market observers. Because of the potential adverse effects on the EU's long term security of supply, the Commission and the Supply Agency also made strong representations to the US authorities. The Commission requested the US to use its efforts to avoid any action which could endanger market stability and the viability of the HEU deal between Russia and the USA and the related feed negotiations in particular. The Agency will monitor closely the effects of sales of USEC's or any other large inventories for any potential adverse effects on stability or long term security of supply to the EU market. If the introduction of such inventories on the EU market were to take place to the detriment of the EU's security of supply, the Agency would take appropriate corrective measures. The basis for such an intervention was clearly confirmed by the Court of First Instance in the KLE case (see page 12)

With regard to its own stockpile, the US DOE agreed not to make any sales for 10 years. In addition the US was prepared to provide $ 325 million for US DOE to purchase the 1997 and 1998 feed deliveries under the HEU deal on condition that Russia would enter into a contract with western companies for the acquisition of the post 1998 feed deliveries.

The Agency views with some concern that a large proportion of the market will be supplied over the coming years from secondary sources, mostly from reduction of military stockpiles. Although this reduction is welcome from a disarmament point of view, care will be needed in placing this material on world markets so as to avoid jeopardising future primary production in the long-term. In the Agency's view, there is a danger that if large supplies from stocks are allowed to flow on to the market too quickly and without relation to demand, prices are likely to be forced down to an extent which makes the continuation of some existing mines and the opening of new deposits uneconomic.

It is evident that should supplies from secondary sources suddenly be reduced or stopped for political or other reasons, supply disruptions might occur. The Agency continues to recommend to EU users to maintain a portfolio of diversified, long term contracts on mutually equitable terms with primary producers. The Agency further recommends that utilities' inventories, in particular those of natural uranium, should also be considered in terms of long term security of supply and not be driven by short term perceptions of a plentiful market, since other inventories may not be readily available in times of shortage. Generally users share these views.

CONVERSION, ENRICHMENT AND FABRICATION

Conversion capacity continued to cover adequately the EU requirements.

The downward pressure on prices resulting from sales of natural uranium inventories which included conversion, as foreseen in last year's report, became evident in 1998 . The conversion spot price as published by the trade press decreased from over US$ 5/kgU to US$ 3.5/kgU during the year. Long term prices fell also but to a lesser extent.

Enrichment and fabrication facilities in the EU provided adequate coverage for users' needs. The market remained relatively stable, and world-wide capacity is more than sufficient to meet current requirements. Current over

capacity was used to re-enrich depleted uranium ("tails") in Russia.

In contrast to the market for natural uranium, the enrichment market is supplied by a very small number of producers world-wide, and the number of spot transactions is relatively low. Most deliveries take place under long term contracts, and enrichers have adjusted their production to take into account the disposition of inventories. Although the prices for multiannual contracts have dropped since the early nineties, the changes have been much smaller than those observed in natural uranium contracts in relative terms.

REPROCESSING AND USE OF MIXED-OXIDE FUELS

Reprocessing of spent fuel in France and the United Kingdom and subsequent use of reprocessed uranium and plutonium (Pu) in mixed-oxide (MOX) fuels continued normally. The construction of BNFL's Sellafield MOX Fuel Plant (SMP) was completed. The plant which has a nominal capacity of 120 t of MOX fuel per year is ready to be commissioned as soon as governmental authorization is granted.

Four new 900 MW reactors were licensed to use MOX in France bringing the total of MOX licensed reactors in that country up to 20.

Utilization of MOX may contribute to reduce significantly the EU's plutonium inventories. It is estimated that the use of a single MOX fuel element consumes 9 kg Pu and avoids the production of 5 kg Pu. Thus each MOX assembly used reduces the inventory of Pu by 14 kg.

As part of its nuclear policy, the new German government announced the intention to end the reprocessing of spent fuel from German reactors, which would require the utilities concerned to terminate their contracts with Cogema in France and BNFL in the United Kingdom ([1]).

MOX FABRICATED FROM MILITARY PLUTONIUM

The use of MOX may contribute towards reducing significantly Russian and US stocks of weapons grade plutonium, thus aiding the disarmament process and in addition generating electricity through an efficient use of such fuel in civil nuclear plants.

The United States and Russia continued to discuss a means to reduce and dispose of military Pu in a parallel fashion, following an agreement between the US and Russian Presidents.

In order to dispose of the US excess weapons grade Pu, the US DOE issued a request for proposals from the private sector for MOX fuel fabrication and reactor irradiation services, on the assumption that the required fabrication facility in the US would be licensed by the Nuclear Regulatory Commission. At the year-end the team including Cogéma Inc with the contribution of Belgonucléaire and EDF was the only one left in the process.

Franco-German-Russian co-operation continued on a parallel project which aims to build a MOX fabrication plant in Russia (DEMOX). The project has the support of the G8 governments. It foresees the transformation of 2 t Pu per year for utilisation in 7 Russian VVER-1000 reactors and in the fast neutron reactor BN-600.

[1] At the time of finalising this report (March 1999) there was no consensus on the matter and a final decision was postponed.

SUPPLY OF MATERIAL FROM THE NEW INDEPENDENT STATES (NIS)

The NIS countries remained the largest source of supply of natural uranium to the EU. During the year, EU utilities took delivery of 4 300 tU under purchasing contracts (as natural uranium or feed contained in enriched uranium product (EUP). A further 1 000 tU were delivered as a result of exchanges. The total acquisitions of natural uranium from the NIS were therefore some 5 300 tU representing about 34 % of the total deliveries to the EU utilities under purchasing contracts in 1998 (32 % in 1997) or 29 % of the total amount of fuel loaded in EU reactors during the year. Of this amount acquisitions from Russia were 3 700 tU under purchasing contracts and 700 tU under exchange contracts resulting in a total of 4 400 tU representing 28% of the total deliveries to the EU utilities under purchasing contracts in 1998 or 24% of the total amount of fuel loaded in EU reactors during the year.

There were 6 new supply contracts concluded by the Supply Agency for NIS uranium during the year, for 1 500 tU. This figure was lower than in previous years. It appears that, as the price gap between NIS and other sources closed, the users felt more encouraged to diversify their sources of supply.

Re-enrichment of western origin tails in Russia for EU companies was established as a further source of feed material, it provides a supply in the order of 1 000 to 2 000 tU (natural uranium equivalent) per year. Part of this material is sold to EU utilities and the remainder exported.

The Agency's Advisory Committee recommended that such re-enriched material should be assimilated to Russian natural uranium, if sold as imported, but that no limitation be imposed if it is further enriched in the EU. In its supply policy the Agency is following this recommendation. The impact of the sales of re-enriched tails is being monitored, and the policy could be revised if a need arises.

PHYSICAL IMPORTS OF NIS ORIGIN MATERIAL

Physical imports from the NIS of natural uranium or feed contained in enriched uranium product (EUP) amounted to some 11 600 tU in 1998. However, deliveries to EU end users were only 5 300 tU during the year, as mentioned above.

For the period 1992-98 imports of natural uranium or feed contained in the EUP from the NIS amounted to a cumulative total of 87 300 tU. This figure compares with 32 200 tU of NIS origin delivered to EU end users during the same period (see table 1).

Table 1 - Physical imports by EU operators of NIS natural uranium or feed contained in EUP (in tU)

YEAR	Total Imports	Deliveries (1) To EU utilities	% Supply (2)
1992	9500	2700	23
1993	12100	2700	22
1994	12200	4500	32
1995	12100	5200	32
1996	17600	6800	43
1997	12200	5000	32
1998	11600	5300	34
Total	87300	32200	32

Notes : (1) Including exchanges

(2) Percentage of NIS deliveries relative to total deliveries to EU utilities under purchasing contracts during the respective year.

The Supply Agency has been conducting studies to analyse the above figures by source and commercial destination. These studies reveal that the greater part of NIS natural uranium was imported by intermediaries (about 80%), while imports of enriched uranium and the feed contained was spread amongst utilities, intermediaries and fabricators. So far it has been possible to establish the use or destination of about 80% of imports. Preliminary results indicate that most of the gap between imports

and EU consumption is explained, first, by identified exports, secondly, by storage pending fulfillment of contracts with EU utilities and, thirdly, by market operators' inventories awaiting sale. The study is still to be completed.

As a result of the imports referred to above, it has been observed that the total inventories of natural uranium in the EU have increased significantly in spite of the utilities' reduction of their own stocks.

It should be noted that the studies and analysis of NIS imports mentioned here relate strictly to the commercial use and destination of such material. All such imports are subject to Euratom and IAEA safeguards while on the territory of the Member States.

SUPPLIES DERIVED FROM DISARMAMENT OF NUCLEAR WEAPONS

Deliveries of low enriched uranium (LEU) derived from the former military Russian HEU continued to be made to USEC. However, in 1998, they were below the scheduled amount of 723 t LEU (from blending 24 t HEU); in fact, only 454 t LEU (from blending 14.5 t HEU) were reported to have been delivered. In 1999 and thereafter the annual scheduled deliveries are of the order of 900 t LEU (from blending 30 t HEU).

Negotiations between the Russians and a consortium of three western companies (Cameco, Cogéma and Nukem) concerning the disposal of most of the feed of the downblended HEU continued throughout the year. It appears that these negotiations were particularly difficult due to the weak market conditions and reported disagreements on price and required guarantees. Progress was reported to have been made following intervention by the US government which, amongst other initiatives, was prepared to allocate the necessary funds to acquire the feed accumulated at USEC during the years 1997 and 1998 and to accept a 10 year moratorium on sales of that material. By the year-end a final agreement between the Russians and the consortium appeared to be in sight.

The feed of the downblended 30t of HEU which is scheduled to be delivered annually from 1999 onwards represents a supply equivalent to some 9000 tU of natural uranium per year until 2013. The Agency continued to follow the matter with great interest in view of its impact on the market. The material is considered to be of Russian origin and subject to restrictions in the US. The policy on its sale within the EU has yet to be decided.

MOX derived from excess military Pu in the US and Russia may become a new source of nuclear fuel in these countries around 2005 (see page 9); however it is not expected that significant amounts of MOX from military Pu from these two sources will be used in the EU in the foreseeable future.

US SUSPENSION AGREEMENTS

In 1998 complaints were made by US producers that a series of sales and purchases by a Japanese company represented a prohibited circumvention of the US anti-dumping Suspension Agreements. It was reported that over 700 tonnes of Australian origin natural uranium were sold on the US market, while at the same time the Japanese company purchased almost identical amounts of Russian material. As it seems that the Australian origin material was ultimately delivered to US end-users, it was claimed that the transactions had amounted to an indirect import of Russian material into the US.

Without commenting on this pending case, the Agency would recommend EU companies involved in nuclear trade to be cautious when complex series of sales, purchases and exchanges are proposed. The Agency has noticed that more and more operators are including in their contracts an "anti-circumvention clause", which states that the material has not been acquired via operations

involving materials subject to a Suspension Agreement and, in some cases, it is also stated that the material is not intended for any such operation. Conversely, if the material has been obtained through an exchange or another indirect operation involving material subject to a Suspension Agreement, the anti-circumvention clause takes note of that circumstance, and this effectively prevents subsequent owners of the material from importing it for final use in the US.

In view of the continuing difficulties concerning exports to the US, the government of Kazakhstan notified on 10 November its intent to terminate its suspension agreement with the US. As a result, provisional anti- dumping duties of 115.82 % are again applicable on imports of Kazakhstan material in the US from 11 January 1999.

LEGAL DEVELOPMENTS

Oral arguments were heard by the Court of Justice in the KLE case[1] on 25 September 1998. The Advocate General issued his opinion on 19 November 1998. He made an in depth analysis of the applicable supply provisions and of the arguments raised by KLE. He concluded that the right to refuse the conclusion of supply contracts could legally be used to ensure a proper diversification of supply sources. The final Judgement is expected in 1999.

Sweden's Supreme Administrative Court announced in December a delay in issuing its final ruling on the closure of Sydkraft's Barsebäck-1 plant.

[1] See for a summary of the Judgement of the Court of First Instance, Annual Report 1997, p. 11-13.

OTHER DEVELOPMENTS

RESEARCH REACTOR FUEL CYCLE

Until 1991, HEU for research reactors in the EU was supplied almost exclusively by the US-DOE, but the amendment to the Energy Policy Act in 1992 made it practically impossible to obtain further HEU material from the US. For this reason, some of the research reactors in the EU which still require this material entered into negotiations with Russia to obtain supplies. Following the earlier conclusion of agreements at government level the first shipment of HEU from Russia to France took place at the end of 1998.

For the back end of the fuel cycle, most operators opted for returning their spent fuel to the US-DOE according to the Department's policy on acceptance of spent fuel from foreign research reactors containing uranium enriched in the US. Cogéma continued to offer to reprocess HEU fuels by diluting them with commercial LEU fuels at its plant in La Hague. One operator confirmed its decision for direct disposal.

The policy which permits the return of spent fuel to the US-DOE expires in 2006 and is not expected to be renewed. Due to the long lead times required to implement solutions for the disposal of spent fuel, particularly for those countries that do not have commercial nuclear power programmes, it is becoming urgent in some cases to decide on alternative courses of action.

MERGERS AND PRIVATIZATIONS

In the uranium mining industry, Cameco (Canada) acquired Uranerz (Germany), strengthening its competitive position.

The association between BNFL and Siemens, announced last year, has yet to materialise. However, in 1998, in partnership with the US engineering and construction group, Morrison

Knudsen, BNFL acquired the nuclear business of Westinghouse.

The privatisation of USEC was completed during the year through a public offering.

ENLARGEMENT OF THE EU COMMUNITY

The Supply Agency participated in discussions with applicant countries for EU Membership on matters relating to the nuclear fuel cycle.

CLIMATE CHANGE

The awareness of global warming, highlighted in 1997 by the Kyoto conference and by the natural disasters of 1998 attributed to *el niño,* again called attention to the role which nuclear energy can play in the avoidance of greenhouse gas emissions. CO_2 is one of the greenhouse gases which are considered to be the main contributors to global warming. In the EU, the 34% share of nuclear energy of total electricity generation ([1]) avoids the emission of some 700 million tonnes of CO_2 each year([2]) (2.3 billion tonnes of CO_2 worldwide, or 10% of current total CO_2 emissions) ([3]).

The process started in Kyoto was further advanced at the 4th Conference of the Parties on climate change which took place in Buenos Aires in November 1998. During this conference an action plan was adopted concerning technology transfers and "flexibility mechanisms" (tradable emission rights). The nuclear industry had a large representation at this Conference.

1 In 1998 the electricity generated in nuclear power stations in the EU amounted to 800 TWh representing 34% of the total electricity produced which amounted to 2339 TWh (source Eurostat).

2 Source : Illustrative Nuclear Programme (PINC) COM(97)401Final.

3 Source : FORATOM.

CHAPTER II

SUPPLY OF NUCLEAR MATERIALS AND ENRICHMENT SERVICES IN THE EUROPEAN UNION

REACTOR NEEDS/NET REQUIREMENTS

During 1998, 2,800 tU of fresh fuel were loaded in EU reactors containing the equivalent of 18 400 t natural uranium and 10 400 t Separative Work (SW), most tails assays were in the range of 0.25 – 0.35 %.

Future EU reactor needs and net requirements for uranium and separative work, based on data supplied by EU utilities, rounded to the nearest 100 t, are estimated as shown in Table 2.

Table 2 - Reactor needs and net requirements for uranium and separative work

A) From 1999 until 2008

Year	Natural Uranium (tU)		Separative Work (tSW)	
	Reactor needs	Net require-ments	Reactor needs	Net require-ments
1999	21300	18100	12000	11100
2000	21200	18300	11700	10900
2001	21500	18400	12000	11200
2002	21800	19000	12200	11200
2003	21300	19000	11900	10900
2004	22100	20000	12400	11600
2005	21600	19500	12200	11300
2006	21700	20000	12200	11300
2007	21600	19800	12400	11400
2008	21600	19800	12300	11300
TOTAL	215700	191900	121300	112200
Average	21600	19200	12100	11200

B) Extended forecast from 2009 until 2018

Year	Natural Uranium (tU)		Separative Work (tSW)	
	Reactor needs	Net requi-rements	Reactor needs	Net requi-rements
2009	20900	19300	12100	11300
2010	20900	19400	12200	11400
2011	20700	19400	12200	11600
2012	20200	18900	11900	11300
2013	20000	18700	12000	11400
2014	19800	18500	11900	11300
2015	19200	17900	11600	11000
2016	19200	17800	11500	10900
2017	19400	18100	11600	11000
2018	19000	17700	11400	10800
TOTAL	199300	185700	118400	112000
Average 1999-2018	20300	18900	12000	11200

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.

Average reactor needs for natural uranium over the next 10 years will be 21 600 tU/year, while average net requirements will be about 19 200 tU/year. Relative to 1997 the reactor requirements remain stable but the net requirements decrease slightly.

Average reactor needs for enrichment over the next 10 years will be 12 100 tSW/year, while average net requirements will be in the order of 11 200 tSW/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 Agency's procedures during 1998 is shown in Table 3.

Transactions involving natural uranium totalled about 17 100 tU, some 8 800 tU of which were the subject of new purchase contracts by EU utilities (spot and multiannual), in addition 2 600 tU were contracted under amendments to existing contracts. Some 7 800 tU transacted related to purchases by producers or intermediaries, as well as exchanges, loans, etc. In comparison with the figures reported for 1997, the total amounts contracted have decreased by 18 %.

Table 3 - Natural uranium contracts concluded by or notified to the Supply Agency

Contract Type	Number	Quantity (tU) *(1)*
Purchase (by a EU utility/user)		
– multiannual *(2)*	13	8155
- spot *(2)*	9	682
Sale (by a EU utility/user)		
– multiannual	2	--
– spot	3	89
Purchase-sale (between two EU utilities/users)		
- multiannual	0	0
- spot	1	--
Purchase-sale (intermediaries)*(3)*		
– multiannual	4	1601
- spot	14	2188
Exchanges *(4)*	41	3988
Loans	0	0
TOTAL	87	17088
Including contracts of less than 10t	13	48
CONTRACT AMENDMENTS *(5)*	5	2600

Notes

(1) 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.

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

(3) Purchases/sales contracts between intermediaries - both buyer and seller are not EU utilities/end users.

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

(5) Concerning purchasing contracts only. The quantity represents the net increase (or decrease).

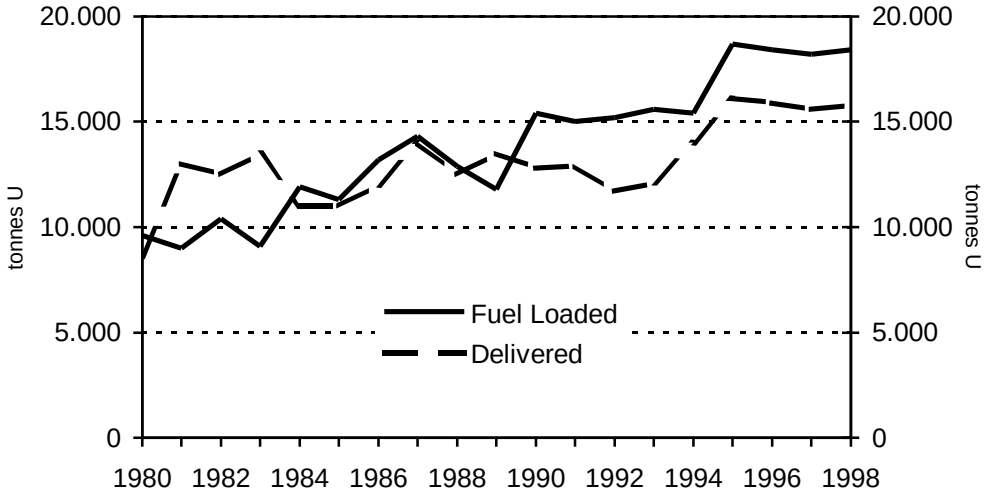
VOLUME OF DELIVERIES

During 1998, natural uranium deliveries under existing purchasing contracts amounted to approximately 15 800 tU compared with 15 600 tU in 1997([1]). Deliveries under spot contracts represented about 6 % of the total (12 % in 1997).

The deliveries taken into account are those made under purchasing contracts to the EU electricity utilities or their procurement organisations; they include also the natural uranium equivalent contained in enriched uranium purchases. Deliveries under purchasing contracts and fuel loaded into reactors by EU utilities since 1980 are shown in Graph 1. The corresponding table is in Annex 1. The difference between deliveries and the amount of fuel loaded can be explained by the use of reprocessed uranium, MOX and drawdown of inventories.

1 Due to late reporting by two utilities, the total deliveries of NIS under purchasing contracts in 1997 needed to be corrected to 15 600 tU (instead of 15 100 tU).

Graph 1 - Natural uranium feed contained in fuel loaded into EU reactors and natural uranium delivered to utilities under purchasing contracts (in tU)



AVERAGE PRICES OF MULTIANNUAL CONTRACTS

Prices for deliveries under multiannual contracts were expressed in 5 different currencies. To calculate the average price, the original contract prices were converted into ECU[1] and then weighted by quantity. For the conversion into ECU the Agency uses the average annual exchange rate of the respective currency as published by Eurostat. A very small number of contracts where it was not possible to establish reliably the price of the natural uranium component (e.g. in some cases of enriched uranium deliveries priced per kg of EUP) were excluded from the price calculation.

The average price for 1998 rounded to the nearest ¼ ECU was as follows:

ECU 34.00/kgU contained in U_3O_8
(ECU 34.75 in 1997)

AVERAGE PRICES OF SPOT CONTRACTS

The 1998 average price of material delivered under spot contracts, calculated according to the same principles, was as follows:

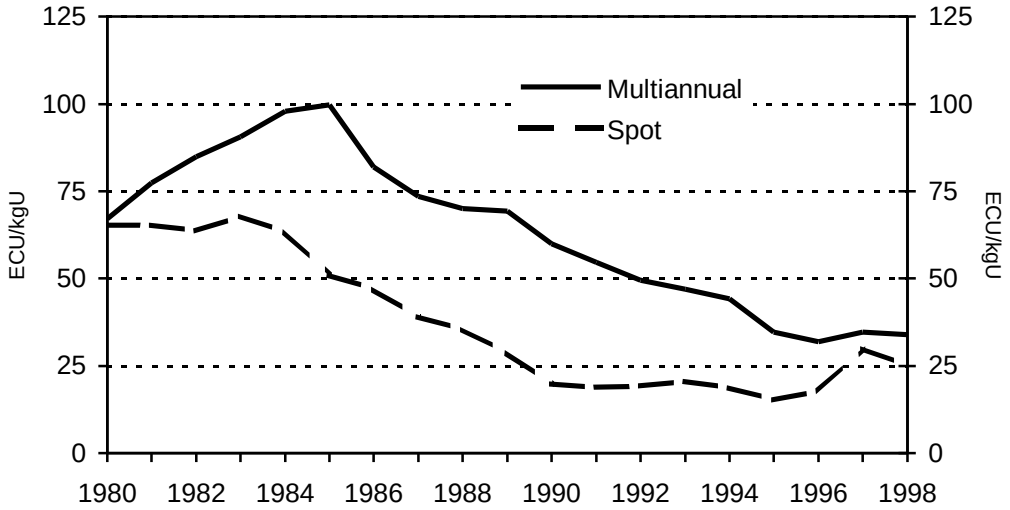
ECU 25.00/kgU contained in U_3O_8
(ECU 30.00 in 1997)

COMPARISON OF PRICES

Graph 2 shows prices for deliveries under multiannual as well as spot contracts since 1980, expressed in ECU. For ease of reference, historical data on prices published in previous Annual Reports and variations in exchange rates are presented in Annex 2.

[1] The Ecu was replaced by the euro on 1 January 1999 with a conversion rate of 1:1. However, historical references (pre-1999) to the ECU continue to be labelled as ECU.

Graph 2 - Average price for natural uranium delivered under spot and multiannual contracts (ECU/kgU)



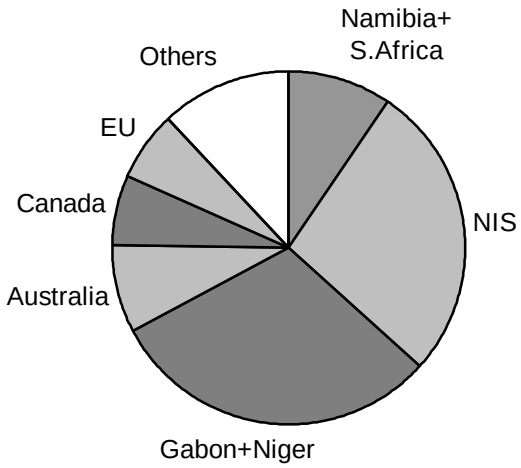
ORIGINS

EU utilities or their procurement organisations obtained in 1998 approximately 94 % of their supplies from 11 countries outside the EU (graph 3). The largest suppliers were Niger([1]) and Russia, which represented each some 25 % of external supply under purchasing contracts (24 % of total supply under purchasing contracts).

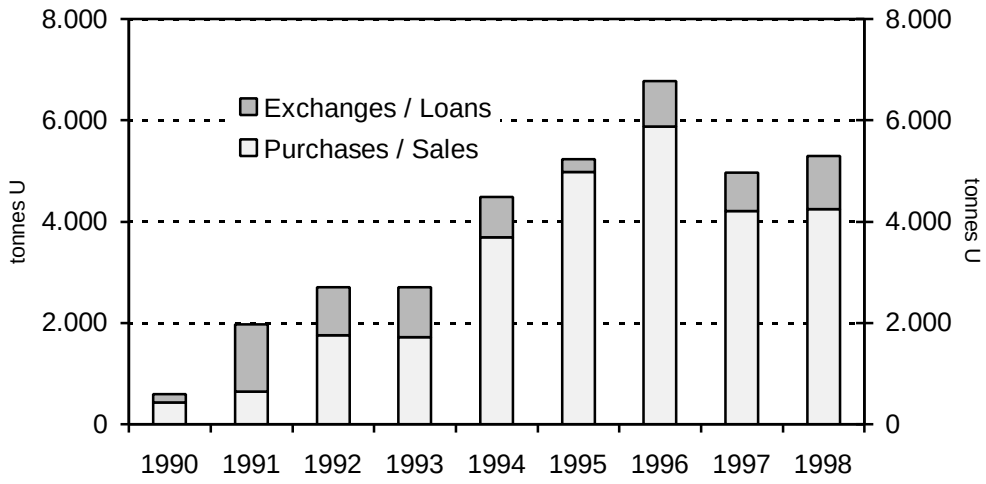
Acquisitions of NIS origin natural uranium by EU utilities since 1990 are shown in Graph 4, which is provided for reference purposes and brings together information already published in previous Annual Reports.

1 Partly due to stockpile usage.

Graph 3 Origin of the natural uranium delivered to EU utilities under purchasing contracts



Graph 4 Acquisitions of NIS origin natural uranium by EU utilities (in tU)



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 1998 in accordance with the Agency's procedures is shown in Table 4.

DELIVERIES OF LOW ENRICHED URANIUM (LEU)

In 1998, supply of enrichment services to EU utilities totalled approximately 9 200 tSW, delivered in 2500 tLEU which contained the equivalent of some 15 800 t of natural uranium feed. Some 75 % of this separative work was provided by EU companies (Eurodif and Urenco). Deliveries of separative work under spot contracts were in the order of 2%.

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, HEU supply is very important to the scientific community.

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 (see also Chapter I). The Supply Agency continued to provide support to reactor operators in the procurement of fuels.

PLUTONIUM (Pu)

In 1998, transactions involving Pu were again mainly related to its use for MOX fuel fabrication, and the Agency concluded 29 such contracts.

Table 4 - Special fissile material contracts concluded by or notified to the Supply Agency

Contract Type *(1)*	Number
I. Special Fissile Materials	
Purchase (by a EU utility/user)	
- multiannual	7
- spot	16
Sale (by a EU utility/user)	
- multiannual	3
- spot	12
Purchase-sale (between two EU utilities/users)	
- multiannual	0
- spot	7
Purchase-sale (intermediaries)	
- multiannual	9
- spot	19
Exchanges (swaps)	6
Loans	19
TOTAL, including *(2)*	98
- Low enriched uranium	59
- High enriched uranium	11
- Plutonium	29
CONTRACT AMENDMENTS	10
II. Enrichment Contracts *(3)*	13
- multiannual	13
- spot	0
CONTRACT AMENDMENTS	19

Notes:

(1) See explanations under Table 3, as appropriate.

(2) Some contracts may involve both LEU and plutonium or HEU and plutonium.

(3) Contracts with primary enrichers only.

COMMISSION AUTHORISATIONS FOR EXPORT

Under the provisions of Article 59(b) of the Euratom Treaty (and Article 62.1(c) in the case of special fissile materials), the authorisation of the Commission is required for the export of nuclear materials produced in the Community. Requests for these authorisations are submitted to the Commission by the Supply Agency.

During 1998, three authorisations were granted by the Commission for the exports of 196 tLEU (with enrichments below 5%). Two additional authorisations were granted for the export of Plutonium.

CHAPTER III

NUCLEAR ENERGY DEVELOPMENTS IN THE EUROPEAN UNION MEMBER STATES

BELGIQUE/BELGIË – BELGIUM

ENERGY POLICY

The implementation of the law of 15 April 1994 concerning the protection of the population and the environment against the dangers of ionizing radiation and the creation of a Federal Agency for Nuclear Control has made some progress. A second series of articles has entered into force and the Director General of the Federal Agency for Nuclear Control has been nominated. The transfer of the personnel of the several ministerial departments and scientific institutions with activities in the nuclear field, who have the appropriate skills, is in preparation.

The Minister in charge of energy matters has decided to create a committee of experts assembled from the different universities and specialized scientific organisations of the country. This committee, after consultation with the national and international actors in the nuclear sector (the electricity producers, the nuclear industry, the organisations charged with nuclear studies and radioactive waste, the research institutes, …) will issue within 18 months a report, the purpose of which is to prepare the future choices with respect to the production of electricity.

NUCLEAR ELECTRICITY GENERATION

In 1998 Belgium's nuclear power stations (including the French share of Tihange 1) generated about 43.9 TWh. This is 2.7% less than in 1997. It represents 55.2% of the country's total electricity production in 1998. The slight drop in production is due to the fact that all units were shut down in 1998 for revision and fuel replacement, while Tihange 1 and 3 had no fuel replacement in 1997, and that the shut down of Tihange 3 was extended to about two and a half months for the replacement of the steam generators. The performance of the Belgian nuclear power plants remained excellent during 1998, with an average availability factor of 88%.

FUEL CYCLE DEVELOPMENTS

Belgium produced 14.6 tonnes of natural uranium in 1998, derived from imported phosphates.

The production of MOX fuel by Belgonucleaire in its Dessel plant amounted to 38 tonnes in 1998, to be used in Belgian, German, Japanese and Swiss power plants.

In line with the recommendations of the resolution of Parliament, adopted on 22 December 1993, concerning the use of MOX fuel in Belgium's nuclear power plants and the suitability of reprocessing spent fuel, a report has been drafted by the competent administrations, which contains a synthesis and an evaluation of the work which has been realised by the firms and institutions involved. As several works are still in progress, the report concluded that no definite choice in favour of one or the other option was necessary in the near future and that nothing could justify eliminating one of them. The Government has asked the competent administrations to draft a more complete report towards the end of 1999, taking into account the results of the work realised until then. The Government decided that the two options have to be kept open and that Synatom had to terminate the contract it

concluded in 1991 with Cogéma, the performance of which has been suspended since December 1993.

Other important events can be mentioned:

- the execution of the reprocessing contract concluded in 1978 between Synatom and Cogéma. Spent fuel assemblies have been transported to La Hague;

- 16 MOX fuel elements were loaded in 1998 in units Doel 3 and Tihange 2, which brings the cumulative total to 72;

- work has progressed on the reference concept of the conditioned spent fuel and on the conceptual design of a spent fuel conditioning plant;

- general R&D-work on the geological disposal of conditioned spent fuel and high-level, medium-level and long-lived waste, carried out mainly by the Nuclear Research Centre at Mol, coordinated and managed by Niras/Ondraf and financed by the waste producers via Niras/Ondraf, apart from the co-financing by the European Commission, continued in several directions. In particular, the construction of the second access shaft for the extension of the underground research laboratory intended for the Praclay demonstration programme has advanced well. The drafting of the report SAFIR 2, giving an overview of the results presently obtained and indicating future orientations for R&D, has advanced well too;

- during the year 1998, 120 spent fuel elements were placed in 5 dry storage containers in the interim storage building at Doel. This brings the total to 416 fuel elements placed in 16 containers. At Tihange 294 spent fuel elements were placed in the wet storage building, which brings the total to 371.

At the beginning of the year the Government took the following decision with regard to long term management of low-level and short-lived waste, on the basis of a report presented by Niras/Ondraf in 1997:

- a solution which is flexible, reversible and which can progressively become permanent has to be worked out;

- a technical and economic choice will have to be made as soon as possible between near surface disposal and geological disposal;

- in order to enable a choice to be made, Ondraf/Niras has been charged with the execution of a programme consisting of land reconnaissance on the 4 existing nuclear zones in Belgium and the zones of municipalities having shown an interest, the further elaboration of the near surface and geological disposal concepts and the development of local co-management structures in order to integrate the projects at the local level.

Niras/Ondraf has effectively started the execution of an action programme, which is expected to last about three years and the aim of which is to present integrated preliminary near surface or geological disposal concepts for each zone.

RESEARCH REACTORS

The BR2-research reactor at the Nuclear Research Centre of Mol operated as scheduled during 105 days- equivalent full power. The main scientific programmes are related to the testing of fuel behavior, reactor pressure vessel steel embrittlement and irradiation assisted stress corrosion cracking. The scientific programme is combined with the commercial production of radioisotopes and nuclear silicon doping.

Two transportations of spent BR2 fuel elements to La Hague have taken place in the framework of the reprocessing contract concluded with Cogéma in 1997.

DANMARK - DENMARK

RADIOACTIVE WASTE

Denmark has no nuclear power plants and the amount of radioactive waste is therefore small. At Risø National Laboratory there are two reactors in operation: a research reactor, DR3, and a small homogeneous reactor, DR1, used for education. DR3 is operated at 10 MW and used for basic research, silicon doping and isotope production. Spent fuel is sent by ship to the United States according to the US policy for research reactor fuel of US origin. There are no plans for disposal of high level waste in Denmark.

Low-Level Waste (LLW) and Intermediate-Level-Waste (ILW) are collected, treated and stored in two intermediate storage facilities on the site of Risø. A storage facility for LLW receives about 100-120 200L-drums per year. Two-thirds of the amount is produced by Risø National Laboratory, the rest comes from hospitals, industry, laboratories and other users of radioactive isotopes in Denmark. At the moment about 4 500 drums are stored in this facility, which has a total capacity of 5 000 drums. A storage facility for ILW receives about 0-5 drums per year. The amount is decreasing after the hot cell facility was closed in 1994. At the moment about 130 m3 of long-lived LLW is stored in this facility.

Solid LLW is compacted in drums and liquid LLW is treated in an evaporator and a bituminization plant. The waste, embedded in bitumen, is then stored in drums. The ILW is not treated but stored in stainless steel containers or drums.

At the moment Denmark has no plans for construction of a repository for final disposal of LLW and ILW.

DEUTSCHLAND - GERMANY

In 1998, Germany's nuclear power plants generated about 161 TWh of electricity, 5.1% less than in the record year of 1997. Nuclear power's share in the public electricity supply amounted to almost 33%.

The decline has been caused by stoppages of longer duration for some reactors (e.g. Krümmel and Unterweser) whose production losses could not be compensated for by the others , despite their very good availability.

Of Germany's 20 commercial nuclear power plants, 19 were connected to the grid, as in the previous year. The Mühlheim-Kärlich nuclear power plant continued to be out of operation for legal reasons. In January 1998 the Federal Administrative Court confirmed the revocation of the first partial permit, because in the Court's opinion this permit had been granted without adequate examination of the site's seismic suitability. The operator RWE Energie AG has in the meantime submitted to the authorities of the Land Rheinland-Pfalz a request for a new first partial permit.

After the federal elections of 27 September 1998, the new Federal Government announced steps aimed at the termination of nuclear energy use in Germany. It is intended to arrange the phase-out of the use of nuclear energy and the resolution of waste disposal questions through discussions with the utilities, if possible on a consensus basis and without indemnification. The Federal Government wants to realize important objectives of the new governmental policy through an amendment of the Atomic Energy Law. This will include the deletion of the requirement to promote nuclear energy, the requirement of annual safety checks, the clarification of the burden of proof in case of a substantiated suspicion of danger, the prohibition of reprocessing and the imposition of direct disposal as the only means of waste management ; the new law will also provide for the partial annulment of the Atomic Energy Law

modifications of May 1998 and an increase of the liability coverage.

In the framework of the basic design optimization phase for the European Pressurized Water Reactor (EPR) project it was possible to demonstrate that the requirements currently applicable in Germany can be fulfilled, i.e. that even in case of severe accidents, including a core melt-down, additional measures outside the plant site are not necessary. By increasing the reactor capacity it would be possible to realize the project at an attractive and competitive price in a common Franco/German installation. Until a decision on construction is taken, which could happen after the European elections in mid-1999, clarification work will continue with the nuclear technology committees established by the governments.

In November 1998 a presentation was made to the qualified public of an innovative boiling water project, the BWR-1000, which has been developed in cooperation between the German utilities and Siemens AG. In this project, the safety requirements are to be met through passively working components and systems to control failures and breakdowns. The presentation obtained a large resonance in the media.

The URENCO enrichment plant in Gronau reached the originally authorized capacity of 1000 t SW/year in February. The installation operated at nearly 100% capacity and without interruption. The capacity extension to 1.800 tSW/year is progressing. The next cascade of this extension will start operation in early 1999. In addition, a further capacity extension by 2.200 tSW/year to a total of 4.000 tSW/year is planned. The application for the necessary licence for this extension was submitted in September.

The ANF fuel fabrication plant in Lingen continues to dispose of a maximum processing capacity of 650 tU/year. In order to improve the efficiency of the fabrication process and the security of supply for customers, additional and modified installations are planned as back up for the production of uranium oxide pellets and fuel rods. These plans are currently the subject of the atomic licensing procedures.

In spring 1998, the interim storage facility for fuel elements in Ahaus received three Castor-containers V/52 with fuel elements from the BWR Grundremmingen and three Castor-containers V/19 with fuel elements from the PWR Neckarwestheim. Since April 1995, already 305 charged Castors THTR/AVR have been stored there. At the identically constructed interim storage facility in Gorleben capacity utilisation, namely eight charged containers, remained unchanged. The two facilities are operated by the Gesellschaft für Nuklear-Service mbH, located in Essen.

The pilot conditioning installation (PKA) at Gorleben has almost been completed. The «cold commissioning» operation is nearing conclusion. The operating licence is expected to be granted in mid-March 1999. Even if for the time being no actual conditioning work will be undertaken, the PKA remains an important instrument for an optimal use of the containers, especially when for political reasons reprocessing is to be replaced by direct disposal.

The storage of radioactive waste in the eastern part of the Morsleben final waste disposal facility had to be interrupted, following a decision by the Upper Administrative Court of Magdeburg of 25 September 1998. Since then, the storage operations have completely ceased. For the time being, additional decisions in the main court procedure must be awaited. So far, 22.300 t of low and intermediate level waste have been deposited there.

The licensing procedure for the planned Konrad final disposal site is reaching its completion. In June, a general positive assessment had been expected. However, the responsible environment minister of Niedersachsen used the events related to the contamination of fuel element transportation casks and in his view the

« unresolved nuclear waste transport risks » as an opportunity to interrupt the procedure.

The exploratory work on the suitability of the saliferous rock at Gorleben as a final disposal site for all kinds of radioactive waste continued in 1998 according to plan. After completion of the construction work for the tunnels and cavities, it was possible to start work for the adaptation and equipment of the underground laboratory and storage rooms. In addition, the ventilation system on the 820 m floor has been established.

The decommissioning of the Karlsruhe reprocessing plant continued in 1998 according to plan. Preparations for the deconstruction within the operation building by means of manual, semi-teleguided and teleguided dismantling of certain process units have been undertaken, which will allow a speedy demolition in coming years. Plans for the construction of a vitrification plant in Karlsruhe are being pursued in parallel ; the plant is to be built for the vitrification of the high level waste (about 70 m^3) produced through previous reprocessing. The first partial permit was granted on 30. 12. 1998.

ELLAS - GREECE

Greece has no nuclear power plants. Electricity is produced by plants fueled with lignite or oil and by hydroelectric plants. At the National Centre for Scientific Research (NCSR) "Demokritos", GRR-1, a 5 MW Research Reactor is in operation for basic and applied research, radioisotope production and other applications.

Two subcritical assemblies are used for education at the Athens Polytechnic University and at Thessaloniki University. Spent nuclear fuel is sent by sea to the US according to the policy of acceptance of research reactor fuel of US origin for permanent disposal.

Low-Level and Intermediate-Level Waste are treated and stored at NCSR "Demokritos" site. Greece's nuclear policy objectives place a strong emphasis on radiation protection and emergency preparedness.

ESPANA - SPAIN

NUCLEAR ELECTRICITY GENERATION

Gross production of electrical energy of nuclear origin in Spain during 1998 was 58.96 TWh, which represents approximately 33% of the total national production. As in recent years, the performance of the nuclear park has been highly satisfactory, as reflected in the average load factor of 88.4%.

The following are the most significant developments that took place in 1998.

NUCLEAR INSTALLATIONS

During 1998 the Ministry of Industry and Energy authorized increases of electrical power in several nuclear plants. As a result of modifications in the turbines of the Santa Maria de Garona nuclear plant as well as in units I and II of the Asco nuclear plant, there has been an increase of 6 MW in the former and of 10.24 MW in unit II of Asco. In the Cofrentes plant, as a result of the thermal power increase authorized in 1997, there has been an increase of 35.4 MW. These developments bring the total power of the Spanish nuclear park to 7637.75 MWe.

The replacement work of the alternator of the Trillo nuclear plant, due to a technical failure of the connection of the stator, took place between March and June.

On 28 January 1998, the Ministry of Industry and Energy authorized the transfer of ownership of Vandellos I nuclear plant from HIFRENSA, the operator, to ENRESA which has received the authorization for its dismantling. The transfer of ownership took place on 4 February 1998.

This is the first authorization granted in Spain for the dismantling of a nuclear plant.

The programme retained for the dismantling includes a first phase during which the buildings and structure of the plant, except the reactor vessel, will be dismantled and demolished. The reactor vessel will be completely insulated and all means of access will be sealed. The environmental and radiological conditions inside the reactor vessel will continue to be monitored. After the completion of the first phase, which is expected to last five years, approximately 80% of the plant's site will be available for other uses, and a waiting period of around 30 years will have to elapse before commencement of the second phase during which the remaining elements of the plant will be dismantled. Eventually the so-called level three will be reached and the former site of the plant could then be used without any limitations. During 1998 some preparatory activities within the framework of the dismantling and closure plan took place.

The control and surveillance programme related to the dismantling and closure of ENUSA's Lobo G uranium ore processing plant at La Haba (Badajoz) was approved in January 1998. This programme will have a minimum duration of 5 years and will come to an end with the official closure of the plant installation.

The Ministry of Industry and Energy authorized the dismantling of the experimental reactor Argos of the University of Cataluna in Barcelona on 20 April 1998. This reactor, of the Argonaut type, was operated between 1963 and 1977. Its fuel was withdrawn in 1992.

FUEL CYCLE

During 1998 the Quercus uranium concentrates production plant, which is owned by ENUSA, continued to operate below design capacity and produced 300.6 tones of locally mined U3O8 (255 tU in U308). The closure of the production activities of Quercus is scheduled for the year 2000.

The Juzbado (Salamanca) fuel fabrication plant, owned by ENUSA, continued to manufacture PWR and BWR fuel elements both for Spanish nuclear plants and for various European countries. Its production in 1998 was 784 elements containing 230 t of U, of which 208 elements are for Spanish PWR, 132 for Spanish BWR and 444 for export to Sweden, Belgium, Germany and Finland.

The intermediate and low-level solid radioactive waste storage of the Empresa Nacional de Residuos Radioactivos (ENRESA) at Sierra Albarrana (El Cabril) continued to operate satisfactorily. By 31December 1998, 27.6% of the storage facility had been filled. It is scheduled that the storage facility will be completely filled around the middle of the decade starting 2010.

With regard to the intermediate storage of spent fuel, the work to change the spent fuel pools in the Jose Cabrera and Santa Maria de Garona plants was completed in 1998. Thus, all nuclear plants in Spain have now undergone such work.

FRANCE

HIGHLIGHTS

At 31 December 1998, the French nuclear facilities numbered 57 pressurized water reactors in operation (thirty-four 900 MW, twenty 1 300 MW and three 1 450 MW), and one fast reactor (PHENIX). The permanent closure of SUPERPHENIX was decided by the French Government at the end of the year. The decommissioning of the facility will occur in 1999.

One reactor of 1 450 MW is under construction for commissioning during 1999. In the course of 1999, four new 900 MW reactors were allowed to use MOX, bringing the total of MOX licensed

reactors up to twenty. The French Government, notably at the time of its press conference of 9 December, stated that "the choice of nuclear energy will be maintained as the major contributor to the national electricity supplies.

Following the investigations with a view to testing underground disposal of nuclear waste, the French Government decided in December to build two laboratories : one in clay, in eastern France (on the border between the Meuse and the Haute-Marne departments) and the other in granite, in a place to be found.

NUCLEAR POWER AND ELECTRICITY GENERATION IN 1998

Gross national consumption of electricity rose to 422.5 TWh, showing an increase of 3.0% compared with 1997. Industrial consumption was up by 1.8% compared with 1997. Tertiary industries and domestic consumption increased by 4.6%. The export balance decreased compared with 1997 and amounted to 58 TWh.

Total net production of electricity rose to 486.2 TWh, i.e. 1.1% more than 1997. A total of 368.4 TWh was produced by nuclear power stations, representing approximately 76% of domestic production. Thermal production from fossil fuel rose to 51.8 TWh, with an increase of 36% compared with 1997. Hydroelectric production decreased by 1.8% compared with 1997 and amounted to 66 TWh.

As regards nuclear operation, 1998 showed a decrease in availability factor, which was 81.2% compared with 82.8% in 1997. This reduction is mainly attributable to the technical problems which occurred at the reactor containment at Belleville and Flamanville nuclear power stations in 1998 (with an impact of 1.6 % on the national availability factor).

In addition, Units 1 and 2 of Chooz (N4 generation), which were connected to the grid respectively in August 1996 and April 1997, have been undergoing a plant shutdown since February 1998. Also, unit 1 of Civaux, in operation since December 1997, has been shut down since May 1998.

Two technical problems affected the start-up of these three power stations in 1998 :

1. deterioration discovered on the main turbines since March 1998; and
2. crackings on two parts of the residual heat removal system discovered at Civaux unit 1 in May and December 1998.

The updated schedule for reconnection (or connection) of these 3 units is the following :

Chooz B1: March 1999
Chooz B2: April 1999
Civaux 1: April 1999
Civaux 2: October 1999 (first connection).

The daily peak of domestic consumption, expressed in GW, amounted to 69 GW which is close to the record of 70 GW reached on 31 December 1993.

The Creys Malville fastbreeder did not operate during 1998. The official act for the definitive shutdown of this fastbreeder was issued on 31 December 1998.

The programme of testing and removing vessel heads has been carried forward. Since 1994, 30 vessel heads out of the 54 in operation have been replaced. Also, 6 removals of steam generator have been achieved since 1995.

At the end of 1998, 17 reactors were operating with MOX fuel. During the year 1998, the Chinon power plant was licensed to load MOX fuel.

Finally, Unit 1 of the Tricastin power station was shut down in November 1998 for an outage after ten years'operation. It is the first unit in France to undergo an outage after a second 10 year period of operation.

URANIUM MINING

In 1998, the national uranium production amounted to 508 tU in concentrates, around 30% down as compared with 1997.

Production came mostly from SMJ (Société des Mines de Jouac) in Limousin; the mining division of Hérault also produced a small quantity.

With regard to French mining interests outside France, in Canada the first production of the McClean mine was again delayed due to the lack of administrative authorisations. Production is now expected to commence around mid 1999. In Niger, production reached 3 715 tU in concentrates. In Gabon, the closure of COMUF facilities is planned for 1999.

URANIUM CONVERSION

In 1998, the two Comurhex plants of Malvési and Pierrelatte operated very satisfactorily, reaching a good level of production.

URANIUM ENRICHMENT

The Georges Besse facility at Tricastin ran extremely well, with seasonal adjustment of the production being made in order to optimize the electricity consumption.

REPROCESSING

The UP2 and UP3 plants operated very satisfactorily during 1998 : 1 633 tonnes of oxide fuel were reprocessed, bringing the cumulative quantity reprocessed to 13 537 tonnes since 1976.

A total of 162 spent fuel casks were received at la Hague. This number is a slight decrease as compared with 1997, because the casks were affected by cask contamination problems which occurred as from May 1998.

IRELAND

Ireland does not have a nuclear power industry and there are no plans for such. Ireland's nuclear policy objectives place a heavy emphasis on the enhancement of nuclear safety, radiation protection and emergency preparedness world-wide. Ireland remains opposed to the operation and expansion of the nuclear industry. In the implementation of its nuclear policy, the Irish Government is advised and assisted by the Radiological Protection Institute of Ireland.

ITALIA – ITALY

ENEL AND THE DECOMISSIONING OF NUCLEAR POWER PLANTS (NPP)

In 1998 ENEL carried out decommissioning of its four nuclear power plants in accordance with its programme to reach the passively safe condition. In particular for the Garigliano NPP waste conditioning was nearly completed and the passively safe condition for the nuclear island was reached. Therefore, tests to verify the respect of the design parameters were started.

At Caorso NPP, all the fuel was transferred from the reactor to the pools inside the reactor building. The reactor is now ready for the first phase of the decommissioning to be commenced to reach the passively safe condition, once the authorization of the Ministry of Industry has been received. Meanwhile conventional and nuclear activities which are necessary to prepare for decommissioning were carried out.

At Trino NPP, the conditioning of the plant to reduce the maintenance cost pending the approval to start the first phase of decommissioning was continued. Conventional dismantling was also carried on.

At Latina NPP, the removal of a part of the primary circuit was completed. Also conventional

dismantling was carried out. Toxic wastes were removed from the plant.

ENEL continued the management of contracts with BNFL for the reprocessing of irradiated fuel. Its staff is involved in international working groups. ENEL is working to sell the residual fresh nuclear fuel.

ENEA AND THE MANAGEMENT OF WASTE

ENEA has continued to carry out its comprehensive programme on the treatment and conditioning of radioactive waste produced in the past in its pilot plants (EUREX and ITREC reprocessing plants, Plutonium Laboratory, Hot Cells).

The Basic Design and the Preliminary Safety Report for the vitrification plant, using the "cold crucible" technology, to be built at the EUREX Plant, have been completed and are now under examination by the Italian Nuclear Safety Authority (ANPA).

In 1998, the Ministry for Industry (responsible for energy policy in Italy), launched, together with the Conference of the Regional Authorities, a concerted action aimed at defining a proper decision process for the choice of the national repository site for short-lived, low and medium level radioactive waste and the interim storage of spent fuels and high-level activity vitrified waste.

A Programme Agreement between the Government and the regional authorities has been jointly defined with this aim, and a national "consultation table" has been set up, with all interested parties.

In November '98, a National Conference on Energy and the Environment was held in Rome, co-sponsored by the three concerned Ministries : Industry, Environment, University and Research, and organized by ENEA.

A specific paper, proposing a comprehensive national plan on radioactive waste and irradiated fuel management, nuclear installations decommissioning and site selection process in Italy has been jointly prepared for the Conference by ENEL, ENEA and ANPA.

On the basis of the conclusions of the Conference and in the framework of the liberalisation process of the national electricity market, the government is now preparing a policy act for these matters, including the reorganization of the activities carried out by ENEL and ENEA in these areas.

A public body responsible for the management of radioactive waste and irradiated fuel, as well as the realization and operation of the repository and the interim storage facility is foreseen.

NEDERLAND – NETHERLANDS

In the nuclear energy field, no new developments took place in the Netherlands in 1998. Therefore, the information on :
- nuclear electricity generation and consumption
- nuclear fuel cycle developments and
- research reactors provided in the Agency's Annual Report for 1997 is still accurate.

Furthermore, the Urenco enrichment plants at Almelo operated satisfactorily at a capacity of 1600 tSW per annum. Civil construction of the first hall of a new plant was completed. First production from this plant is planned from mid 2000. The already decommissioned first production plant was returned to green field site.

As regards national energy policy, the further liberalisation of the Netherlands electricity sector has been implemented by the adoption by Parliament in June 1998 of the new Electricity Act. As a result of this the government's role will change dramatically. Its central role in planning capacity will decline and with that its influence on the choice of fuel. Furthermore, its task of regulating prices will largely disappear.

In the nuclear field, as far as reprocessing is concerned, a discussion was initiated in the Dutch Parliament about possibly terminating the reprocessing of spent fuel from the Dodewaard and Borssele Nuclear Power Plants.

At the request of the Ministry of Economic Affairs, ECN carried out a study mainly with respect to environmental, proliferation and financial aspects of reprocessing as compared with its alternative, direct storage. Based on this study, the government took the view that there were no urgent reasons to change the actual strategy based on the reprocessing of spent fuel. On 22 January 1998, a discussion took place between the Minister of Economic Affairs and the Minister of Housing, Planning and Environment on the one hand and Parliament on the other hand on this issue. One of the opposition parties agreed with the above-mentioned position of the government. However, two of the governmental parties expressed doubts on this issue. Finally, a motion asking for more investigations with respect to possibilities and consequences of changing the reprocessing strategy including financial aspects was adopted. It is expected that the results of this investigation will be sent to Parliament in early 1999.

Finally, as regards nuclear research, it can be stated that the High Flux Reactor operated by ECN in Petten, is of increasing significance for the medical industry in the whole of Europe. This reactor is the main producer of medical radioisotopes in Europe and is the leader in research of cancer treatment by neutrons (the so-called Boron Neutron Capture Therapy). As a consequence of changing markets the ECN nuclear research operation merged with the nuclear research division into the Nuclear Research and Consulting Group (NRG), a subsidiary of both ECN and KEMA.

ÖSTERREICH - AUSTRIA

ENERGY POLICY PRINCIPLES

The Austrian energy policy, based on the principles of the International Energy Agency of the OECD and laid down in the Energy Report of the Austrian Government 1996, remains unchanged.

The implementation of this policy was continuously pursued giving special attention to changing energy and environment policy requirements, both at the national and international level, and with the aim of meeting the challenges arising from the facts that :

- European integration continues to progress and requires constructive co-operation as well as respective legal adaptations;

- the anticipated global climate change necessitates CO_2 reduction measures on a national basis;

- the far-reaching changes in the economies of Central and Eastern Europe open up new challenges and co-operation possibilities.

Taking into account these challenges, the most important objectives of the Austrian long-term energy policy - such as satisfying energy requirements, security of supplies, environmental compatibility and conservation of energy resources, social acceptance, utmost priority for energy efficiency, the reduction of oil consumption and oil import dependency as well as of energy imports in general and the increased utilisation of renewable energy resources - remain unchanged.

AUSTRIA'S ENERGY POLICY ACHIEVEMENTS

The following figures about the development of energy and oil consumption show that the Austrian energy policy has proved to be very successful :

- energy intensity, expressed in terms of primary energy supply (PES) per unit of Gross Domestic Product in Austrian Schillings (ATS GDP), decreased from 895.1 MJ/1000 ATS GDP in 1980 to 723.4 MJ/1000 ATS GDP in 1997, i.e. by 19.2%;

- the share of oil in energy supply fell from 49% in 1980 to 39% in 1997. The share of renewables increased from 20% in 1980 to 26% in 1997. The overall carbondioxide emissions stabilised at the level of the early seventies;

- specific energy demand in industry (industrial energy input per unit of industrial net product) further decreased by about one- third in the last 15 years (recent data are not available).

Combined efforts of the Federal Government, the Länder (provinces), the producers and the consumers – the so-called social partners – will ensure that the common energy policy objectives will be achieved also in the future.

NO UTILISATION OF NUCLEAR ENERGY IN AUSTRIA

Austria has no nuclear power plants. The origin of this situation is a law of 1978 establishing the prohibition of nuclear power plants on Austrian territory. This was the legal consequence of a referendum in November 1978 resulting in a negative vote against the nuclear power plant project Zwentendorf. The events in Chernobyl in 1986 reinforced this parliamentary decision and further strengthened the opposition of the Austrian population against nuclear power.

RESEARCH REACTORS

Although Austria has no nuclear power plants, there are, however, three research reactors in operation in Vienna, Seibersdorf and Graz.

(With regard to the ASTRA Reactor in Seibersdorf there are plans to close down the reactor as from 31 July 1999 and to begin the appropriate steps to decommission the reactor permanently.)

The overall situation for the two other remaining reactors, as previously reported in the 1997 annual report, remains unchanged.

RADIOACTIVE WASTE IN AUSTRIA

Since Austria does not operate nuclear power plants, there is no major production of high level radioactive waste (HLW). Consequently, there is no need to consider intermediate or final storage capacities in Austria for HLW. The relatively small quantities of HLW resulting from the Austrian research reactors are covered by a framework contract for “US-origin nuclear fuel” and will return to the US during the next decade.

Low and medium level waste (L/MLW) from hospitals, industry and research laboratories (30-40 tons/year) is collected and treated by the Austrian Research Centre at Seibersdorf. The research centre is equipped with suitable facilities to process and condition low and medium level waste (incinerator, supercompactor and wastewater evaporator). As a conditioning process, cementing is predominantly used.

INTERIM STORAGE FACILITY

On the basis of a joint agreement between the Republic of Austria, the community of Seibersdorf and the Austrian Research Centre Seibersdorf, the intermediate storage facility is scheduled to be operated until 2012 on the site of the research centre with a capacity of 15.000 drums of conditioned waste. After this date, the waste will be transferred to a final storage facility which is planned to be built on a site to be selected at the beginning of the next decade.

PORTUGAL

ENERGY POLICY CONSIDERATIONS

The dependence on imported energy remains at a high level, of the order of 90%.

In 1996 the Total Primary Energy Supply (TPES) amounted to 19 088 x 10^3 toe which represented a small decrease (-0.4%) compared with the previous year.

Imported oil and coal contributed 69 % and 18 % respectively to the total energy supply in that year.

In order to diversify energy supply and reduce the growth of CO_2 emissions, Portugal is introducing natural gas which comes from Algeria. The first deliveries took place in early 1997, and since October 1997 natural gas is being used to fuel the dual fired power plant of Carregardo (6x125 MWe).

As to the construction of the gas fired power plant of Tapada de Outeiro (3x330 MWe), the second unit started operation in October 1998. The first unit, originally scheduled for March 1998, has been delayed but should start operation in March 1999. The third unit, scheduled for October 1999, is expected to enter into service early in May 1999.

NUCLEAR ELECTRICITY GENERATION

Portugal has no plans at present to use this source of energy.

FUEL CYCLE DEVELOPMENTS

Uranium (yellow cake) production remains at a very low level and amounted to 18.5 tU (21.5 t of U_3O_8) in 1998.

SUOMI/FINLAND - FINLAND

ENERGY POLICY CONSIDERATIONS

There were no new policy decisions in 1998 directly related to nuclear energy. However, developments in the fields of the general policy and the climate policy are believed to have an indirect effect on the role of nuclear energy. These developments include the ongoing restructuring of the electricity markets, as well as the signing of the Kyoto protocol, followed by the agreement on the burden sharing within the EU. As a consequence, the public attitude towards nuclear power has become slightly more favorable, but simultaneously the long term economic advantages of nuclear power have lost some of their weight in relation to other factors to be taken into account in investment decisions.

Each of the two power companies operating nuclear power plants in Finland has decided to increase its readiness to start a new nuclear project by launching as a preparatory step an environmental impact assessment procedure related to a new power unit situated on an existing site. In both cases the first phase of the procedure was passed in 1998.

NUCLEAR ELECTRICITY GENERATION AND CONSUMPTION

New operating licences for increased power levels were granted to all four nuclear power plant units during 1998. Altogether the new power levels mean an addition of 350 MW to the Finnish electricity generation capacity. The total amount of electricity produced by these units in 1998 was 21.0 TWh or 4.7% more than in 1997. This corresponds to 31.3% of the electricity generation and 27.4% of the electricity supply in Finland.

RADIOACTIVE WASTE POLICY AND DEVELOPMENTS

An operating licence for a final repository of low and medium level wastes from the Loviisa nuclear power plant was granted in April.

The site selection of a deep geological repository for spent nuclear fuel is scheduled for the year 2000. In 1998, the nuclear power utilities were finalizing site selection studies and preparing an environmental impact assessment report concerning four alternative localities.

RESEARCH REACTORS

There is one 250 kW Triga Mark II reactor operating in Finland. This reactor, the original purpose of which was education and research, has since been modified to serve mainly as a neutron source for boron neutron capture therapy of brain tumor patients.

SVERIGE – SWEDEN

ENERGY POLICY CONSIDERATIONS

In February 1998 the Government decided that Barsebäck Kraft AB was to close down the operation of power reactor Barsebäck 1 by 1 July 1998. This decision was based on the 1997 Act on the phasing-out of nuclear power. Following an appeal against this decision the Supreme Administrative Court ordered a postponement of the implementation of the decision until completion of the legal procedure has been completed. No final decision had been taken by the Court by the end of 1998.

In December 1998 the Government, having earlier informed Parliament about its intention, decided to release the nuclear power utilities from their requirement to maintain jointly strategic stocks of enriched uranium, enough to generate 35 TWh. In future each utility will be free to decide its own stock-holding policy.

NUCLEAR ELECTRICITY GENERATION

The Swedish nuclear power stations generated 70.5 TWh in 1998, 5% more than in the previous year. Nuclear power represented ca. 46% of the electricity generated in Sweden in 1998 (hydro ca. 48%). Following the unusually high water flow to the reservoirs, hydro electricity production was at record level and consequently the nuclear power production capacity was not fully utilized.

Availability of the Swedish reactors was on average 84.8 % in 1998, compared with 78.8 % in 1997.

The four reactors at Ringhals and the three reactors at Forsmark all achieved very good production figures. Due to the ongoing modernisation programme for Oskarshamn 1, this unit was offline for about six months. This work will continue and is planned to be finished in year 2001. The two other reactors at Oskarshamn continued to perform satisfactorily. The two units at the Barsebäck plant produced 8.3 TWh, the highest output since 1991.

The nuclear powerplants at Forsmark and Ringhals are now environmentally certified according to ISO14001.

NUCLEAR FUEL CYCLE DEVELOPMENTS

At the ABB Atom fuel fabrication plant 380 tons of uranium dioxide powder were converted and 270 tons of fresh fuel were produced during 1998. More than half of the production was for the export market.

In 1998 ABB Atom installed and brought into operation equipment of a unique design to further reduce the environmental impact of its operation.

RADIOACTIVE WASTE

In the autumn of 1998, SKB (the Swedish Nuclear Fuel and Waste Management Co, owned jointly by the nuclear power utilities)

obtained permission to increase the capacity of the intermediate store of spent fuel, CLAB, from 5 000 tons to 8 000 tons. Work at the site has already commenced.

SKB has outlined a new "Programme for Research & Development on Final Storage of Spent Fuel", which will cover three years. This programme was submitted to the Government in the autumn of 1998. The programme's main line is to go forward, demonstrate technology and start, in 2001, detailed investigations on a possible site for final storage.

The local municipality of Tierp, situated about 150 km north of Stockholm, in the summer of 1998 agreed to carry out a pre-study for a final repository of spent fuel, in co-operation with SKB. This means that SKB now has four pre-studies ongoing.

In November 1998, SKB inaugurated the new "Encapsulation Laboratory" which is located in the town of Oskarshamn.

In November 1998, the utility OKG made an application to the Government in order to obtain a licence to use MOX fuel in its reactors.

The 1999 fee for the waste management activities including future decommissioning of all reactors was raised in December 1998 to an average of 0.013 SEK per KWh.

RESEARCH REACTORS

During 1998 decisions were made to build a Boron Neutron Capture Therapy facility at the R2-0 reactor in Studsvik. Its purpose is the treatment with neutron radiation of patients suffering from brain tumors. A facility for production of iodine-125 is also being built. This radioisotope is used for treatment of prostatic cancer.

Both the R2, a 50 MW MTR-reactor used for fuel testing, fuel investigations, silicon doping and isotope production, and the R2-0 (1 MW) reactors have operated at full capacity. Both reactors also provide neutrons for basic research for the Neutron Research Laboratory in Sweden.

UNITED KINGDOM

ENERGY POLICY CONSIDERATIONS

In its latest White Paper on energy, published on 8 October 1998, the government considered that nuclear power "makes a valuable contribution to diversity of supply and emissions reduction". The Paper goes on to say however that the cost of new construction means nuclear power's share of generation is expected to decrease in the first decades of the next century as existing capacity is retired. In the meantime, any proposals for nuclear construction are to be considered against the same objectives as those for other types of stations – the ability to ensure secure, diverse and sustainable supplies of energy at competitive prices.

In December 1997, the government announced its detailed proposals for the merger of Magnox Electric plc, which owns and operates the UK's six operating and three decommissioning civil magnox stations, and BNFL. The aim of the merger is to improve the arrangements for managing public sector nuclear liabilities by ending the mismatch where BNFL has responsibility for dealing with the majority of magnox liabilities while Magnox meets the costs. The merger is taking place in two key stages, the first of which, transfer of the government's shares in Magnox to BNFL, took place in January 1998. The second stage, full merger of the combined businesses of the two companies, is expected to be completed during 1999, subject to the companies meeting the requirements of the relevant regulators.

The process of integrating Nuclear Electric Ltd and Scottish Nuclear Ltd, who between them operate the UK's seven AGR stations and one PWR station, continued during 1998; the two

companies now trade under the name of British Energy.

On 5 June the government announced that commercial reprocessing at Dounreay would cease. The reprocessing plants will continue to operate, subject to the necessary regulatory consents, only for as long as necessary to deal with the existing liabilities and committed work. No new commercial contracts for reprocessing at Dounreay will be accepted.

NUCLEAR ELECTRICITY GENERATION AND CONSUMPTION

The UK's nuclear power stations supplied over 90 TWh in 1998, some 1.5% more than in 1997, and representing about 27% of the electricity supplied in the UK in 1998.

FUEL CYCLE DEVELOPMENTS

Total output from British Energy's eight stations for the 1997/98 financial year, at 66.7 TWh, confirmed the company's position as the UK's leading generator, with a market share of 21%. During 1998 British Energy established a number of partnerships in the UK and international energy sectors as part of the company's development strategy. One example of this development can be seen in British Energy's joint venture with US utility PECO Electric to purchase Three Mile Island 1.

Urenco, the UK based British-Dutch-German centrifuge enricher, continued to expand its enrichment capacity during 1998 in line with increased business commitments. In particular, further capacity entered into operation at Capenhurst, UK, where a new plant was commissioned in December 1997. Total capacity at all three plants at the end of 1998 was 3 950 tSW per annum.

In April 1994, British Nuclear Fuels plc (BNFL) began construction of the Sellafield MOX Fuel Plant (SMP) which will fabricate mixed oxide (MOX) fuel from a blend of plutonium and uranium. The final decision on whether to commence operation of the SMP now rests with Environment ministers who are considering the UK Environment Agency's response to BNFL's application. Once operating, the plant has the capability to produce 120 tonnes of MOX fuel per year.

BNFL's Thermal Oxide Reprocessing Plant (Thorp) at Sellafield in Cumbria began operation in March 1994. As at October 1998, some 1 750 tonnes of spent fuel have been sheared and dissolved at the Plant. Thorp currently has an order book valued at £12 billion over 15 years.

BNFL, in partnership with the US engineering and construction group Morrison Knudsen (MK), in 1998 acquired the global nuclear business of Westinghouse Electric Corporation.

In March 1997, the then Secretary of State for the Environment rejected Nirex' application to construct an underground rock characterisation facility at the site adjacent to BNFL's Sellafield works which it was investigating for its proposed deep disposal facility for intermediate level radioactive waste. Consideration continues to be given to the consequences of this decision for intermediate level waste disposal policy and its implementation.

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

CHAPTER IV

INTERNATIONAL RELATIONS

INTRODUCTION

European Union (EU) operators acquire nuclear materials and services from a number of external supplying countries. Moreover, some EU operators also process materials on behalf of foreign clients. While in the European Union, nuclear materials in the civil fuel cycle are subject to the safeguards provisions of the Treaty establishing the European Atomic Energy Community (Euratom or the Community) and, as appropriate, also to the agreements entered into by the Community, its Member States and the International Atomic Energy Agency. In addition, nuclear materials transferred between the Community and three non-Community countries – Australia, Canada and the USA – are subject to international agreements concluded between the Community and the country concerned. These agreements provide for some additional conditions which apply to such materials. Furthermore, transfers of nuclear materials with some other countries are or may become covered under agreements with the European Community and Euratom of a more general nature.

Under the provisions of the Euratom Treaty, international agreements are negotiated on behalf of the Community by the European Commission in accordance with directives issued by the Council of Ministers. Where these agreements relate to the supply of nuclear materials or services, the Euratom Supply Agency takes part in the Commission's negotiating team and in any ongoing consultations with the authorities of the countries concerned. Developments in relation to these agreements during the year relevant to nuclear fuel supplies are reported below.

The Agency has compiled a compendium of agreements to which the European Atomic Energy Community is a party and which relate to nuclear fuel supply. ([1])

BILATERAL NUCLEAR CO-OPERATION AGREEMENTS

EURATOM/AUSTRALIA

Following the agreement reached between Euratom and Australia in October 1997, whereby Australia will grant generic prior consent, under certain conditions, for retransfers from Euratom to Japan of Australian obligated plutonium after the reprocessing of Japanese spent fuel in the EU, an exchange of diplomatic notes took place in Canberra on 28 May 1998. Following that diplomatic step, and once Australia notifies that all its domestic legislative requirements have been satisfied, these arrangements will enter into force.

EURATOM/CANADA

As provided for in Article XIII of the Euratom/Canada Agreement for Co-operation in the peaceful uses of Atomic Energy, consultations took place in Ottawa in June 1998.

The consultations under Article XIII provided an opportunity to review the nuclear energy policy and programmes in both Euratom and Canada and to exchange views and information on a variety of issues, such as the respective nuclear relations with other countries, the status of the

[1] This document is published by the Office for Official Publications of the European Communities Luxembourg under reference n° ISBN 92-828-0091-1.

worldwide nuclear fuel market and International Atomic Energy Agency matters. The Euratom side raised the issue of Canadian authorizations for retransfers of Canadian obligated depleted uranium from Euratom to Russia for upgrading into natural and enriched uranium product and arrangements for leaving the remaining "secondary tails" material there.

EURATOM/USA

Under Article 12 of the Euratom/USA agreement, the second round of consultations since the agreement came into force in 1996, took place in Brussels on 19-20 October 1998. Both parties confirmed that the agreement is working satisfactorily and exchanged views on their nuclear policy developments, on nuclear relations with third countries, on the status of the worldwide nuclear fuel market and on IAEA matters, including strengthening of nuclear safeguards.

The Euratom side specifically raised the issue of the sale intentions of natural uranium by the United States Enrichment Corporation (USEC) and their potentially disrupting effects on the market and on the highly enriched uranium (HEU) agreement between the US and Russia. The Euratom delegation reiterated prior requests made to the US Government to find a fair and equitable solution to the overpricing by USEC of enrichment services supplied to two EU companies. It also brought to the US government's attention the case of a licence application by an EU company to the US Nuclear Regulatory Commission (NRC) and requested more expeditious treatment for future cases.

RETRANSFERS

Under the terms of the Community's agreements with Australia, Canada and the USA, these supplier countries retain the right of consent, albeit often in a long-term programmatic framework, over the retransfer from the Community of nuclear materials subject to those agreements to other countries outside the Community.

Under the Euratom/Canada agreement, simplified procedures relating to retransfers of certain Canadian-obligated nuclear items are in place for most of the Community's nuclear trading partners. In the case of the Euratom/Australia Agreement retransfers from the Community of Australian obligated material can take place, subject to certain notification conditions, to countries with which Australia has a co-operation agreement in place for activities for which Australia has accepted those countries as a destination. Again, this includes most of the Community's nuclear trading partners.

Under the Euratom/US agreement, a mechanism providing for advance generic consent for retransfers of nuclear items subject to the agreement is in place based on a list of destinations outside the EU which includes most of the Community's nuclear trading partners. Advance generic consent for the retransfer to Japan of plutonium, including plutonium contained in mixed oxide fuel, is maintained under this agreement by reference to an exchange of letters of 1988 between the European Commission and the US Mission to the European Communities.

Following the entry into force of a new US/Switzerland nuclear co-operation agreement in June 1998, a similar mechanism for retransfers of this kind to Switzerland is expected to be operational in early 1999.

Applications for retransfer consents falling outside the generic consents provided for under the above agreements are handled by the Supply Agency. During 1998, four such retransfers were approved by the US.

BILATERAL RELATIONS IN THE NUCLEAR FIELD WITH OTHER COUNTRIES

THE RUSSIAN FEDERATION

Following the entry into force of the Partnership and Co-operation Agreement (PCA) between the European Communities, including Euratom, their Member States and the Russian Federation on 1 December 1997, a first meeting of the EU/Russia Co-operation Council at ministerial level took place in February 1998 and was followed by meetings of the EU/Russia Co-operation Committee held in April and December 1998. On all these occasions the issue of EU/Russia nuclear trade was discussed and the EC side reiterated its willingness to continue discussions with a view to reaching a nuclear trade arrangement as envisaged in article 22 of the PCA.

OTHER NEW INDEPENDENT STATES (NIS)

No progress was reported with regard to the proposal of the Commission to the Council for the negotiation of bilateral nuclear cooperation agreements with the following NIS: Kazakhstan, Kyrgyzstan, Tajikistan, Ukraine and Uzbekistan. To date the Council has only adopted directives for the negotiation of agreements with Kazakhstan and Ukraine regarding nuclear safety and nuclear fusion. In December 1998, the Commission proposed to the Council the negotiation of a global nuclear cooperation agreement, including a nuclear trade component, with Ukraine. The provisions of the Euratom Treaty continue to apply automatically to uranium supplied from the NIS to the EU, just as to supplies from any other country.

JAPAN

On 25 May 1998 the Council approved a negotiating mandate for the negotiation by the Commission of an agreement on the peaceful uses of nuclear energy between Euratom and Japan. A key objective of the proposed agreement is to facilitate nuclear trade between industry in Euratom and in Japan through the establishment of a framework for the implementation of existing and future commercial arrangements.

Following substantive preparatory work on both sides, it is expected that the first round of formal negotiations will take place in spring 1999.

MULTILATERAL AGREEMENTS IN THE NUCLEAR FIELD

ENERGY CHARTER TREATY (ECT)

The Energy Charter Treaties entered into force on 16 April 1998. At the end of 1998, 38 countries plus the European Communities had ratified the ECT. At that date two EU Member States had not completed their ratification procedures, but they are applying the Treaty on a provisional basis. The Russian Federation had also not ratified, but it is committed to apply the Treaty on a provisional basis.

On 24 April 1998 the Energy Charter Conference adopted the Amendment to the trade-related provisions of the ECT. The following joint declaration made by the Russian Federation and the European Union was made with respect to the Trade Amendment: “The Russian Federation has raised the issue of trade in nuclear materials. The Russian Federation and the EU agreed that the partnership and co-operation agreement between the Russian Federation, the European Union and its Member States, which entered into force on 1 December 1997, is the appropriate framework to deal with this issue, as confirmed in the conclusions of 27 January 1998 Co-operation Council”.

By its decision of 13 July 1998 (98/537/EC) the Council of the European Union formally approved the text of the Trade Amendment and authorized its provisional application.

CHAPTER V

ADMINISTRATIVE REPORT

PERSONNEL

The staff establishment of the Agency at the end of 1998 was 24.

FINANCE

The Agency's expenditure amounted to ECU 192 578.95 for 1998. This amount was financed principally 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 Agency as provided by the Euratom Treaty.

ADVISORY COMMITTEE

The Advisory Committee held two meetings in 1998. The Agency informed the Committee of developments related to supply policy in particular with regard to the disposition of ex-military High Enriched Uranium from Russia and supply from other New Independent States and discussed with the Committee from a supply perspective the policy treatment to be given, in the EU to depleted uranium enriched in Russia([1]). Exchanges of views took place on market developments, levels of production and stockpiles in those countries. Also the Agency informed the Committee about a proposal, still under discussion within the Commission services at the year end, to convert the Agency's capital from EMA units of account into euro.

Likewise, the Committee was briefed by the Commission services and the Agency on the results of official consultations with the US, Australia and Canada within the framework of existing nuclear agreements with those countries as well as on the status of and developments relating to potential Euratom international agreements in the area of nuclear fuel supply.

The Agency's annual report and accounts for 1997 received favourable opinions from the Committee, as did its budget for 1999.

A new Chairman and Vice-Chairmen of the Committee were elected for the term of office extending to 28 March 1999.

1 See "Supply of material from NIS" in Chapter I.

ORGANISATIONAL CHART

(AS AT 31 DECEMBER 1998)

EURATOM SUPPLY AGENCY

Director General	Mr. M. GOPPEL
Assistant to the Director General	Mr. D. MONASSE (a.i.)
• Nuclear fuels supply contracts and research	Mr. J.C. BLANQUART Mr. J. MOTA Mr. A. BOUQUET Mrs. P. BOUCHAUD-BEULE
• General Affairs; Secretariat of the Advisory Committee	Mr. D.S. ENNALS Mr. P. MARTINEZ-VARGAS

ADVISORY COMMITTEE OF THE SUPPLY AGENCY

Chairman	Mr. S. SANDKLEF (Vattenfall Fuel, Sweden)
Vice-Chairmen	Mr. L. F. DURRET (Cogéma, France) Mr. C. GIMENO SANZ (Permanent Representation of Spain)

WORKING PARTY

Chairman	Mr. M. S. TRAVIS (Rio Tinto, Mineral Services, UK)
Vice-Chairmen	Mr. P. GOLDSCHMIDT (Synatom, Belgium) Mr. J. HUBER (Bayernwerk, Germany)

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ANNEX 1

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

YEAR	FUEL LOADED	DELIVERIES	% SPOT DELIVERIES
1980	9 600	8 600	(4)
1981	9 000	13 000	10.0
1982	10 400	12 500	<10.0
1983	9 100	13 500	<10.0
1984	11 900	11 000	<10.0
1985	11 300	11 000	11.5
1986	13 200	12 000	9.5
1987	14 300	14 000	17.0
1988	12 900	12 500	4.5
1989	11 800	13 500	11.5
1990	15 400	12 800	16.7
1991	15 000	12 900	13.3
1992	15 200	11 700	13.7
1993	15 600	12 100	11.3
1994	15 400	14 000	21.0
1995	18 700	16 100	18.1
1996	18 400	15 900	4.4
1997	18 200	15 600(*)	12
1998	18 400	15 800	6
Total	263 800	248 500	

(*)See footnote 1 on page 16.

ANNEX 2

ESA average price for multiannual and spot contracts involving natural uranium

YEAR	MULTIANNUAL CONTRACTS		SPOT CONTRACTS		EXCHANGE RATE
	ECU/kgU	US$/lb$U_3O_8$	ECU/kgU	US$/lb$U_3O_8$	US $ PER ECU
1980	67.20	36.00	65.34	35.00	1.392
1981	77.45	33.25	65.22	28.00	1.116
1982	84.86	32.00	63.65	24.00	0.978
1983	90.51	31.00	67.89	23.25	0.890
1984	98.00	29.75	63.41	19.25	0.789
1985	99.77	29.00	51.09	15.00	0.763
1986	81.89	31.00	46.89	17.75	0.984
1987	73.50	32.50	39.00	17.25	1.154
1988	70.00	31.82	35.50	16.13	1.182
1989	69.25	29.35	28.75	12.19	1.102
1990	60.00	29.39	19.75	9.68	1.273
1991	54.75	26.09	19.00	9.05	1.239
1992	49.50	24.71	19.25	9.61	1.298
1993	47.00	21.17	20.50	9.23	1.171
1994	44.25	20.25	18.75	8.58	1.190
1995	34.75	17.48	15.25	7.67	1.308
1996	32.00	15.63	17.75	8.67	1.270
1997	34.75	15.16	30.00	13.09	1.134
1998	34.00	14.66	25.00	10.78	1.121