AVAILABILITY OF ENRICHMENT SERVICES

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Our present technics for recovery of useful energy from the fission process consist of a series or chain of industrial undertakings.

The "heavy" links of the chain, i.e. recovery of natural uranium, enrichment when such is needed, power station, spent fuel and waste management represent highly capital intensive undertakings with a lead time for planning, siting, construction, and commissioning of 8 - 15 years. Add to this characterization that good economy requests large units and already in a normal market economy difficulties to maintain a capacity balance over the whole system of undertakings would be expected.

Nuclear energy and its undertakings has however also a different "dimension" compared to other base supply industries. Not only are we dealing with raw materials and refinement processes and products of a civil strategic importance, i.e. energy supply, but also undertakings and products that could be developed for unparalleled destruction.

It is quite elementary to state that the system or series of undertakings must be in world-wide balance if we are really to benefit from the nuclear source of energy. My comments have however indicated unusual constraints in reaching that balance.

NEED OF ENRICHMENT

Before I go into the matter of constraints and remedies I would be expected to analyse and forecast the short term and long term future need of uranium isotopic enrichment versus present capacity, capacity under construction as well as announced plans. I hesitate to do so or at least to present any precise figures. Figures have been presented at recent conferences forecasting a need for capacity increase outside the countries with controllly planned economies up to 95 000 tonnes of SWU/year during
the second half of the 1980's, i.e. fivefold compared to today's capacity. For a given nuclear power forecast, the demand for uranium enrichment separative work can be determined after assumption of data regarding

- reactor type
- nuclear plant load factors
- uranium enrichment tails assay
- plutonium and uranium recycle
- fuel cycle lead times including stockpiling.

Even if the installation of nuclear power were projectable with some degree of certainty - which is not the case - the future demand for separative work is subject to a considerable degree of uncertainty. The effect of only two of the major uncertainties on the demand has been calculated by Krymm and Woite, illustrated in Fig 1 [2].

If all plausible variations were taken into account the ratio exceeding a factor of 2 between maximum and minimum demands could be approached.

Plans have been announced according to which total capacity could produce well over 800 000 tonnes of SWU through 1990 if installed. Most likely however some of these plans are not going to be realized.

The plant output of enriched uranium is flexible. With today established methods the tails assay can vary from a high figure down to 0.2 % (and even lower) which also means a high variation in consumption of natural uranium.

We are used to be presented diagrams showing the optimum tails assay related to the ratio between cost for natural uranium and cost for enrichment. It is however to my meaning improper if planning for new enrichment capacity should be done on basis of such an illustration only.

Natural uranium is a depletable resource where also geological, geographical, and political elements interfere the availability. It is in the interest of the consuming countries and utilities to diminish the use of natural uranium, i.e. to support a policy and development towards low tails enrichment capacity and technics even if short term optimisation calculations should indicate higher figures. A widespread implementation of such a policy would support request for a capacity increase on the high side as well as further process development in the enrichment field.

CONSTRAINTS TO FUTURE ENRICHMENT AVAILABILITY

My short comment on need and capacity underlined the extreme difficulty for a presumptive producer to estimate future market, market shares, investment and business risk etc.

The main source of enriched uranium fuel for nuclear power plants has been federally owned plants in the USA and in the USSR. These plants were once built and operated to cover military needs.

Thus the enrichment industry has still not experienced a free self regulating supply-demand situation, nor has it built up a credibility of its own. It is for many reasons to be questioned if it ever will. I wish to underline my question mark by summarizing some constraining factors.

1. Technical and economical factors

a) High specific capital investment
b) Size factor where for example diffusion plants for good economy should feed 100 - 150 power reactors

c) Uncertainty as to size of future market
d) Classified technology
e) New technology under way at various degrees of development.

2. Politico-economic factors

a) The proven technology is not and will not be commercially freely available

b) Sale of enrichment services as well as end use of the enriched uranium and products deriving from it is under stringent security conditions and arrangements.

We can also foresee in the future requests and actions to improve safeguards and controls to prevent diversion of enriched material, to guard against the misuse of enrichment technology, and to develop physical protection against theft and sabotage.

FUTURE ORGANISATION

The factors are well observed but represent nevertheless an unusual set tending no doubt to discourage investment from the private sector in a market type of economy.

Nuclear power exists in a very specific political atmosphere and my conclusion is that the enrichment - as also the reprocessing - possesses such special features that it cannot be looked upon as a usual commercial venture, and cannot be treated as such. Although present plans if realized could cause even an overcapacity, I am in doubt whether usual market forces alone will be enough to regulate the adjustment of enrichment capacity in a proper way. I am aware that this opinion is not shared by everyone in every quarter.

In a market system economy one must compensate these obvious handicaps by special arrangements. Otherwise business risks and all other uncertainties will delay a timely development of new capacity and contribute to a viscous circle with a down trend in installed nuclear energy generating capacity due to nonguaranteed availability of enrichment service.

What we must achieve is an organisational set up that

a) can guarantee materials and technology be spread in a controlled and safeguarded fashion

b) will secure long term market and cost cover for base production

c) has credibility for financing of multibillion dollar venture.

This would be fulfilled in a cooperative organisation arrangement between customers and operators under governmental umbrellas and IAEA safeguards and at the same time by a limitation of number and location of enrichment facilities.

What I am trying to say is that it is high time that we get out of a thinking of traditional vendor - customer relationship. A pragmatic kind of international cooperative approach must develop in this field as well as
and even more - in the field of spent fuel treatment, an approach contradictory to traditional ideas of choice and competition. If we are unable to create radical new ideas to vitalize the development of these fundamental parts of the fuel cycle system it is hard to see how the politically and technically complicated nuclear fuel and nuclear power system will ever stabilize to a proper balance.

From the point of view of a consumer representing a medium sized nuclear power program with no domestic enrichment capacity or plans for such capacity I have, however, some prerequisites when supporting such multinational cooperative development:

- the availability of services must be assured for example through a collaboration system also between several enrichment organisations
- a development towards an enrichment monopoly situation and unfair use of such a position towards consumers is unacceptable. Government and/or consumer control and participation in this respect is fundamental
- consumers shall not be prevented from stockpiling enriched material as a national and consumer security measure
- it is not in the consumer's interest nor does it serve an aim of overall efficiency in the nuclear fuel cycle if national policies be established that insist on compulsory sale of both natural uranium and enrichment services together.

The task to develop and assure adequate enrichment capacity thus calls for international cooperative ventures of large dimensions and of very complex nature.

The concern is how to get initiatives and actions and not just produce general statements at nuclear conferences.

The coordination of planning and risk sharing must be achieved in advance and should not be the consequence from periods of instability and disappointments.

It is to me a responsibility for governments of countries in possession of enrichment technology to act together with IAEA with a common responsibility to create and regulate in a cooperative spirit with all consumer nations the adequate worldwide enrichment capacity.

REFERENCES


Fig 1. Annual World Separative Work Unit Requirements (not including countries with centrally planned economies).
A tails assay of 0.25 % and a constant load factor of 70 % were assumed.