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U.S. NUCLEAR REGULATORY COMMISSION
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NRC Staff Other
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Secondary Supplies: Future Friend or Foe?

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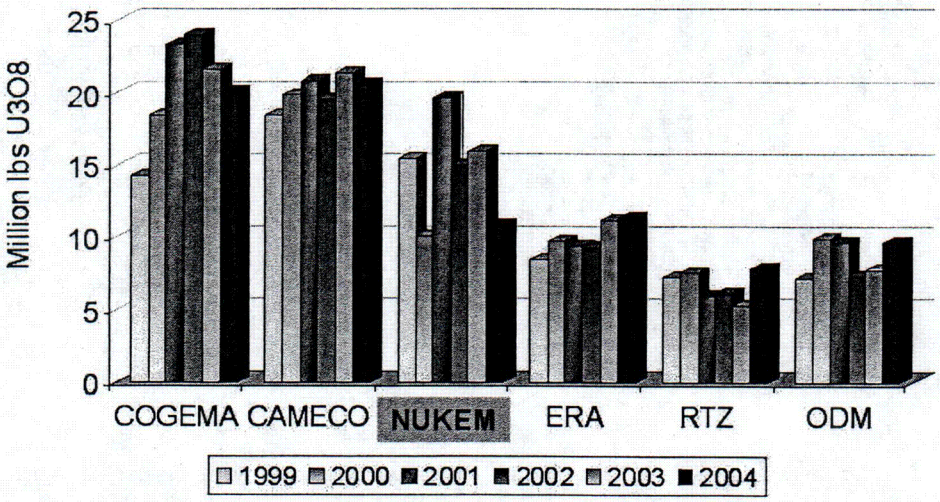
Good morning ladies and gentlemen.

My topic today is "Secondary Supplies: Friend or Foe?" The recent disclosure of the sale of US government tails to Energy Northwest, the pending US government sale of its HEU stocks and tails inventory, and the renewed interest in an HEU II deal, make this a very relevant topic.

In the brief time that is available to me I will do my best to make the case that, because these secondary supplies are a friend to some and a foe to others, it is incumbent upon our industry to find common ground on this issue if we are to avoid fuel supply disruptions in the future.

Figure 1 – RWE NUKEM Delivery Commitments vs. Uranium Production of the Big Producers



Just briefly, here's how NUKEM fits in relative to other top suppliers *(Figure 1)*. As you can see, we're right in the middle of things, with the six of us accounting for about two-thirds of annual global production. Aside from the free publicity, the reason I put this slide up here is to establish our credentials in respect to this topic. Over NUKEM's twenty-five-plus-years history we have been one of the

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largest sources of secondary supply to the spot market. During that time we have viewed these sources as either potential friends or foes depending upon whether they were under our control or not. So this is definitely an issue to which we can speak knowledgably.

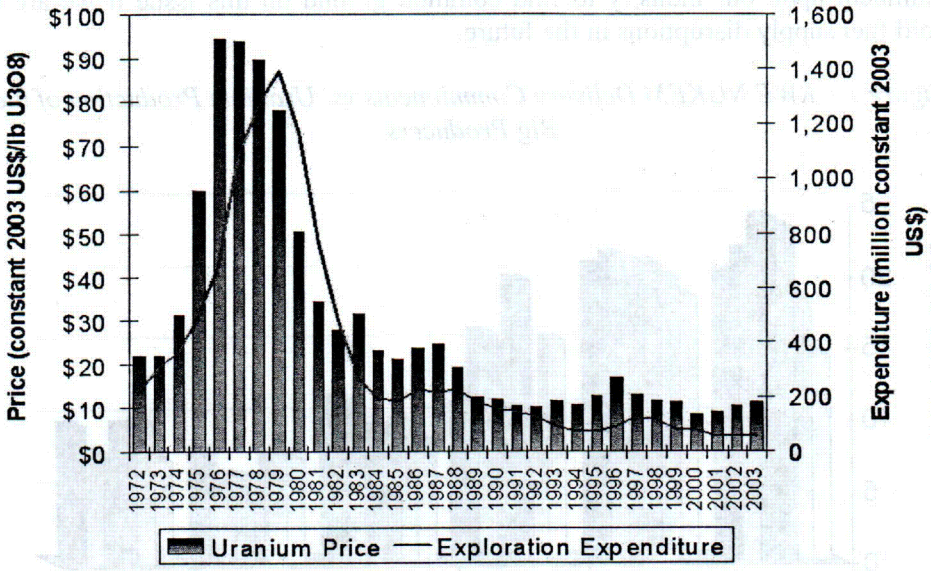
As we all know, the nuclear world has been cruising on secondary supplies of different types for more than 20 years. These supplies have been so ample that they perennially make up one-third or more of total supply for uranium and conversion, and somewhat less for enrichment services.

For any fuel buyer trying to save a dollar on procurement, secondary sources have been a real friend over the years. By the same token, for producers, secondary sources have represented an implacable foe, especially the segments of secondary supply that come to market unpredictably.

Beyond this narrow view of "friend" and "foe" defined in terms of price, however, there are the larger questions of security of supply and the long-term sustainability of the nuclear fuel cycle.

Clearly, secondary supplies – in the form of marketable inventories – are a friend when they enable us to skate over supply disruptions with no one running out of fuel. Those supplies can be a serious foe, however, when they discourage new investment in primary production facilities.

Figure 2 – Excess Supplies Destroy Exploration Investment



Source: Tom Poole, INI

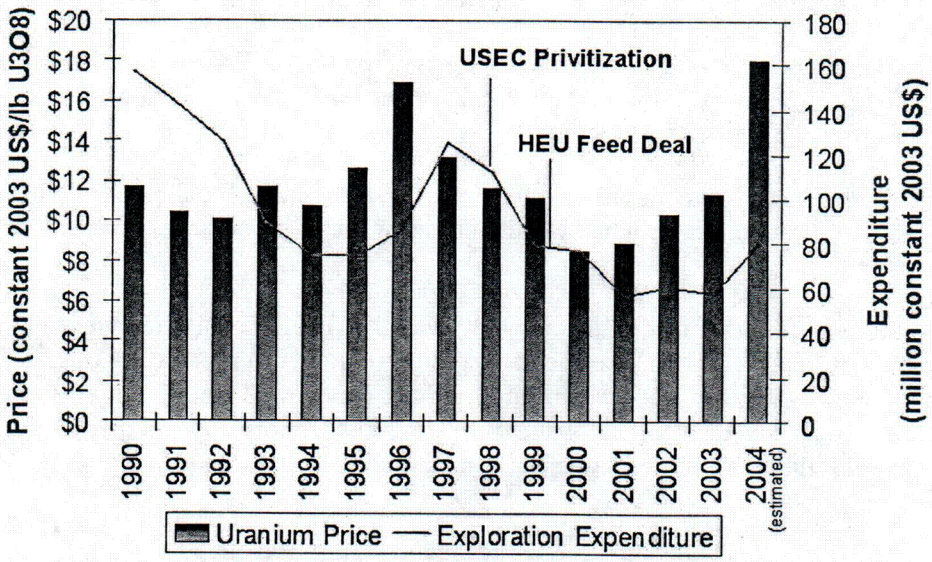
This is the big picture of uranium prices correlated with Western-world exploration expenditures, stated in 2003 dollars *(Figure 2)*. Exploration is obviously a function of market price for the product, and as the market price fell, exploration investment fell right along with it.

A couple of points worth noting: Most of today's primary production – and much of the prospective new production – is coming from deposits discovered 20 or 30 years ago. Thus, a good question is whether we are investing enough to be able to

guarantee supplies for the next generation of nuclear plants? Without those supplies, will there even be a big new generation of nuclear plants?

Then too, consider the scale of what exploration investment used to entail: Almost a billion dollars per year at its height in the late-1970s. That might have been excessive, but it's certainly a far cry from the $60-$100 million per year invested more recently or even the $180 million estimated for this year.

Figure 3 – Recent Impact of Secondary Supply

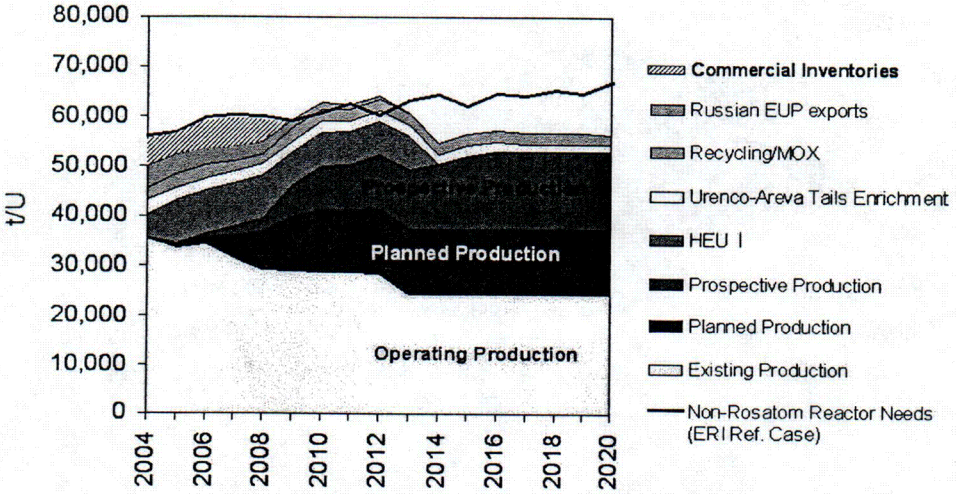


Source: Tom Poole, INI and RWE NUKEM, Inc.

This curve illustrates somewhat more dramatically how closely tied exploration investment is to the market price of uranium *(Figure 3)*.

The 1996 price spike jump-started exploration immediately, and the subsequent price fall crushed it. There seems little doubt that the availability of cheap secondary supplies was the main culprit in the market's prompt retreat.

Figure 4 – Non-CIS Uranium Supply-Demand



This is essentially a "base case" picture for uranium requirements as of the start of this year *(Figure 4)*.

We see demand growing moderately, with new reactors and licence renewals off-setting the effect of falling tails assays.

In the near term, there may be a supply shortfall, but this should be filled by available excess inventories from the commercial sector.

Notice, though, that new production is ramping up quite sharply – sharply enough so that inventories stop being a major supply factor in the 2008-2009 period.

The apparent supply gap that opens up in the 2013-2014 period stems largely from just two events: the end of the Russian HEU feed deal and the expected shutdown of ERA's Ranger mine.

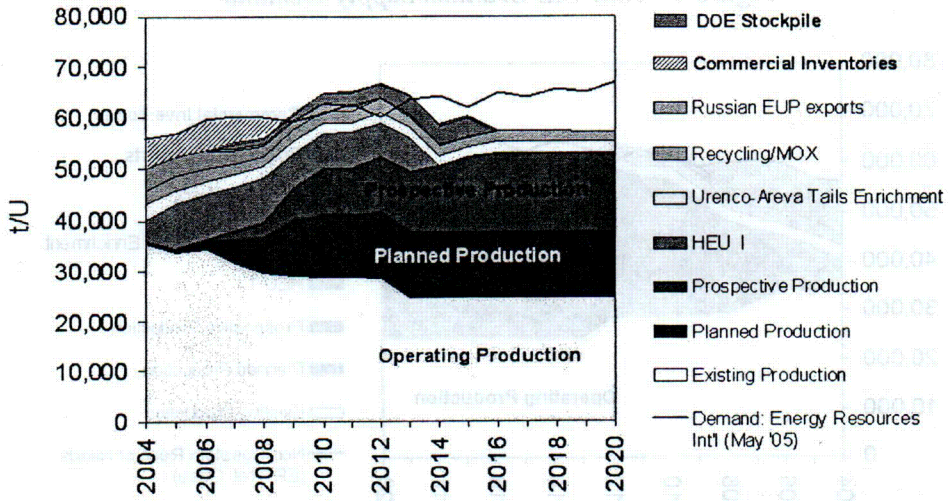
A key question is the extent to which market forces will be allowed to stimulate necessary production, or whether yet another wave of secondary supplies will play a disruptive role.

At the beginning of this year, our view was that DOE inventories were likely to remain in place – much like the strategic petroleum reserve. Most of this DOE stockpile – something over 60 million pounds of natural uranium equivalent – is subject to a sales moratorium that expires in 2009. It now appears that DOE plans to start liquidating this stockpile as soon as it is feasible to do so.

With no consultation at all with the nuclear industry, the Energy Department is already looking for RFPs dealing with parts of its stockpile. Apparently, the wisdom of the overall policy of liquidation is not an area where industry input is either sought or welcome.

Whether by accident or design, the timing of such sales could have a very unwelcome impact on the market, at least from the suppliers' standpoint.

Figure 5 – "Western" Uranium Supply-Demand plus DOE Inventory Sales



As this slide illustrates, the proposed DOE stockpile liquidation plan coincides with a period of rising production and precedes the gap arising from the end of the HEU-1 deal and the probable shutdown of Ranger.

Thus, two or three years before new production will be needed, we suddenly see significant government supplies coming into the market at indeterminate price levels.

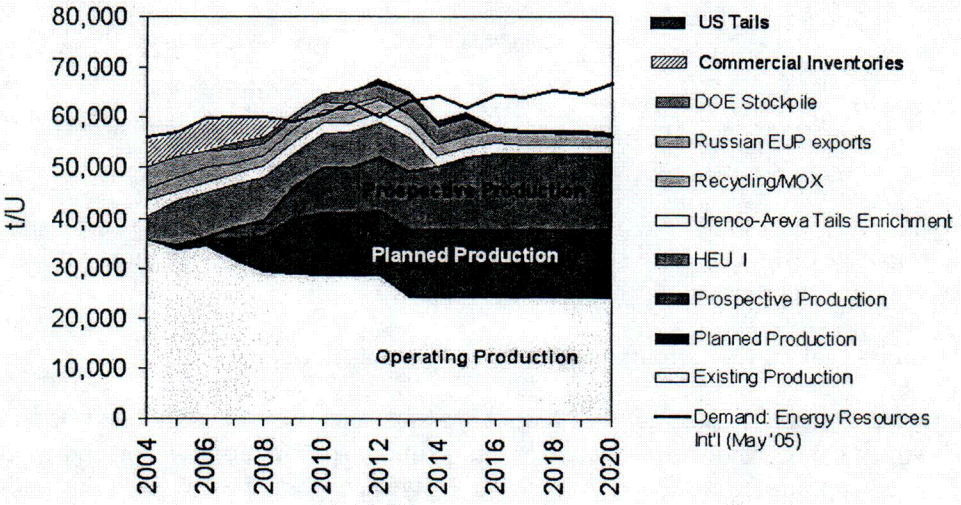
It is hard to see why this inventory liquidation would not be price-suppressive, and we know only too well what liquidation of governmental stockpiles has done to the production sector in the none-too-distant past.

It is only in the last few months that that is has become clear that US uranium tails material – held mostly by DOE – may constitute yet another source of competing supply.

According to a recent announcement, the federally-owned Bonneville Power Administration will obtain up to 1900 tonnesU (equivalent to about 5 million pounds U_3O_8) from DOE tails in the period 2009-2017.

An arrangement that was apparently two years in the making, it forms a perfect example of what government favouring opacity over transparency.

Figure 6 – "Western" Uranium Supply-Demand plus DOE Inventory Sales plus US Tails



Although the US tails stockpile might produce as much as 70 million pounds of natural uranium equivalent over time, capacity constraints seem likely to limit the scope of such a program (at least in the US) to something on the order of 750 tonnesU equivalent per year, or about 2 million pounds worth.

Thus, at this point, we do not see US tails being a make-or-break proposition for the Western World uranium market.

Whether US tails might find themselves being re-enriched in Russia is another possibility, but at this point it is too early to speculate.

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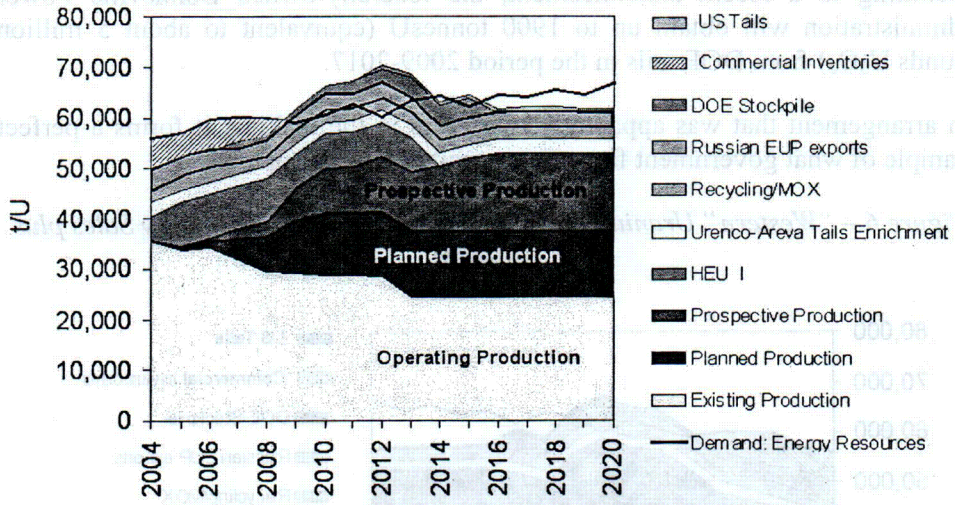
In our base case projection, we assume that Russian EUP exports will taper down gradually between now and 2012. This is based on the prospect that demand to supply the Russian-design reactors will grow over time and that Russia's domestic primary uranium resources may not be adequate to meet requirements.

Still, it doesn't have to be that way. It is estimated that Russia may have enough tails material to produce the equivalent of about 60 000 t/U of natural uranium, or 3000 t/U per year for 20 years. A domestically-focused HEU-II deal is another possibility, meeting domestic needs handily.

Thus, it seems entirely possible that Russia could maintain an export program of 3000 tonnes of uranium per year equivalent in the form of EUP, at least until the 2020 time frame.

Figure 7 – "Western" Uranium including DOE Stockpile, US Tails and Russian EUP

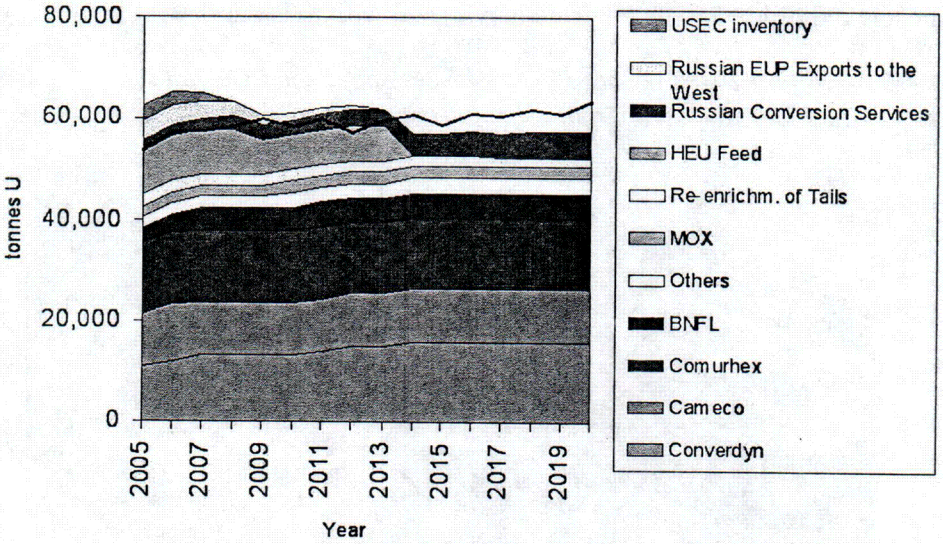


When we put just these three sources of extra secondary supply together, we see a market that is over-served in the 2010-2013 period.

It certainly looks a lot more like a glut than it does a shortage.

There seems to be no question but that as we approach the end of the next decade we will need considerable increases in primary production – and possibly continued support from secondary supply. However, when we compare this slide against the Base Case I presented in slide 6, we see that the potential release of secondary supply would compete directly and successfully against prospective production, pushing off a recovery in the uranium mining sector by perhaps three to five years.

Figure 8 – "Western" Conversion Supply-Demand
(Includes Rosatom Export Potential/Exludes Rosatom Own Needs)



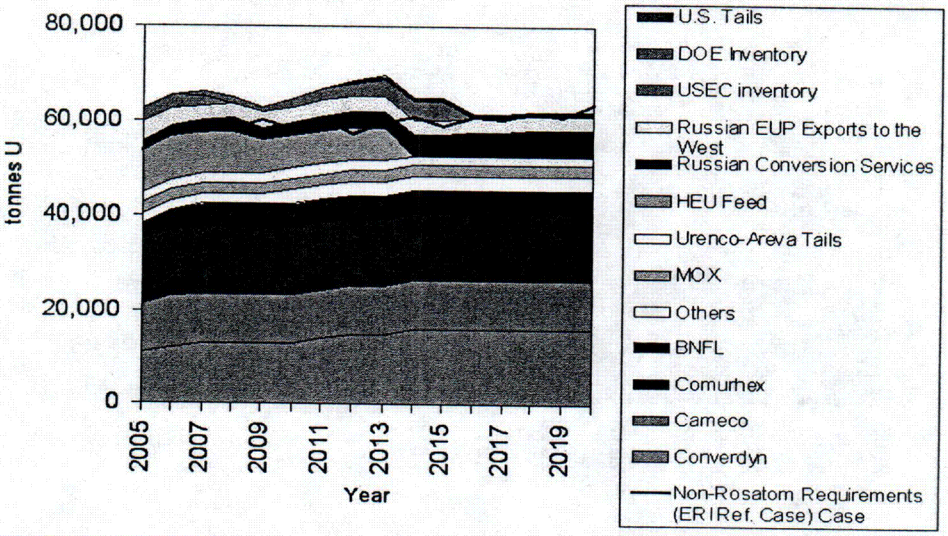
Here we see a "base case" for conversion services. To the degree that there looks to be slight over-supply in the near term, what this represents is necessary inventory-building to make up for the inventory liquidations of 2003-2004.

The gap we see farther out stems from the prospective end of the HEU feed deal.

Unlike the case of uranium, however, new conversion services that may be needed to fill the gap do not depend on discoveries made years in advance. The conversion services industry has ample time to add capacity to meet future demand. As long as commercial terms are reasonable – which they were not a few years ago – appropriate capacity additions are eminently feasible.

As we will see, however, possible additional secondary supply, and exports from Russia, may complicate future capacity planning.

Figure 9 – Conversion Supply-Demand plus DOE Inventory, US Tails, and Russian EUP Exports @ 3000 t/U equiv. per year



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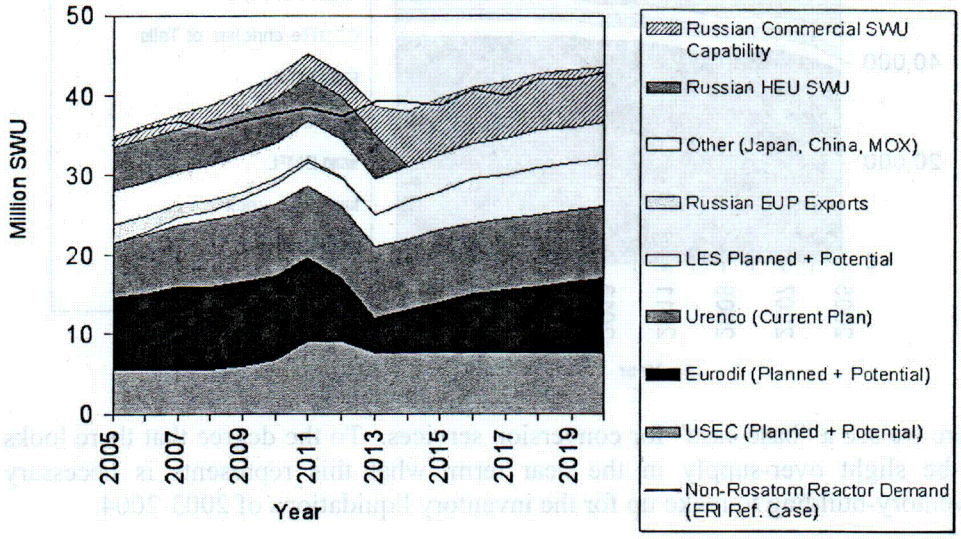
Once again, the liquidation of government stockpiles, both Russian and American, could make near-term investment in added primary capacity considerably more risky than it needs to be. The solution would be more transparency, but fortunately we still have several years in which to work this out.

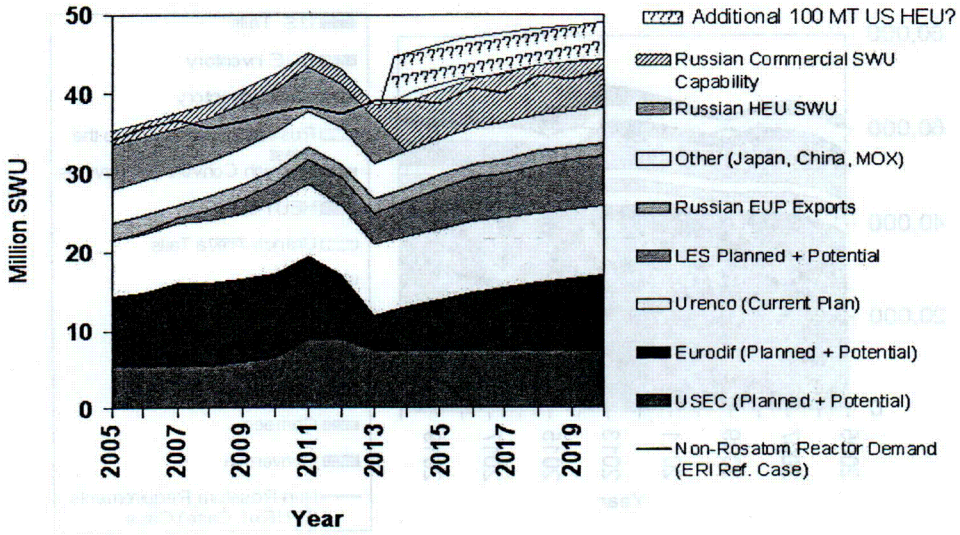
Figure 10 – "Western" Enrichment Supply and Demand (Includes Rostaom Exports/Excludes Rosatom Requirements)



We are now looking at the base case for enrichment services.

It is noteworthy that the West is scheduled to lose about 17-18 million SWU of capacity with the planned retirement of the US and French GDPs. Another 5.5 million SWU is scheduled to go away with the end of the HEU-I deal. Thus, with about 23 million potential "Western" SWUs dropping out, and only about 14 million SWU firmly planned, there is a substantial gap to be filled. We expect this gap to be filled partly be added Western capacity and significantly by a major increase in Russian commercial SWU supply to the West in the post-2013 time frame.

Figure 11 – "Western" Enrichment plus Additional Russian EUP+US HEU



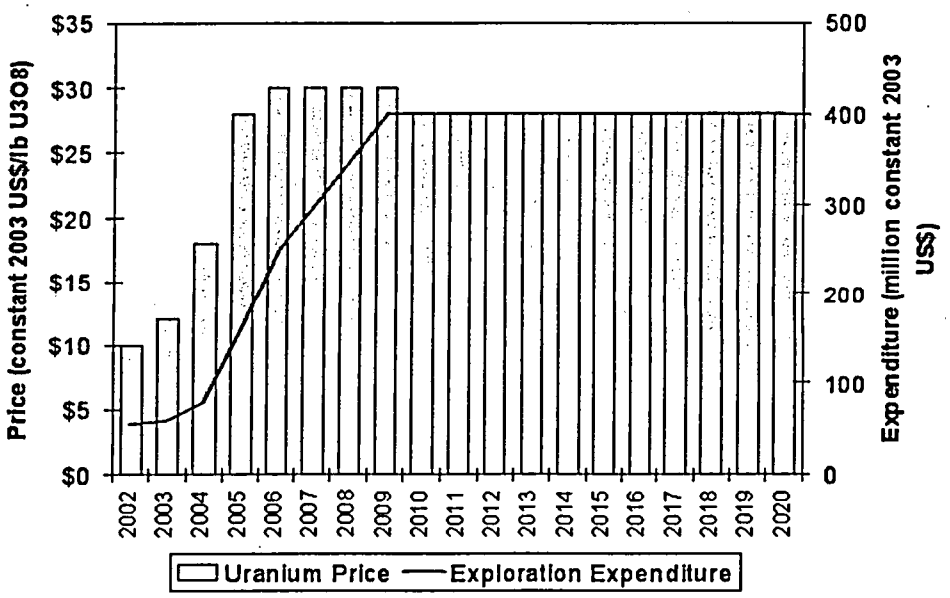
Some of you may recall that in 1994, then Secretary of Energy, Hazel O'Leary, declared 174 tonnes of HEU surplus to defence requirements. Of this, 39 tonnes was allocated to TVA, 64 to USEC, 10 to test reactors and 23 was declared waste. Nearly half the remaining 38 tonnes was recently subject to a DOE solicitation of interest, and the rest is expected to be disposed of as well. We calculate that the 34 tonnes, in lots of 17 and 21 tonnes, contain approximately 4 to 4.5 million SWUs. This should begin to reach the market as early as next year at the rate of about 350 000 SWUs per year over 12 years.

That said, there is yet another potential source of supply: what the DOE has termed "up to 100 metric tonnes" of HEU. This is additional material that could be declared surplus to defence needs, as per a 2004 announcement.

Depending on the enrichment level, which has not been disclosed, this lot of HEU could contain anywhere from perhaps 8000 t/U to 20,000 t/U, anywhere from seven million to 19 million SWUs. An educated guess would put it at around 10 million SWUs and 12 000 tonnes of contained uranium.

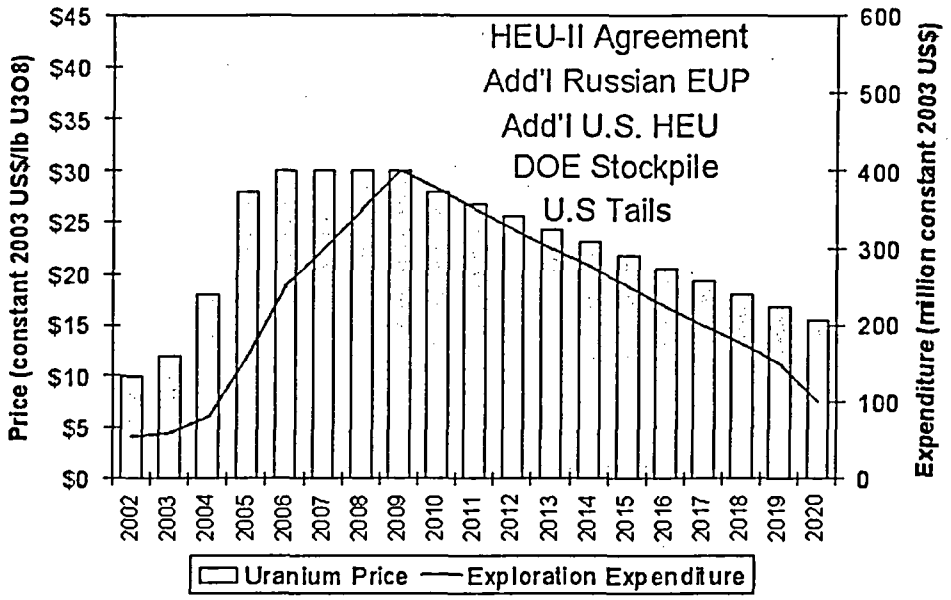
As to timing, we note that since US blend-down capacities at NFS and B&W facilities are limited, we might not be seeing any of this material being burned in a reactor until after 2013. However, the fact remains that the US government is in the process of developing a plan for commercializing this inventory, and potential buyers have already registered their interest in acquiring it.

Figure 12 – Exploration Investment: Proxy for New Investment in Primary Production



If the past is a guide, this is the sort of scale of investment in uranium exploration one would expect at higher price levels. If we are going to have adequate supply in the 2020s and 2030s – which we will need if new plants are to be built – this is scale of investment required.

Figure 13 – Exploration Investment: Hammered By New Secondary Supply



Here's what happens – optimistically – with new secondary supplies dumped on the market. It could get ugly.

It is simply a fact that higher prices in the uranium market are essential if new exploration is to uncover new deposits, and if new investment in mines and mills is to occur. Moreover, these price levels can not be allowed to slide back into the basement if supplies are going to be there in the next decade and beyond when new nuclear plants may ordered.

Markets don't like surprises, especially surprises that are inflicted on them by government whims that disregard such private sector requirements as return on investment and reasonably predictable requirements. This is particularly true in the uranium sector, where discovery and development risks are high, and lead times extraordinarily long. If governments really want to be a friend to the market, transparency and true market neutrality must be the name of the game. Only when secondary supplies are viewed as a friend to all, and a foe to none, will fuel suppliers be in position to make the necessary investment decisions that will assure adequate supplies to meet expanding demand.

Thank you.