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The Harmonious Market for Uranium Enrichment Services

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Introduction

During a recent nuclear fuel industry meeting in Berlin, we were invited to give a presentation on the reduction of the risks associated with the uranium enrichment market. We therefore have the opportunity of giving our views on this subject. Indeed, risk assessments vary greatly between electricity companies, suppliers of services, politicians, financiers, etc. And the issues are further complicated by the fact that, as the points raised in previous sessions show, we are now approaching a critical moment for the long-term future of nuclear power.

Therefore, instead of subjecting you to an ambitious, and presumptuous, analysis of the ways of reducing the risks associated with the market, I have decided to simply give you my own views about the market.

However, as it is well known that market harmony is rarely a stable situation, I will mention a few issues that may represent risk factors for the enrichment industry, and nuclear engineering in general.

What is the current situation?

a. What is the market for enrichment? And what are its perspectives?

As can be seen from *Figure 1*, the market will be growing steadily, at an average rate of 0.5% per year, for 20 to 25 years. This corresponds to the current population of light water reactors and to projections that I consider prudent concerning the construction of new reactors, particularly in Asia. There is obviously no allowance for any major events, which might call into question the very existence of the nuclear industry. Subject to this last reservation, it can be taken that the future is clear, enabling all those involved in enrichment services to plan ahead on a solid basis.

b. Who are the players, and what do they expect of the market?

- The nuclear generating electricity companies, who are now less numerous and, as a result of deregulation of the markets, are now more concerned with more cost-effective operation of their means of production.

In my opinion, what they are seeking is:

- to have the assurance of reliable supplies in the short and long term, guaranteeing that their reactors can be operated; and
 - to have the assurance of supply at competitive prices, in other words, there must be competition between enrichment services suppliers.
- The enrichment companies: these are six in number, and four strongly dominate the market. It must be emphasized that, now most of the Russian Federation has joined the free market economy, its internal market has to be viewed as part of the worldwide one:
 - a. MINATOM operates four plants and is controlling the source of the Russian HEU deal. MINATOM supplies at least 40% of the total SWU needs including the HEU. MINATOM is willing to increase its market share mainly in Western Europe and in Asia.
 - b. USEC operates the Paducah plant and is the exclusive US agent for the achievement of the HEU deal.
 - c. URENCO operates three plants in the European Union and is currently increasing its capacity.
 - d. EURODIF operates a single plant in Pierrelatte in France.

There are a total of 12 enrichment plants representing a theoretical installed capacity of 46 million SWUs; the actual production capacity is 40 million SWUs, which is sufficient to cover the requirements of more than 440 reactors. In 2000, the world demand corresponding to light water reactors was estimated at 37 million SWUs.

- Politics plays an important role in this sector of activity. The main reasons for which it intervenes are to ensure non-proliferation and security of supply. The very existence of EURODIF owes much to the desire of certain states to possess the necessary means to achieve independence from the USA in the past.
- c. The situation is summarized in *Figure 2*, which indicates the geographical distribution of the market in 2000.

What does it show?

It shows where the demand is located. More importantly, it shows how the four main suppliers of enrichment services operate. It should be noted that each geographical area varies greatly in the way the market is divided up, clearly illustrating the will of the political authorities to monitor and, in some cases, regulate the situation.

This can be seen from the following examples:

- In Europe, the Euratom Treaty, and the policy of the Euratom Procurement Agency resulting from its application, provides for the monitoring of the security of supply to ensure that supplies of Community origin remain at adequate levels, while ensuring also that the rules of competition are observed. In the current context, with the electricity market in the process of being deregulated, the policy can be said to consist of making security of supply compatible with competitive prices.
- The USA has joined Russia in a drive to reduce to the two main nuclear arsenals, focusing on minimizing proliferation risks and reducing the stocks of excess ex-military fissile materials without delay. Accordingly, half of the market has been frozen, until 2013 at least, by the agreement between America and Russia on Russian military HEU. The other half is open to competition, on condition that this does not excessively weaken the only remaining local enrichment organization, which could lead to a protectionist reaction by the DOC.
- In Eastern Europe, for historical reasons, the market has been almost totally cornered by Russian suppliers, and is still practically inaccessible to foreign ones. The situation creates a situation of major commercial imbalance between, for example, suppliers from the European Union and Russian suppliers.
- The Asian market currently appears to be a very open one, although both Japan and China clearly wish to increase their domestic enrichment capacities, even at substantial extra cost if necessary.

But if the figures are consolidated at world market level for each of the main suppliers of enrichment services, the market share amounts to between 15 and 25%, excluding the HEU deal which represents 15% of the world market, and which is justified by non-proliferation considerations of general interest.

MINATOM	25%
Russian HEU	15%
USEC	18%
EURODIF	23%
URENCO	15%

- d. To summarize, there is clearly a predictable and steadily-growing market for enrichment, with four main suppliers that possess the capacity necessary to meet the demand of the reactor operators, and an additional resource corresponding to the Russian military HEU. Each geographical area has its own rules enabling the political authorities to supervise and organize the proper functioning of procurement of the means of producing electrical power. And this is indeed the central issue, at a time when reliability of supply is becoming a key issue in the energy debate.

e. The enrichment market thus appears to be a harmonious and stable one, but I think it is important to emphasize that keeping it so depends on good principles prevailing, and on the behaviour of all the stakeholders being both responsible and constructive. I hope, as everyone probably must, that this situation does not change and that:

- electricity companies can continue to operate their reactors confidently; and
- the enrichment companies can effectively supply the services required, while preparing for the future: preparations will include putting a convincing case for the large investments to be amortized to render possible dynamic, competitive, worldwide nuclear generating capacity.

f. It therefore appears prudent to raise the question whether there are any risk factors likely to upset this balanced situation.

Are there any risk factors capable of upsetting the current stable market conditions and creating a state of disorder?

g. The immediate impression, as I have previously mentioned, is that the market is in a state of balance.

	Current situation
Actual production capacity	40 million SWUs
World requirements	37 million SWUs

In reality, there is a major imbalance.

- The Western countries, which have a requirement for 31 million SWUs, only possess a production capacity of 20 SWUs, making them strongly dependent on Russian industry.

	Current situation
Actual world production capacity	40 million SWUs
World requirements	37 million SWUs
Actual Western production capacity	20 million SWUs
Western requirements	31 million SWUs

Without even considering the political constraints previously referred to, by simply making a comparison with similar situations where a geographical area is dependent on other sources of raw materials for energy, it is clearly apparent that there is indeed a risk factor.

- The imbalance is made greater by the differences in market accessibility in the different geographical areas. The American, Asian and European markets are accessible to competitors. At the present time, the Eastern European market is not.

This means that Western requirement balance is already significantly dependent upon Russian deliveries.

This situation calls for vigilance by the different players, while the rules of competition between the suppliers must be complied with.

- h. The second risk factor is the contingent failure or disappearance of any of the players. This could result from industrial, commercial or political problems. And it could be either temporary or permanent. It could also result from premature termination of the supply of HEU, for whatever reason.

If one of the Western enrichment service providers were to fail or disappear, what would the supply and demand situation then be?

	Current situation	Degraded situation
Actual world production capacity	40 million SWUs	30 to 35 million SWUs
World requirements	37 million SWUs	37 million SWUs
Actual Western production capacity	20 million SWUs	12 to 15 million SWUs
Western requirements	31 million SWUs	31 million SWUs

This table shows that there would be a gap of more than 15 million SWUs between Western supply and demand, a very worrying situation.

- i. A third risk factor is the exposure of a geographical area to supplies from outside it. What is the situation?

Risk exposure as a % of a total supply (2000)	Single source largest exposure	Foreign supplies largest exposure
European Union	45% (Eurodif)	19% (Russia)
USA	50% (Russian HEU)	50% (Russian HEU)
Asia	51% (USEC)	51% (USEC)
Eastern Europe & CIS	99% (Russia)	1% (others)

Two zones are widely single source plus foreign supplies dependent, i.e. the USA and Asia.

It would, of course, be possible to identify other risk factors, but I think that the three that I have mentioned are the main ones.

What conclusions can we draw?

- It is clear that, at the present time, supply and demand are substantially balanced, enabling electricity companies to benefit from stable, competitive prices. But the situation could easily be upset.
- For some length of time, the market will need its four main suppliers, and each must ensure that their output is reliable and their continued existence can be depended on.

- Anything that disturbs the present equilibrium could have substantial effects, amplified by the asymmetry previously referred to. Actual dumping, creating excess capacity or other ill-conceived actions could result in an initial drop in the price of enrichment, but also in the possible disappearance of a supplier and finally in an unacceptable and uncontrollable increase in prices, the final outcome of which would be prejudicial to the entire nuclear power industry.

To avoid such situations the following points, in my opinion, need careful consideration.

- All the stakeholders must set in place and maintain market rules ensuring that all the electricity companies are guaranteed reliable supplies and prices that remain competitive.
- Investments should not be made with a view to creating excess production capacity.
- If investment is made in capacity, due consideration should be given to the industrial means of enrichment and the requirements in the different geographical areas.
- Political decisions and agreements, such as new programmes to sell ex-military materials, need to be reached in consultation with the industrial partners, and the agreements need to be durable and consistent with economic and industrial realities.
- To conclude this section, I would like to state that the credibility of the nuclear industry in the eyes of public opinion necessitates all the players having responsible attitudes and, finally, nuclear power being both dependable and competitively priced for the end users.

What is the policy of the AREVA group?

Rest assured that I have no intention of making a marketing presentation for the AREVA group or its COGEMA and EURODIF subsidiaries. (We have a stand in the hall for that...).

AREVA, the world leader in the fuel cycle, is at the service of electricity companies and the operators of nuclear reactors, at all stages of the cycle. Its goals: to supply flexible, reliable services, at competitive prices, and thus prepare the way for future reactor orders.

This strategy obviously applies to uranium enrichment services.

- The EURODIF plant, which is now completely amortized, has been the subject of careful operation and maintenance ensuring reliable and effective functioning for more than ten years.

- AREVA intends to remain in this sector of the fuel cycle as a major long-term player, and has therefore set aside the necessary financial resources for construction of a new plant to replace the existing one. This plant will use the centrifuge process.
- With regard to the issues I have referred to in this presentation, it is important to note that AREVA is positioning itself as an active, responsible supporter of the nuclear industry by involving itself in the mechanisms for controlling and reducing the cost of the kWh by contributing to security of supply and making a voluntary commitment to the process of durable development.

Figure 1. The harmonious market of uranium enrichment services. Visibility on two decades of world requirements (the average growth rate is 0.5%/year).

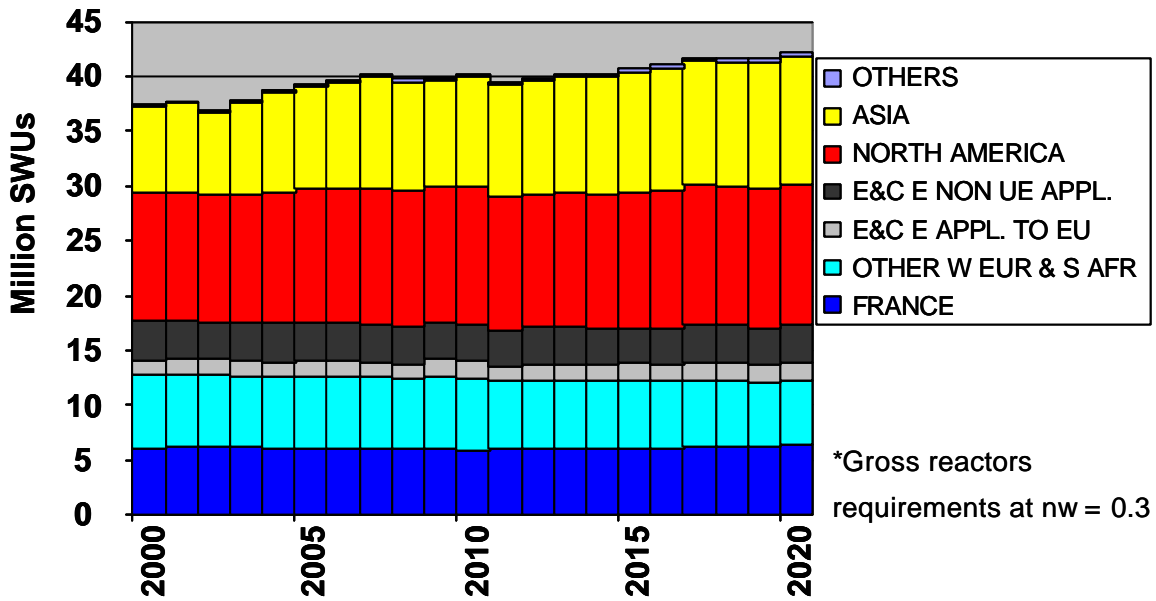


Figure 2. The market breakdown.

