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Outlook for the Nuclear Fuel Market: Observations of a Newcomer

Jeffry E Sterba

As a relative newcomer to the nuclear fuel industry, having started with the US Enrichment Corporation (USEC) at the beginning of 1999, over the last eight months I have had a whirlwind education. Although in my previous role as a Chief Operating Officer of a nuclear utility I was certainly exposed to the issues surrounding the nuclear industry, I was not so involved with the nuclear fuel cycle. During this eight months, I have found the industry to be utterly fascinating. However, I am certainly not an expert, and so in this presentation I will share a point of view that is really the observations of a newcomer to the nuclear fuel industry.

I have found the industry to be made up of a close knit group of highly competent professionals, who are truly committed to the nuclear option. They are people who are challenged by how to extol the virtues of nuclear energy, while attempting to manage the political and economic implications of a very complex industry. The industry is comprised of people who are also attempting to determine what is the appropriate structure for this industry and its various sectors, given that virtually every sector today is in a condition of oversupply. I have found it interesting that while some of the previous presentations talked about potential shortages of uranium, we are operating in a marketplace today in which it appears that there is an oversupply.

I have also found the industry to be much more complex than I expected. Complex in very intriguing ways that involve the inter-linkage of national security with trade and commercial issues. This provides very fertile ground for fascinating and challenging times, and great opportunities for a new ideas to come to the table. Within USEC, I have found a company that is ready to transform what I think may be appropriately characterised as a heritage of government bureaucracy. There is a commitment to transform USEC into a competitive market-focused company. While many of the historical attributes of USEC are key to its future, others are not.

While we certainly operate in a global marketplace, I would like to make a few comments about the lay of the nuclear landscape in North America. While not a renaissance, I think there is clearly a reinvigoration of the nuclear industry occurring, and it has happened rather quickly over the last couple of years. Awareness of the environmental issues has created a situation in which nuclear can be looked upon in a different way. I agree with Mr Doucet that environmental awareness does not in itself make the nuclear option viable. But it does allow the nuclear option to be considered for the future. In order for it to be acted upon, obviously nuclear will have to compete in an economic sense.

However, in the United States, as in other countries, nuclear power has an Achilles heel at this stage, which is the storage and disposal of spent fuel. Until that issue is resolved in the eyes of the public, the increased interest in nuclear power will not translate into a commitment to additional investment.

As I mentioned, economic performance is obviously a key factor, and this is one area where I believe the nuclear industry, not just in the United States but across the world, has shown marked progress. Since 1990 there has been an improvement of over ten percentage points in the average capacity factor of US reactors. Looking at that on a world scale, it is equivalent to almost twenty new 1000 MWe reactors, just through the improved performance of existing reactors.

We have also seen in the USA an enhanced relationship between the nuclear power industry and its regulator, the Nuclear Regulatory Commission (NRC). While still making sure that health, safety and security are of paramount importance, the NRC has become much more focused on cost-effective risk assessment, compared with what some have characterised as an adversarial role of five or more years ago. This can be particularly seen in the potential for licence renewal for existing reactors.

We now have a situation in which five licence renewal applications have been filed with the NRC, and three reactors have been granted initial approval to extend their licences beyond the initial 40 year term. There are another 14 reactors that have given notice of intent to file. What is interesting is that this is occurring in a market-based competitive environment for electricity supply, and that probably four or five years ago some of these plants were expected to be subject to premature shut down. Now we are seeing a marketplace that is receptive to their life extension.

The changes in the electricity markets are finally creating a market for the ownership of nuclear assets. In the United States there are 103 reactors, which are operated by 41 companies. However, 14 of those companies operate only one reactor and another 16 operate two reactors. Thus, of the 41 nuclear operating utilities, 30 operate only one or two reactors. This creates an environment that is ripe for consolidation, which we are certainly seeing. There are now five transactions that have either been closed or are near completion that will change the ownership of nuclear reactors. So far we have two main players participating in this element of the revitalisation of the nuclear sector, but there are others waiting in the wings.

I think the most powerful part of this is that these changes are occurring within the context of a competitive electricity market, in which the discipline of the marketplace is selecting winners from losers. It is determining that nuclear plants can be winners, albeit with the purchase of nuclear assets at a small fraction of the investment in building them. There is a long way to go before new nuclear facilities can compete with what I still believe will be a plentiful supply of natural gas within North America. The discipline of a market place has numerous implications. For nuclear fuel suppliers, there is the trickle-down effect, where customers who are now operating in a competitive market have much higher expectations or demands of their suppliers.

Let me speak now about the enrichment industry. In the enrichment market there is a significant current oversupply condition which has created stiff competition between the enrichers (Figure 1). There are now three broad sources of enrichment or its equivalent. First is the traditional fresh uranium and enrichment approach. The second is the use of spent fuel reprocessing and mixed oxide (MOX) fuel technology, both in the conventional way it is being used in a number of countries already, and also the future use of weapons grade plutonium for MOX fuel. The third is the use of low enriched uranium (LEU) derived from high enriched uranium (HEU) that has been removed from nuclear weapons.

There are plans for each of these three sources to be expanded in varying parts of the world. There are plans to expand worldwide enrichment production capability; there are plans to increase reprocessing capability in the world; and there is certainly interest in building on the success of the Russia-US HEU arrangement and expanding it to apply to additional HEU material from nuclear weapons stockpiles.

Yet, these endeavours are occurring in a marketplace that currently is oversupplied. How will this work out? That I think is one of the major challenges we face. The Russia-US HEU transaction that USEC is involved in as the Executive Agent has created some of the excess supply, including a significant secondary source of uranium as well as enrichment. But in the greater scheme of things, the HEU agreement is, as we say in the United States, *on the side of the angels*. It represents the single largest swords-to-ploughshares programme (Figure 2). So far 66 tonnes of HEU have been converted, representing over 2700 nuclear warheads. It will amount to 7000 nuclear warheads by the end of 2001, and 20 000 by the end of the term of the existing agreement in 2015. So, far over US\$1.4 billion has flowed to Russia under this agreement. Much of this, although maybe not enough of it, has been used to help support the nuclear industry that Russia has a right to be so proud of. The arrangements were intended to be commercial in concept, although this is not yet fully the case and additional changes need to be made. In 1999 we will take delivery of the largest quantity so far under the agreement, the equivalent of over 30 tonnes of HEU, with over 5.5 million SWU of enrichment associated with it.

An important implication of competition in the enrichment industry, as in any industry, is the tendency for customers to want greater diversity in the supply of critical inputs, for both leverage and risk reasons. The enrichment market largely developed regionally with a strong preference for the use of indigenous suppliers in the countries and regions in which those enrichers were located (Figure 3). Today there is greater diversity of supply than there was ten years ago, but the patterns that have developed are different across the regions. As competition begins to heat up for nuclear utilities worldwide. Will this profile be significantly different five years from now? This is clearly an issue that we will be addressing, as will others in the enrichment industry.

A further impact that competition is having in the uranium enrichment industry is premium on cost control and the efficiency of suppliers. With the gaseous diffusion technology which USEC is using, electricity and labour are the two biggest cost inputs. Although the western United States has had well developed wholesale electricity markets and the associated price volatility for the last ten years, USEC's gaseous diffusion plants (GDPs) are

in a region where truly competitive wholesale markets are a more recent phenomenon. In fact, significant price volatility has only occurred in this portion of the Midwest - Kentucky and Ohio - over the last few years.

These changes in the pricing of electricity have led us to dramatically alter the way in which we operate the GDPs. During periods of anticipated high power demand (and thus high prices) we can ramp down the use of certain of the cascades. In periods of unexpected high demand and high prices we can use freezer sublimers capability to manage the loads placed on the GDPs over a relatively short period of time. Figure 4 shows the difference between fiscal year 1998 and the present year in terms of the profile of spot market prices for electricity and the way in which we use electricity at the GDPs. In the fiscal year 2000 we expect volatile electricity prices and you can see that the shape of our power use curve is substantially different. This has led to significant savings. In the first eight months of 1999, we have saved approximately US\$60 million in electricity costs through being able to manage the relationship between electricity use and SWU production.

As I mentioned, is the second major component of costs. In USEC's GDP labour force there has been a reduction of approximately 20% over the last three years (Figure 5). Further changes will be driven by market forces, while we continue to ensure a safe and productive working environment at the GDPs.

Let me mention briefly something that is of interest to many in the nuclear fuel industry: the impact of USEC's uranium stockpile on the market. As is well known, USEC has a stockpile of about 24 000 tonnes of UF₆. In return for that material, USEC made a commitment to ensure that its entry into the market is managed in a prudent manner. Of course, it is hard to tell what might cause the market to move. But I thought it might be useful to put USEC's stockpile into perspective with the rest of the market (Figure 6). Over the period 2000-08, USEC's total inventory represents less than 4% of total uranium demand. Comparing USEC's uncommitted inventory with the uncommitted demand that exists in the uranium market, it is less than 5%. The amount of uranium that USEC has in inventory is about two and a half years worth of the uranium component of the material that will be delivered under the Russia-US HEU deal. My point is that it is a fairly small percentage, and it is only one of, many factors in the uranium market that can drive prices and cause changes in the outlook for the market.

I will conclude by just briefly touching on something I know is important: our commitment to do everything we can to enhance USEC's market-driven and customer-focused approach. Those are buzz words that must be backed up by action. Our commitment as a company is to ensure we do the best we can to meet our customers' needs, not only for enrichment services but also for whatever else we can provide, as we work together to improve the prospects for the future of nuclear power in the United States and the rest of the world.

3. Regional diversity of enrichment supply.

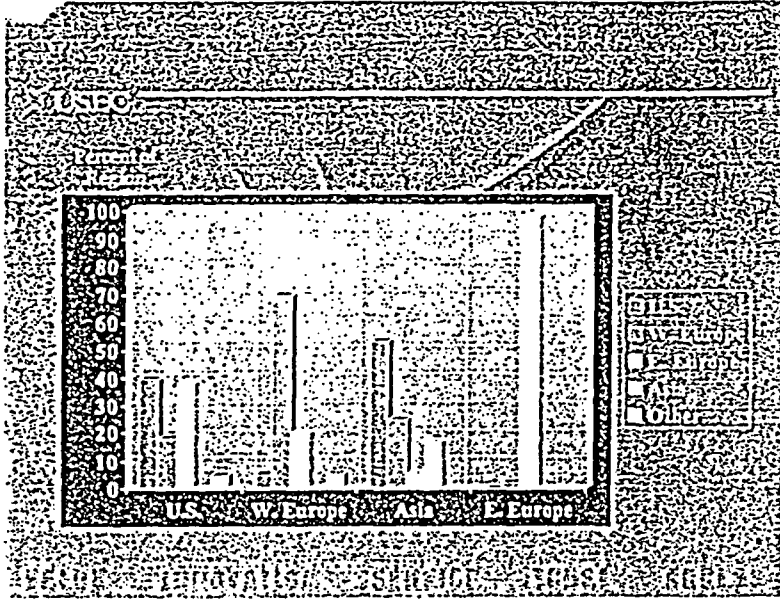


Figure 4. Comparisons of power consumption at USEC's GDP's and electricity spot market prices.

