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The End of the HEU Deal: A Conversation with Tom Neff

The last shipment of LEU blended down from Russian HEU was made last week. To mark this occasion, we thought it only fitting to get some observations from Dr. Thomas Neff, widely considered the father of the HEU deal. On October 24, 1991, Dr. Neff proposed the concept of the HEU deal in a New York Times Op-Ed entitled, "A Grand Uranium Bargain." Because of this concept and his subsequent work in making the deal a reality, in 1997 Dr. Neff was awarded the Leo Szilard Award.

While nuclear fuel industry tends to focus on the supply and market ramifications of the HEU deal, it was driven by important nonproliferation and economic considerations. Moreover, while the deal has been accepted as a fact of life and perhaps has been taken for granted, it was far from a "slam dunk" due to its incredible complexity. Below UxC's President, Jeff Combs, explores the origins of the deal and the issues faced along the way with Dr. Neff in order to provide the reader with more insight to this historic development.

How did the deal get started? Following the Bush-Gorbachev arms limitations actions in 1991, I wondered what would happen to all the weapons being demobilized and it occurred to me that the HEU in a nuclear weapon would be worth more than a half million dollars if blended down to power plant fuel. I described how this would work in the New York Times Op-Ed. But several days earlier, on October 19th, I met Victor Mikhailov, head of the Russian weapons program, at a Federation of American Scientists (FAS) meeting in Washington. I proposed a sale of Russian HEU and gave him a draft of the Op-Ed and an economic analysis. He immediately asked how much he could sell. I knew a bit about U.S. production but not that of Russia and suggested 500 tonnes. He startled me by saying he could do that.

So, the deal came down to this impromptu meeting? Yes, the whole deal might never have happened if Mikhailov had not been a chain-smoker and had to stay in the hallway outside the non-smoking conference room, making it easier to approach him.

What happened next? In December, I went with the FAS group to Moscow and met with officials of the weapons labs who were in serious financial trouble, confirming my fears about instability. At Russian invitation, I returned to Moscow several times in the spring of 1992, meeting with the Ministry of Foreign Affairs and Minatom. By this point, it was clear that the U.S. would not initiate things so I wrote to Mikhailov saying:

"Unfortunately, the U.S. interagency process has not resulted in any agreement on how to act. Officials have suggested to me that it would be easier for the U.S. to react to a Russian proposal, than to make such an official proposal."

This was, of course, stretching things a bit, but it worked. Mikhailov sent a letter to the U.S. and met in Washington on July 21st with then Energy Secretary Watkins, proposing a deal. During the next six weeks, General William Burns led negotiations with Mikhailov and on August 31, 1992, President George H. W. Bush announced an agreement, essentially the same as was signed by the Clinton Administration on February 18, 1993.

But, it was not just Russia that was involved. Correct. The fact that HEU was worth a lot of money was also essential to getting Ukraine to repatriate its weapons to Russia, a point made to Ukrainian Defense Minister Antonov in our December 1991 FAS visit and during my visit early the next year. The idea was that Ukraine would exchange strategic weapons stationed there for fuel for Russian-type reactors, which was later done under a January 1994 trilateral agreement negotiated by Vice President Gore. Kazakhstan (which I first visited early in 1992) and Belarus gave up the weapons stationed there.

The economics of the deal proved to be anything but simple, especially when it came to the contained feed. When I originally proposed the deal, my analysis showed that the LEU from Russian HEU could be used in the DOE enrichment program, saving money (which then included recovered costs for the U.S. plants). This would make the deal "budget neutral," a requirement of a 1986 law. The idea was that DOE would sell the SWU and overfeed utility uranium deliveries displaced by the EUP from Russian HEU. However, the creation of the U.S. Enrichment Corporation changed the calculation: it no longer made sense to overfeed uranium and the new Corporation also needed to make a profit on the HEU deal.

Without overfeed, the displaced uranium was orphaned and could not be sold due to the Suspension Agreement. The DOE officials who negotiated the commercial agreement in 1993 (prior to formation of USEC) called for payment for the uranium component only when "used or sold," or by the end of the HEU Agreement. "Used" referred to overfeed in the DOE enrichment

plants, which would not occur. The result was that Russia was not going to be paid for the uranium component, about one-third of the money, until 2013. And the uranium, unlike the SWU component, was the property of the Russian government, not Minatom.

This was obviously a key stumbling block. Yes. I worked with Senator Domenici and his staff in 1996 as he drafted the Privatization Act, which returned title to the uranium component to Russian control and introduced a gradually increasing quota for its forward sale. This over-rode both the defective contract and the Suspension Agreement restrictions. Domenici also required USEC to purchase and transfer to DOE the displaced uranium feed for 1995-96 deliveries as a condition for privatization. At Dominici's suggestion, I met several times with USEC head Nick Timbers, suggesting that leaving a $4 billion uranium liability in 2013 would not be good for privatization. USEC agreed.

What few seemed to know until USEC issued its prospectus for privatization in 1998, DOE had much earlier transferred large amounts of uranium to the company which proposed to sell very large volumes in the next few years. As UxC commented at the time, there was not room in the market for both USEC and Russian uranium. I went back to Domenici, who appropriated $325 million to buy 11,000 tonnes of uranium from the 1997 and 1998 deliveries (which would be worth more than a billion dollars today), conditional on Russia reaching an agreement on a commercial deal beginning in 1999. After several false starts, involving intermediaries who tried to get involved, Cameco, Cogema (now AREVA) and NUKEM signed an agreement in March 1999. Their involvement was integral to the deal moving forward.

Once this hurdle was cleared, what were the major problems? The U.S. and Russia both had problems with oversight and implementation. The 1990s were a period of turmoil in Russia, leading various parties to seek access to the large stream of revenue from the HEU deal. The same disorder that allowed Minister Mikhailov to enter into the deal in the first place also meant that the Russian government initially had trouble overseeing its implementation.

On the U.S. side, the underlying problem was lack of effective U.S. government oversight and difficulty balancing conflicting domestic and international security objectives: maximize returns from privatization, maintain a domestic enrichment capability, deploy a more efficient enrichment technology, keep jobs in Ohio and Kentucky, and keep the HEU deal going, all while making profits for shareholders and to pay substantial corporate overhead. To me, it seemed impossible for a profit-oriented firm to carry out all these objectives without ongoing subsidy, either by the U.S. or by Russia. The national security people, while great at arms control and strategic matters, were not so great at using commercial mechanisms to implement their objectives, while the government officials looking at the business and domestic political issues did not pay enough attention to national security.

You must have travelled a lot to Russia as part of this process. In total, I made 20 trips to the former Soviet Union between 1991 and 2003, working with Atomic Ministers Mikhailov, Adamov and Rumyantsev, as well as with Ministers of Finance and Deputy Prime Ministers. We also met in Europe and the U.S. The U.S. frequently did not have a "front channel" mechanism for bilateral consultations to solve problems, perhaps not wanting (or able) to get involved in commercial matters, which is exactly what the HEU deal was. Instead, commercial matters, and information flow, were often delegated to commercial agents and it was sometimes not clear if an agent was speaking on behalf of its government or on its own behalf. What was needed to complement this was a "back channel" for information flow and analysis between governments, which I tried, as best I could, to provide.

But, these efforts paid off – the deal was a success. However clumsily, the HEU deal got done. Russia has received about $17 billion, 500 tonnes of HEU were destroyed (from 20,000 to 30,000 nuclear weapons), and the Russian nuclear establishment not only survived but now prospers. From the U.S. perspective, a major national security objective was achieved. No weapons, weapons material, or personnel went astray and the commercial deal made possible the achievement of major arms control objectives, including MPC&A, verification and transparency. Together with U.S. HEU blending, about a third of the weapons material on the planet has been safely destroyed.

What does the future hold for HEU? It is very clear that the final delivery on December 10th was the last to the U.S. Russia still has HEU and it may blend down more for its own use. Thousands of workers are employed at a number of facilities purifying and blending down HEU. Russia has usually had to blend with material enriched from tails in order to meet western specifications but it can make fuel for domestic, and some foreign, use without such costly procedures. Moreover, the levels of isotopic contamination in much of the remaining Russian HEU are higher than was used for the deal with the U.S. This means that even if Russia continues to blend down HEU, it is likely to be burned in Russian reactors.

Any final thoughts? The ultimate lesson of this 22-year effort is that there can be win-win solutions to international security problems. It takes a lot of people working together – different governments (and even different political parties within the U.S. government) as well as private industry – but it can be done. This is something to keep in mind as we confront the problems of today.