The U.S.-Russian HEU Purchase Agreement: Achievements, Problems, Prospects

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Executive Summary

In August 1992, U.S. President George Bush announced that the United States would buy approximately 500 tons of highly enriched uranium (HEU) from Russia over the next twenty years; this HEU would come from dismantled Russian nuclear weapons. This material would be blended with low enriched uranium (LEU), fabricated into reactor fuel, and sold to nuclear power-generating utilities in the United States and elsewhere in the world. Moscow would receive the proceeds of these sales, thereby giving Russia a financial incentive to continue its nuclear weapons dismantlement program, as well as hard currency for economic reforms and nuclear safety improvements. At no cost to the U.S. taxpayer, this agreement would also serve an important national security objective by promoting the destruction of a substantial fraction of Russia's total stockpile of weapon-grade fissile material, a stockpile which poses a serious proliferation risk because of the degradation of the Russian nuclear custodial system. Colloquially known as the "HEU deal," the commercial contract for this widely hailed agreement was signed in January 1994 with the enthusiastic support of the Clinton administration.

The HEU deal is not being implemented at the speed or scope envisaged by Presidents Bush and Clinton, and it is in fact in danger of coming completely undone. No HEU was purchased from Russia in 1994, and there is an on-going dispute with the Russian government over the price to be paid for the small amount of material ordered in 1995; because of this dispute, the Russian government has threatened to cancel the HEU deal. Fundamentally, the implementation of the HEU deal is encountering difficulties because the Clinton administration, like the Bush administration before it, has consistently given greater weight to the commercial interests of the domestic uranium enrichment industry than to the broader national security interest in removing bomb-grade material from Russia.

In more specific terms, there are two central problems with how the United States is currently trying to implement the HEU deal.

- *The Executive Agent.* During the Bush administration, the U.S. government assigned responsibility for executing the HEU deal to the U.S. Enrichment Corporation (USEC), a federally owned company in the process of being privatized. USEC was given the Department of Energy's two civilian plants for the enrichment of uranium with the intention of becoming a competitive, private sector supplier on the international nuclear fuel market. Giving USEC the HEU deal was seen as a way of enhancing its competitiveness and, therefore, a way of increasing the proceeds of the privatization for the U.S. Treasury. In fact, however, USEC has powerful commercial interests in preventing -or, at a minimum,

having exclusive control over- the large influx of Russian enriched uranium onto the U.S. market required by the LIEU deal because of its current position as a low-cost monopoly enrichment supplier in the U.S. market. This fact makes USEC uniquely unsuited to its current role as the sole executive agent of the HEU deal, and is the root cause for the ongoing price dispute with the Russian government. Recent USEC proposals - including the so-called "four-tiered" approach -do not remove this fundamental conflict of interest.

- *The Suspension Agreement. As* a result of a 1991 anti-dumping suit by the U.S. uranium industry, the U.S. government imposed a prohibitive tariff on uranium imports from the former Soviet Union in 1992. These tariffs were later replaced by a suspension agreement between the U.S. and Russian government that regulates Russian uranium imports with a quota system that is based on the principle of "matched sales" with U.S. uranium producers. The suspension agreement effectively restricts the near-term resale of the natural uranium component of the Russian HEU on the U.S. market, which has made it difficult for the U.S. government to find a viable means of compensating Russia for the full value of its blended-down HEU.

In practice, these two problems have become confusingly intertwined, not least because USEC has tried to use the trouble with the suspension agreement to distract attention from the more fundamental problem having to do with its own conflicts of interest as the sole U.S. executive agent in the HEU deal - a role it desperately wants to retain.

In mid-1995, the U.S. government began to devote considerable energy to finding a solution to the suspension agreement problem, but this task has proven difficult because of the complexity of the issue and the multitude of competing interests involved. Little attention has been given to the core problems associated with the conflicting interests of USEC as the sole executive agent of the HEU deal. For understandable commercial reasons, USEC has gone to great lengths to retain control over the HEU deal, but the problem with the HEU deal will become acute in 1996, when the current price agreement expires and USEC has been fully privatized. Unless there is a change in the current U.S. procedure for buying Russian HEU before then, the HEU deal is likely to collapse in late 1996 when USEC and the Russian government are unable to agree on the price to be paid for further shipments of Russian HEU.

The recommended solutions to these problems with the HEU deal are as follows.

- *The Executive Agent.* The government should develop a system allowing other firms in the nuclear industry to compete for the right to import the Russian HEU into the United States. In the event that USEC fails to commit to import the required amount of Russian HEU in a

given year, the right to import the Russian HEU should be allocated to other firms in the nuclear industry on a competitive basis. This should be done before USEC is fully privatized, and as part of this effort the president should immediately clarify, and Congress should legislatively confirm, that the U.S. government has the right to designate alternative executive agents for the HEU deal and to cancel USEC's current contract with the Russian government regulating its purchase of Russian HEU.

- *The Suspension Agreement.* The president should instruct the Department of Commerce to modify the suspension agreement to allow the sale of the uranium content of the Russian HEU under a gradual and predictable schedule of forward sales. Such a system, which has already been proposed by Senator Pete Domenici (R-N.M.), would moderate the downward pressure on the price of uranium that the sale of the uranium contained in the Russian HEU (called the "feed component") would exert. Russia should be given clear legal title to the Iced component of the uranium it delivers to the United States, as well as the right to choose when, to whom, and at what price it resells this uranium.

Since the scheduled duration of the HEU deal is twenty years, it is important to ensure that the mechanism established for its implementation is viable and self-sustaining. At the moment, it is not. Therefore, the administration and the Congress should act quickly to correct the faults in the current system for implementing the HEU deal. This should at a minimum be done before the U.S. government sells USEC to private investors, since once this occurs, the process of correcting the problems associated with USEC's role as executive agent will become substantially more difficult.

More fundamentally, American leaders should rethink U.S. priorities with respect to the HEU deal. Rationally assessed, the U.S. national interests at stake in removing HEU from the former Soviet Union are sufficiently compelling to warrant a major expansion and acceleration of the U.S. purchase of Russian HEU.. If the U.S. government were truly committed to reducing the proliferation and other national security risks caused by the collapse of the USSR, it would resolve to purchase as much Russian HEU as possible, as quickly as possible.

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Introduction

At the end of August 1992. President George Bush made an announcement that would have been unthinkable even three years earlier, when lie entered office

> I am pleased to announce that the Russian Federation and the United States have now initialed an agreement to ensure that highly enriched uranium [HEU] from dismantled nuclear weapons will be used only for peaceful purposes. ... Under the agreement, the United States and Russia would seek within the next 12 months to conclude an implementing contract establishing the terms of the purchase of weapons-grade uranium by the U.S. Department of Energy and the dilution of that material to reactor-grade uranium for sale as commercial reactor fuel. The contract would also provide for the participation of the U.S. private sector and the use by the Russian Federation of a portion of the proceeds to increase the safety of nuclear reactors in the former Soviet Union.[1]

After over a year of hard-fought negotiations following up on President Bush's announcement, President Bill Clinton was able to announce on January 14, 1994, that the United States and Russia "have signed a contract to purchase $12 billion of highly enriched uranium over the next 20 years. "[2]

The U.S. purchase of 500 metric tons of highly enriched uranium from dismantled Russian warheads is known colloquially as the "HEU deal," and it is clearly one of the more intelligent national security initiatives in U.S. history. The security and accounting of fissile material in Russia is known to be inadequate. so the existence of a large stockpile of excess HEU in Russia poses a serious threat to the security of the United States and its allies, Given that blended-down HEU has real economic value in the energy industry (unlike plutonium), the U.S. government had the opportunity to implement a non-proliferation policy that would simultaneously improve U.S. national security and lower the energy bills for U.S. consumers - at negligible cost to the U.S. taxpayer. In the nuclear era, swords-into-plowshares is the HEU deal.

Until mid-1995, the public statements of the Bush and Clinton administrations suggested that the HEU deal was in fine shape, on track to be implemented according to schedule, and working smoothly as intended. This is, in fact, not true.

The HEU deal is not being implemented at the speed or scope envisaged by Presidents Bush and Clinton, and it is in fact in danger of coming completely undone. No HEU was purchased from Russia in 1994, and there is an on-going dispute with the Russian government

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1. "Statement on the Russian-United States Agreement on the Disposition of Uranium from Nuclear Weapons," August 31, 1992, in *Public Papers of the Presidents of the United States, George Bush,* 1992-93, Vol. II (Washington. D. C.. U.S. Government Printing Office, 1993), pp. 1453-1454.
2. "Press Conference by President Clinton and President Yeltsin in Moscow," January 14, 1994, in *Weekly Compilation of Presidential Documents,* Vol. 30, No. 3 (January 24, 1994), p. 61.

over the price to be paid for the small amount of material ordered in 1995; because of this dispute, the Russian government has threatened to cancel the HEU deal in its entirety. Unless the U.S. procedure for buying the Russian material is substantially reworked, less than 20 metric tons of HEU is likely to be purchased by the United States before the HEU deal collapses in 1996, and there is a real possibility that the Russian government will cancel the HEU deal even before then.[3]

In mid-1995, as the trouble with the HEU deal became publicly known, there emerged a widespread impression that the problem with the HEU deal was the result of a 1992 U.S. antidumping ruling against uranium imports from Russia. While it is true that the anti-dumping process has complicated the implementation of the HEU deal, the anti-dumping process is not the most serious problem with the HEU deal, and it served primarily to distract attention from the real flaw in how the United States has sought to implement the HEU deal.

Fundamentally, the troubled implementation of the HEU deal is a result of an unsound decision by the White House to give exclusive executive control over the HEU deal to an enterprise - the U.S. Enrichment Corporation (USEC), a wholly owned government corporation in the process of being privatized - that is uniquely unsuited to that role. For peculiar and complex commercial reasons. USEC will not offer Russia a fair market price for the blended-down HEU so long as it alone has the right to order and market the material outside of Russia.

The two key reasons for the initial decision to give USEC control over the HEU deal appear to be, first, an inadequate analysis of the commercial implications of the HEU deal by the Bush administration's national security team, and second, a determined effort by officials in the Department of Energy (who would later become USEC's management) to use the HEU deal to enhance the competitiveness of the U.S. enrichment operation. As USEC's conflict of interest in the HEU deal has become more widely understood in the Clinton administration in 1995, however, the failure to correct this basic flaw in the U.S. implementation of the HEU deal now appears to be due to an unwillingness to challenge or undermine commercial interests of USEC for the sake of a national security initiative.

The Undoing of the HEU Deal

The evolution of the HEU deal began in 1991, a year which saw several unexpected events that would decisively influence the subsequent development of the HEU deal. First, with the Cold War coming to a close, President Bush and Soviet President Mikhail Gorbachev agreed to sweeping reductions in their states' nuclear arsenals, which over the next 5-10 years would lead to the dismantlement of tens of thousands of excess nuclear weapons, thereby adding hundreds of tons of HEU to both states' already large HEU stockpiles. Second, in an October 24, 1991, *New York*

3. One of the first widely noted public hints that something was amiss with the HEU deal is Jessica Mathews, "National Security Blunder," *Washington Post*, May 5, 1995, p. A25.

Times op-ed piece, Thomas Neff, a physicist from MIT, proposed that the United States should buy this excess HEU from the Soviet Union, blend it with natural uranium to produce a mixture suitable for use in power-generating reactors, and resell it to utilities. The Bush administration did not take up this elegant idea until after the third key event of 1991 - an otter by the Soviet government to do exactly what Neff had proposed. The fourth event was the collapse of the Soviet Union in December 1991, which caused a serious degradation in the Soviet nuclear custodial system, heightening the risk of nuclear leakage from Russia and the other Soviet successor states.

Taken together, these four developments are usually seen as the catalyst of the HEU deal. The national security community, in particular, tends to believe that the HEU deal was driven primarily by non-proliferation concerns. Since buying Russian HEU makes so much sense, it sounds perfectly plausible to say that the enlightened self-interest of the United States was the prime motivating force behind the HEU deal.

In fact, this interpretation of the HEU deal is incomplete. Two different developments in 1991-92 have had greater significance in the evolution of the HEU deal than the four mentioned above. The first was a dramatic rise in U.S. imports of Soviet uranium, followed by a protectionist backlash. In 1988, the Soviet Union began to export uranium to the United States under an exclusive marketing agreement with Concord/Nuexco, a Colorado-based uranium mining and trading firm. Because of these imports, the Soviet share of the U.S. uranium market grew from zero in 1988 to about 20 percent in 1991, and the spot market uranium price fell by roughly 20 percent per year over 1988-1991. Moreover, because it had little experience in free-market uranium trading, the Soviet government unwittingly became embroiled in a market manipulation scheme run by Concord/Nuexco, which used its control over Soviet uranium imports to profit from the fall in the price of uranium, disrupting the uranium market and exacerbating the price effects of the new imports of Soviet uranium.[4] This fall in the spot price of uranium prompted an ad hoc committee of 13 uranium mining companies, a labor union, and the Department of Energy to file an anti-dumping petition against Soviet uranium imports on November 8, 1991; this case resulted in the signing of "suspension agreements" with each of the uranium-exporting former Soviet republics, halting the anti-dumping investigation but seriously restricting their access to the U.S. market.

The second development was the mid-1992 decision to privatize the Department of Energy's civilian uranium enrichment enterprise. In the Energy Policy Act of 1992, Congress authorized the creation of the U.S. Enrichment Corporation (USEC), which would inherit the Department of Energy's two civilian enrichment plants in Portsmouth, Ohio, and Paducah,

4. The possibility of such a market manipulation scheme was first described in "Thomas L. Neff, "Winning and Losing in a Tracing Regime," *Nuclear Fuel Market Quarterly* (II/ 1991), pp. 7-14.

Kentucky. The creation of USEC, or something like it, had been discussed for many years. The Energy Policy Act specified that USEC would become a government-owned but independent company on July 1, 1993, and that USEC shares would be sold to the public some time in the future, with the proceeds of this sale (estimated at about $1.5 billion) going to the U.S. Treasury. Importantly, the Energy Policy Act also stipulated (somewhat ambiguously) that USEC would have the exclusive right to be the executive agent in the U.S. purchases of Russian HEU;[5] this was correctly seen as a way of enhancing USEC's economic competitiveness and, therefore, its value to the Treasury when fully privatized - but at the price of placing the HEU deal on an unsound commercial footing.

Since mid-1992, the commercial interests of USEC and the protectionist dynamics of the anti-dumping suit have been the dominant forces behind the HEU deal, and their effects have been overwhelmingly negative.

During both the Bush and Clinton administrations, foreign-policy officials in the U.S. government have understood that buying HEU from dismantled Russian weapons serves the national security interests of the United States. Nonetheless, the government has allowed the narrow commercial interests of the domestic uranium industry to cripple the implementation of the HEU deal. This central fact in the history of the HEU deal is not widely known, for it is hidden within a morass of technical, legal, and economic esoterica. Above all else, the impending demise of the HEU deal has been a failure on the part of the senior national security advisors to Presidents Bush and Clinton: under both administrations, the national-security leadership of the U.S. government has been remiss in its responsibility to ensure the success of a vitally important nonproliferation initiative.

Outline of the Study

This study has five sections. In the first, I describe five specific ways in which the HEU deal, if executed as originally conceived, serves U.S. national interests. In my view', the HEU deal represents one of the best national security ideas in U.S. history, and I defend this proposition in the first section. In doing this, I also describe in more detailed terms the different ways the HEU deal could be implemented.

In the second section, I develop in detail the intertwined histories of the HEU deal, the uranium anti-dumping case, and the privatization of USEC. This history demonstrates the

5. 42 U.S.C. § 1408(A)(1992). The precise language of the Energy Policy Act is as follows: "The Corporation is authorized to negotiate the purchase of all highly enriched uranium made available by any State of the former Soviet Union under a government-to-government agreement or shall assume the obligations of the Department [of Energy] tinder any contractual agreement that has been reached with any such State or any private entity before the transition date." The important ambiguity concerns whether this provision gives USEC an exclusive authorization to execute the HEU deal, or whether the government is free to designate alternative executive agents.

extraordinary extent to which the national security policies of two U.S. administrations have been dominated by an obscure trade law and the commercial interests of a government-owned enrichment operation.

Five specific mistakes by the executive branch in its implementation of the HEU deal are summarized in the third section. It is worth noting, however, that the original sin in the undoing of the HEU deal was committed by the Congress and the executive branch together, and it takes the form of an unsound decision to vest USEC with exclusive control over the HEU deal, coupled with an anti-dumping law that subordinates broad national interests to the narrow commercial interests of non-competitive U.S. industries.

In the fourth section, I present a number of policy options for establishing an effective and viable procedure for implementing the HEU deal. Because all of the options for reviving the HEU deal conflict with the private interests of politically influential segments of the U.S. nuclear industry, the implementation of each option presented in section four would require commitment and courage on the part of the White House.

Finally, in the concluding section, I present and recommend a bolder alternative for implementing the HEU deal, one which goes well beyond the contemporary parameters of political feasibility. Under this alternative, the U.S. government would directly purchase as much as possible of the insecurely stored fissile material in the former Soviet Union, as quickly as possible. The United States has directly purchased fissile material from the former Soviet Union once already: in a covert operation called Project Sapphire, the United States secretly bought and removed 600 kilograms of HEU from Kazakhstan. Implemented in this way, the HEU deal would have a greater and more rapid impact on reducing the threat of fissile material leakage from Russia. In effect, the HEU deal would become Project Sapphire writ large.

I. The HEU Deal

This section has two purposes. First, it explains how the HEU deal is supposed to work without dwelling on the problems of implementing the HEU deal that have been encountered in practice. Second, it presents five arguments for why the HEU deal, if properly implemented, would serve U.S. national interests.

How the HEU Deal is Supposed to Work

The HEU deal is in principle quite simple.[6] Russia dismantles its excess nuclear warheads, extracting the plutonium and highly enriched uranium contained within them. As Russia's stockpile of excess HEU begins to grow, the United States starts buying the excess Russian HEU. This HEU is blended with uranium that has a much lower isotopic concentration of U-235, producing low enriched uranium (LEU), which has the correct isotopic concentration - about *4%* on average - for use in civilian power reactors.[7] The LEU is then brought to the United States, fabricated into fuel assemblies. and sold to utilities in the United States and around the world. The utilities then bum this LEU fuel in their reactors, producing energy and spent fuel. Thus, the HEU deal translates nuclear weapons into the electric current that supplies the world's power grid.

The commercial viability of the HEU deal is closely tied to the economics of the front end of the nuclear fuel cycle, particularly the enrichment of natural uranium. Enrichment in a gaseous diffusion plant is an expensive process, requiring large amounts of electricity. The standard measure of uranium enrichment is a "separative work unit," or SWU. Thus, when someone in the nuclear industry speaks of "producing SWU" or "selling SWU," they are referring to the enrichment of natural uranium and the sale of "enriched uranium product" (EUP, or "product") to utilities, which use it for power generation. There are two civilian gaseous diffusion enrichment plants in the United States, one in Portsmouth, Ohio, employing 2,600 people, and the other in

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6. For a helpful overview, see Oleg Bukharin, "Weapons to Fuel," *Science & Global Security*, Vol. 4 (1994), pp. 179-188

7. Uranium has several isotopes, but the one that can sustain a slow-neutron chain reaction is U-235. Uranium found in nature consists of only about 0.7% U-235, which is insufficient to sustain a chain reaction in a normal light water reactor. Enrichment is the process of raising the percentage of U-235 in a quantity of uranium. (The percentage of uranium that is U-235 is called the "assay.") Normal light water power reactors use 3 5% enriched uranium which is low enriched uranium (LEU). LEU is usually defined as uranium with an assay of less than 20%. Weapons and some reactors (such as those in submarines) use highly enriched uranium (HEU), which usually has an assay in excess of 90%.

Paducah, Kentucky, employing 1,770.[8] These plants supply 80-90% of the domestic SWU demand, most of which falls under long-term fixed-price contracts. These plants were run by the Department of Energy until mid-1993 when, pursuant to the Energy Policy Act of 1992, they were leased for a nominal fee to the U.S. Enrichment Corporation (USEC). USEC has now replaced the Department of Energy as the dominant SWU supplier on the U.S. market.

Figures 1, 2, and 3 help illustrate the mechanics and the economics of the HEU deal.[9] Figure 1 shows normal enrichment operations, without the HEU deal. Utilities buy natural uranium on the open market and sign a contract with USEC to have it enriched to the appropriate level. The natural uranium - now called "feedstock" -goes to one of USEC's two plants, where it is fed into an enrichment cascade. The enrichment process produces a much smaller amount of enriched product, as well as a much larger amount of tailings, or tails, that have been depicted of much of their original U-235.[10] The enriched product is then converted from a gas to a solid, fabricated into fuel rods, shipped to reactors, and burned. Figure 1 shows in rough terms one year's operation by USEC: utilities deliver 21,204 metric tons (MT) of natural uranium to USEC, and receive in return 2,373 MT of 4% enriched product. In so doing, USEC has produced 13 million SWU and will be paid a fee for that amount of SWU by the utilities. This fee varies from contract to contract, but the average price paid to USEC is around $120/SWU.

Figure 2 shows what happens if the HEU deal is executed alongside USEC's normal enrichment operations. Ten metric tons of HEU are removed from Russian nuclear weapons and blended with 295 MT of 1.5% enriched uranium.[11] This produces 305 MT of approximately 4% enriched LEU, which contains the equivalent of 1.9 million SWU and 2,979 MT of natural uranium, the latter of which is called the "feed component." [12] This LEU is then shipped to the

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8. Paul Barton, "Piketon Plant's Future Could Hinge on Russian Uranium Deal," *Gannett News Service*, November 11, 1993.

9. The author thanks Thomas Neff for assistance with these diagrams. Any errors are the author's alone.

10. Tails are mainly a waste product. This relationship of feed to tails to product is expressed in the following equation:

$$FA*FM = TA*TM + PA*PM$$

where: FA equals the feed assay, FM equals the feed mass, TA equals the tails assay, TM equals the tails mass, PA equals the product assay, and PM equals the product mass. The tails assay is used as a measure of the ratio of SWU to feed in LEU production.

11. Russia must use blendstock that is I-5"o enriched because the Russian HEU contains a relatively high amount of U-234, an undesirable contaminant. Because the 1.5% enriched uranium contains less U-234 than natural or depleted uranium, the U-234 content in the delivered LEU can be brought to an acceptable level by using slightly enriched blendstock. Using enriched blendstock, however, adds to the SWU content of the blended-down HEU, thereby displacing more of USEC's own production.

12. The units of measurement in the uranium trade can be confusing because uranium can be contained in many different chemical compounds. The solid form of natural uranium used in the uranium trade is 0308, which is called "yellowcake." 1.7176 is uranium hexaflouride, an intermediate product that is made from purified and converted U308. UF6 is a solid that is gasified for enrichment, and it is typically measured in kilograms or metric tons of uranium

United States, where it is to be delivered to USEC's customers in the place of new LEU from USEC's enrichment plants.

The sale of this blended-down Russian HEU to utilities will affect USEC's operations in two ways, also shown in Figure 2. By supplying 305 MT of 4% enriched product for use as fuel_ the HEU deal directly displaces 1.9 million SWU that USEC would normally produce each ycar.[13] In other words, because of the additional supply caused by the HEU deal, USEC's own SWU production would fall by 15% unless USEC increased its market share. Assuming that each SWU costs $60 for USEC to produce, this will allow USEC to avoid $114 million in direct SWU production costs while delivering the same amount of enriched uranium product to its customers. Note that importing Russian LEU reduces USEC's profits if it must pay Russia more than USEC's own production cost - about $60/SWU.[14] Because the United States agreed in May 1993 to pay Russia $82/SWU, executing the HEU deal simply displaces USEC's own lower cost production, thereby reducing USEC's per unit profit by roughly $22. The importance of this point will be explained in detail below.

The second part of the economic value of the blended-down Russian HEU comes from its feed component. Historically, utilities bought the uranium feed for the LEU fuel and delivered it to USEC for enrichment. Assuming that this practice continues (and it may not), utilities receiving blended-down Russian HEU will still buy and deliver natural uranium feed to USEC as part of their enrichment contracts, and the HEU imports will displace a portion of these feed deliveries. As Figure 2 shows, 2,979 MT of the natural uranium that would normally be delivered to USEC by utilities would accumulate in USEC's inventory; according to the HEU contract signed in January 1994, Russia is not to be paid for the feed component in its blended-down HEU until this accumulated inventory is sold or consumed by USEC, or when the contract expires in 2014.

Since the utilities will not want to pay twice for the uranium feed component of the LEU fuel they receive from USEC, some other means of getting value from USEC's inventory of displaced feed must be found if Russia is to be paid for the feed component of its blended-down HEU. This can be done in one of. two ways. First, the material set aside by USEC could be resold to other buyers, with the proceeds from these sales transferred to Russia. This approach would depress the market price of natural uranium and, as explained below, is constrained by the

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equivalent (MT, equal to 1,000 kilograms). Quantities of uranium are standardized as kilograms of uranium equivalent (kg. U). Every kilogram of UF6 contains 0.68 kg. U, and every pound of U308 contains 0.39 kg. U. (One kilogram equals 2.2 pounds.) For a more detailed discussion, see Thomas L. Neff, *The International Uranium Market* (Cambridge, Mass.: Ballinger Publishing Company, 1984), p. 11.

13. Note that an increase in the size of the annual Russian HEU shipment to 30 MT would triple the size of this displacement effect, since 30 MT would contain 5.7 million SWU.

14. Global demand for SWU is essentially flat, and USEC cannot readily increase its market share, so importing Russian LEU necessarily displaces USEC's own production.

U.S.-Russian suspension agreement for uranium imports. Assuming that this material could be sold in the future, after the suspension agreement expires, it would still only be rational for USEC to purchase the feed component from Russia if the unit puce its pays for the uranium is less than the unit price it expects to receive (appropriately discounted) when it resells the uranium. Since there is currently no viable futures market in uranium, purchasing the Russian feed in the expectation of future sales is an uncertain proposition for any market actor, even one without USEC's conflicts of interest.

Alternatively, USEC has the option of feeding this excess uranium into its enrichment cascades, which is called "overfeeding." Overfeeding increases the tails assay but decreases the amount of SWU needed to produce the same amount of LEU, which would allow USEC to avoid even greater costs. This is illustrated in Figure 3, where overfeeding would save an additional 1.2 million SWU if the tails assay were raised to about 0.36%. Again assuming that each SWU costs $60 for USEC to produce, this overfeeding would allow USEC to avoid an additional $72 million in SWU production costs, thereby raising the total economic value of the 10 MT of blended-down Russian HEU to $184 million. Overfeeding would not depress the market price of uranium; indeed, when Thomas Neff initially elaborated the idea behind the HEU deal in 1992, he assumed that the displaced feed would be used to overfeed the U.S. enrichment cascades, thereby avoiding the problem with the suspension agreement. [15]

The problem with overfeeding, however, is that it is cost effective for USEC only if USEC saves more from overfeeding than it has to pay for the uranium that is overfed. If this condition does not hold, then USEC will see the feed component of the Russian HEU as a liability and will resist buying it. In 1992, it was impossible to know if this condition would hold because two critical pieces of information were lacking: USEC's cost of producing SWU (which defines how much USEC could save from overfeeding) and the price USEC would have to pay for the Russian feed component.

In fact, when this information finally became known, it turned out that it would not be in USEC's interest to purchase the Russian feed to overfeed its own enrichment cascades. As a result of u series of implicit subsidies from the U.S. government that began to be conferred in late 1992, USEC's production cost is an inordinately low $60/SWU.[16] Because the cost avoided by

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15. See Thomas L. Neff, "Integrating Uranium from Weapons into the Civil Fuel Cycle," *Science and Global Security*, Vol. 3 (1993), pp. 215-222.

16. USEC's real production cost is not precisely known, but $60/SWU is the cost publicly quoted by the USEC management. The government has implicitly subsidized USEC in three main ways: first, the Energy Policy Act allowed USER: to inherit the very low-cost energy contracts with local utilities that were earlier negotiated by the Department of Energy; second, the Department of Energy agree to lease its two enrichment plants to USEC for a nominal fee, which has meant that USEC has essentially no capital costs; and third, USEC is being given part of the Department of Energy's natural and low enriched uranium stockpile, which allows USEC to cross-subsidize its SWU production. According to Klaus Messer, the CEO of Urenco - one of USEC's competitors in the enrichment

overfeeding 2,979 MT of natural uranium is $72 million, it will make sense for USEC to overfeed only if USEC must pay Russia less than $72 million for the 2,979 MT of natural uranium - that is, only if USEC pays Russia less than $24.20 per kilogram of uranium (see Figure 3). In May 1993, however, it was agreed that the United States would pay Russia $28.5 per kilogram of uranium for the feed component in the Russian HEU. At this price, overfeeding is not cost effective for USEC, and USEC has understandably refused to purchase the Russian uranium at the agreed price for use as overfeed.

Thus, as a result of the implicit government subsidization of USEC's production costs, some way other than overfeeding needed to be found to compensate Russia for the full value of the blended-down Russian HEU. The obvious way to do this would be to resell the uranium - component on the open market, but as explained in greater detail below, the suspension agreement constrains such sales - a problem that was not widely expected when the decision to give USEC exclusive executive control over the HEU deal was made. For this complex set of reasons, finding a viable means of compensating Russia for the feed component of its blended-down HEU has proven exceptionally difficult for the U.S. government.

Implementing the HEU deal is much simpler if it is done outside of the context of existing or traditional enrichment contracts between utilities and USEC. (USEC would have no necessary role to pay in the HEU deal if the sale were executed in this fashion.) If the blended-down HEU were marketed directly to utilities as LEU fuel, there would be no issue of overfeeding the enrichment cascades or displacing the feed that is normally delivered in a contract to buy SWU from an enricher like USEC- Instead, utilities would enter into contracts for LEU fuel that are different from those which they historically signed with the Department of Energy. Rather than pay USEC for the service of enriching natural uranium that the utilities procure and deliver, the utilities would be able to buy LEU as a single commodity from whoever was marketing the blended-down Russian HEU. Unless it were controlled solely by USEC, such an arrangement would run counter to USEC's commercial interests by increasing the level of competition in the SWU market, reducing USEC's market share, and probably depressing the worldwide SWU price. Such an arrangement would also increase the Russian share of the worldwide natural uranium market, and probably drive down the price of natural uranium as well. Since the authors of the suspension agreement presumed that the feed component of the Russian HEU would be handled exclusively by USEC in the context of normal enrichment contracts, it is possible that the suspension agreement as currently written would not apply to the feed component in blended-down Russian HEU marketed directly to U.S. utilities, though this interpretation has not been tested.

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market- "it is ridiculous to assume that USEC's real production costs could be below $130 per SWU." (lesser is probably referring to USEC's average cost of production, not its marginal cost.) See "Interview with Dr. Klaus Mescal," *NUKEM Market Report*, June 1994, p. 20.

How the HEU Deal Serves U.S. National Interests

Most people in the national security and non-proliferation communities do not need to be persuaded of the value of the HEU deal - they understand already that it has the potential to serve multiple U.S. security interests in an elegant, revenue-neutral fashion. Nonetheless, since many of the problems encountered in the implementation of the HEU deal reflect a certain disregard for the benefits of buying Russian HEU, it is useful to briefly summarize the five specific ways that the HEU deal advances important U.S. national interests.

Incentives for Russian Warhead Dismantlement

First, the HEU deal provides a financial incentive for Russia to continue and accelerate the dismantlement of its excess nuclear weapons. The importance of this end cannot be overemphasized. Although Russia has treaty obligations to destroy thousands of nuclear weapon launchers, it has made no treaty-based commitment to actually dismantle its excess nuclear weapons. Because the United States is rapidly approaching the end of its own warhead dismantlement program, the HEU deal is essential to give Russia a tangible incentive to continue dismantling its own nuclear weapons. The physical destruction of Russian nuclear weapons is clearly in the U.S. interest. Obviously, however, it is crucial that the fissile material components resulting from the dismantlement process be stored under secure conditions: the HEU deal also serves this aim.

Permanent Proliferation Risk Reduction

The HEU deal can permanently reduce the risk of nuclear proliferation by physically destroying 500 tons of fissile material - enough for 25,000 simple nuclear weapons. Enriching uranium is an extremely expensive and difficult process, but de-enriching it is as simple as mixing two substances together. Until it is blended with natural or low enriched uranium, however, HEU poses am acute proliferation risk. A simple implosion nuclear weapon can be built from less than 15 kilograms of HEU, and with 55 kilograms any state and many terrorist groups could build an even simpler gun-type weapon, which would have a 15-20 kiloton yield. The HEU deal gives the United States and Russia an opportunity to permanently erase a large portion of the proliferation risk posed by insecurely stored fissile material in Russia.

Trade - Not Aid - with Russia

The third advantage of the HEU deal is that it offers a lucrative hard-currency trade with Russia, which will assist Russia in its transition to a more liberal, more market-based economy. There can be little doubt that the United States has an enduring interest in Russian economic reform, since Russia will continue to be a drain on world resources and a latent threat to international security

until it has a functioning market economy and a stable democratic polity. The $12 billion - a significant sum - that the HEU deal would inject into the Russian economy would assist the Russian government in servicing its international debt, moderate the deficit in Russia's balance of payments, promote the conversion of the Russian military complex to non-military activities, and improve Minatom's ability to effectively guard the fissile material remaining in its installations. As the U.S. foreign aid budget dwindles, the role of trade in achieving these objectives will become more important, and in this respect, the HEU deal offers the possibility of assisting Russian economic reform at no net cost to the U.S. government or the United States as a whole.

Leverage over Minatom

Fourth, the HEU deal gives the United States valuable leverage over the Russian Ministry of Atomic Energy (Minatom). Minatom, which manages a sprawling nuclear complex facing a highly uncertain and troubled future, desperately wants to carry out this HEU-for-dollars transaction. Doing so would allow Minatom to pay its employees salaries, build new plants, and increase its political influence in Moscow. For this reason, the HEU deal offers the United States government an opportunity to influence Minatom's policies and behavior in other areas, the most important of which concerns the security of the fissile materials in Minatom custody. These materials, which are stored at dozens of sites, pose an extremely serious proliferation risk to the United States and the rest of the international community. To date, Minatom has been hostile to most international or American efforts to improve cooperatively the security and accounting systems at its nuclear facilities. A realistic prospect of implementing the HEU deal should help reduce this hostility.

Welfare Maximization

If smoothly implemented, the HEU deal would probably have a positive economic effect on U.S. national welfare. The release of blended-down Russian HEU on the global market is essentially a supply curve shift in the natural uranium and SWU markets. In a simple static model, this should result in reductions in the price of uranium, SWU, reactor fuel, and electricity.[17] However, the nuclear fuel market is exceptionally complex and suffers from serious market imperfections. As a result, the dynamic effects of the HEU deal on U.S. welfare are not entirely predictable.

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17. In the static partial equilibrium model, whether this supply curve shift increases net U.S. welfare depends on the elasticities and the values of U.S. uranium and SWU imports and exports.

Table 1. -Chronology of the Anti-Dumping Case and the HEU Deal

Anti-Dumping Case	Date	The HEU Deal
	October 24, 1991	Op-ed by Thomas Neff
Anti-Dumping petition filed	November 8,1991	
Preliminary ITC finding of injury	December 23, 1991	
	December 25, 1991	Dissolution of USSR
Preliminary Department of Commerce finding of dumping	May 29, 1992	
Yeltsin complains about anti-dumping ruling at the G-7 summit	July 8, 1992	
Suspension agreement negotiations begin	Summer 1992	U.S.-Russian negoiations on HEU deal begin
	August 31, 1992	U.S.-Russian agreement to purchase HEU initialed
Suspension agreements initialed	September 16, 1992	
Suspension agreements signed	September 17, 1992	
	October 8, 1992	Senate passes Energy Policy Act of 1992, authorizing the privatization of USEC
Minatom voices objections to suspension agreement	October 1992	
	February 18, 1993	Russian and the United States sign the government-to-government agreements to purchase 500 MT of Russian HEU over 20 years
	May 3, 1993	HEU contract initialed
	September 9, 1993	Mikhailov announces he will not sign the HEU contracts until the suspension agreement is amended
	November 18, 1993	Vote on START in the Ukrainian Rada
Amendment to Russian suspension agreement initialed	December 15, 1993	
	January 14, 1994	Trilateral Statement; HEU contract signed
Amendment to Russian suspension Agreement signed	March 11, 1994	
	March 18, 1994	Transparency protocol to HEU deal signed
	November 23, 1994	Project Sapphire (Kazakhstan)
Canada agrees to drop its complaint Against the amended suspension agreement	February 21, 1995	

II. History: The Anti-Dumping Case, USEC, and the HEU Deal

This section develops the parallel histories of the HEU deal and the anti-dumping case against uranium imports from the states of the former Soviet Union. An understanding of the trouble encountered by the HEU deal requires an understanding of the law that permitted the 1991 suit against Soviet uranium imports, so I begin this section by briefly describing U.S. anti-dumping law as it is applied against imports from non-market economies.

Because the history of the HEU deal and the uranium anti-dumping case is so complex, a chronology of the key events mentioned in the ensuing narrative is provided on Table 1.

U.S. Anti-Dumping Law

The historic purpose behind anti-dumping laws, dating back to the Antidumping Act of 1916, was to prevent predatory pricing by foreign producers. Predatory pricing refers to the attempt by one producer to drive all other producers of a certain good out of the market by lowering its prices: after its competitors are driven out, the predatory producer, now a monopoly, will be able to raise its prices and reap much higher profits, which under certain conditions can result in a net welfare loss for the United States. Under other conditions, however, predatory pricing will cause a net increase in American welfare, even if some American companies are put out of business.[18] Nonetheless, predatory pricing is widely regarded as an "unfair" trading practice that should be protected against.

As currently written, U.S. anti-dumping laws have little to do with the legitimate concern over predatory pricing. [19] Instead, the U.S. anti-dumping law seeks to combat imports at "less than fair value"- an ambiguous and controversial term that goes well beyond the concept of predatory pricing.[20] In practice, this has made the anti-dumping law a popular and effective source

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18. The welfare gains of predatory pricing result from the fact that, in its initial phase, U.S. consumers benefit from the lower prices charged by the firm engaging in predatory pricing. A net welfare loss will occur only if these gains are outweighed by the welfare losses in the second phase of predatory pricing, when the predator raises its prices above their original level.

19. Indeed, it was the 1921 Antidumping Act that first abandoned the requirement that domestic industries seeking anti-dumping relief must demonstrate predatory-pricing intent or effect. See Peter Orszag and Joseph Stiglitz, "Dumping on Free Trade: The U.S. Import Trade Laws," Center for Economic Performance Discussion Paper No. 210, London School of Economics, October 1994.

20. The anti-dumping statute is Section 731 of the 1988 Trade Act. for a survey of U.S. anti-dumping law. see Orszag and Stiglitz, "Dumping on free Trade"; for more detailed treatments, see Michael Kabik, "The Dilemma of 'Dumping' from Nonmarket Economy Countries," *Emory International Law Review*, Vol. 6 (Fall 1992); Richard Dale, *Anti-Dumping Law in a Liberal Trade Order* (New York: St. Martin's Press, 1980); R. Botluck and R. Litan,

of protection for U.S. industries facing lower cost foreign imports. Seeking protection against dumping enables domestic producers to brand their foreign competitors as "unfair" trading partners, and the anti-dumping statute provides them with an administrative process that almost always results in substantial anti-dumping duties. Unlike normal tariffs, the president has no discretion to alter the size or scope of anti-dumping duties. Anti-dumping proceedings almost always result in very high duties because the process is heavily biased against imports in a complicated and technical way.[21] While a full analysis of U.S. anti-dumping law is beyond the scope of this study, the most important source of this bias is the manner in which the U.S. government calculates the "fair value" (now referred to in the law as the "normal value") of an imported good. Furthermore, there is a special provision in the U.S. anti-dumping law that specifies how the "fair value" of imports from non-market economics should be calculated.[22]

Anti-dumping proceedings generally begin when a U.S. company petitions the Department of Commence to initiate an investigation of a pattern of imports that appears to be dumping. The proceedings then have two strands. First, the Department of Commence is charged with determining whether dumping has occurred, which requires it to calculate the "fair value" of the goods being imported. If the price of the import was less than the calculated "fair value," then dumping has occurred. Second, the International Trade Commission (ITC), an independent regulatory agency, is charged with determining if the imports in question have caused or are causing material injury to a U.S. producer of a similar good. Material injury is defined as "harm which is not inconsequential, immaterial, or unimportant."[23] If both findings are affirmative, then an anti-dumping duty equal to the margin between the earlier price of the import and its "fair value" must automatically be imposed on all future imports. The Department of Commerce also has the power to impose these duties retroactively if it rules that "critical" circumstances exist.

Given that the standard for material injury is relatively easy to meet in cases like the Soviet uranium one, the key aspect of the anti-dumping process is how the Department of Commerce calculates "fair value." The most common way to calculate the "fair value" of imports from non

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eds., *Down in the Dumps: Administration of U.S. Unfair Trade Laws* (Washington, D.C.: The Brookings Institution, 1991); J.M. Finger, *Antidumping: How It Works and Who Gets Hurt* (Ann Arbor, Mich.: University of Michigan Press, 1993); P. Areeda and D. Turner, "Predatory Pricing and Related Practices Under Section 2 of the Sherman Act," *Harvard Law Review*, Vol 88, No. 4 (February 1975), pp. 697-733, and Jeffrey P. Bialos, Randolph C Tritell, and Martin S. Applebaum, "Trading with Central and Eastern Europe: The Application of the U.S. Unfair Trade Laws to Economies in Transition," *International Law Practicum*, Vol. 7 (1994)

21. According to one study, 80%0 of all anti-dumping cases result in findings of dumping. Orszag and Stiglitz, "Dumping on Free Trade."

22. By 1995, all of the states of the former Soviet Union were still treated by the U.S. government as non-market economies, as were the majority of the states in eastern Europe.

23. 19 U.S.C. § 1677(7)(A) (1988). See also Gregory Waddoups, "antidumping Measure Against Republics of the Former Soviet Union: Techsnabexport, Ltd. v United States," *Journal of Contemporary International Law*, Vol. 19 (1993)

market economies is the "surrogate country constructed cost" method. This method combines the factor costs of one or more surrogate countries with market-based economies, with the factor of production ratios from the non-market economy accused of dumping or, if this information is unavailable, from other countries where such information is available. The law gives the Department of Commerce broad discretion to choose which countries to use in its surrogate cost constructions, and in fact, Commerce sometimes relies on the information supplied by the original petitioners in the anti-dumping suit - that is, from the domestic producers seeking protection against lower cost imports.[24] Because this method, on top of all of the other biases in U.S. antidumping law, is heavily weighted in favor of the U.S. industry seeking protection, the Department of Commerce almost always finds that dumping has occurred in cases brought against exporters in non-market economies.[25] This method also tends to result in findings of very large dumping margins, which are automatically translated into anti-dumping duties if the ITC finds that material injury has occurred.

As a way of avoiding the mandatory imposition of anti-dumping duties, the law gives the Department of Commerce the power to sign a "suspension agreement" with the exporters accused or found guilty of dumping.[26] A suspension agreement will stop an anti-dumping investigation, if it is still going on, and permit imports of the good in question subject to the terms of the suspension agreement, which may be highly restrictive. According to the law, Commerce must determine that the suspension agreement "will prevent the suppression or under-cutting of price levels" of the goods in question; that "effective monitoring of the [suspension] agreement by the United States is practicable", and that the suspension agreement is "in the public interest."[27] Interested parties, including the producers who bought the original anti-dumping suit, may challenge suspension agreements negotiated by Commerce in court.

The Anti-Dumping Case Against Uranium Imports from the Soviet Union

The 1988-91 developments in the uranium market that led to the anti-dumping case against Soviet uranium imports are not simple, and many of the details remain shrouded in a series of furtive deals involving an enterprising U.S. company in Colorado, a secretive Soviet ministry in Moscow, and a gullible industry. As already noted, in 1988 the U.S. uranium mining and trading company

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24. Bialos, Tritell, and Applebaum, "Trading with Central and Eastern Europe."
25. According to one study, the surrogate country constructed cost "approach does not result in a very accurate measure of dumping margins: the choice of a surrogate is the most significant variable and can result in a wide range of outcomes, ,even Commerce's discretion in this area." Bialos, Tritell, and Applebaum, 'Trading with Central and Eastern Europe."
26. 19 U.S.C. § 1671c, 1673c.
27. Waddoups, "Antidumping Measure Against Republics of the Former Soviet Union."

Concord/Nuexco signed a contract with the Soviet government that gave it the exclusive right to import Soviet uranium into the United Stales. This contract, and the inexperience of the Soviet government, allowed Concord/Nuexco to engage in a clever market manipulation scheme that severely disrupted the global uranium market.

In simplified terms, Concord/Nuexco's market manipulation scheme worked as follows. The Soviet Union's contract with Concord/Nuexco stipulated that Moscow would be paid according to the published forward spot market price on a specific day each quarter. Thus, Concord/Nuexco knew on exactly which day the price of the uranium it was buying from the Soviet government would be determined. Unbeknownst to the Soviet Union, Concord/Nuexco used this insider information to go short on uranium: that is, Concord/Nuexco borrowed large amounts of uranium from utilities and other firms with uranium inventories and promptly resold this material, driving down the price of uranium. Concord/Nuexco could do this safely because it knew that it would be able to cover its short position with uranium from the Soviet Union. Since the price paid to the Soviet Union would depend on the forward spot market price on a specific date that Concord/Nuexco knew in advance, Concord/Nuexco was effectively guaranteed a tidy profit (as long as no duties applied to the Soviet uranium). The scheme ensured that the Soviet Union's earnings from its uranium exports would steadily decrease over time. Even as the price of uranium fell from about $14 per pound in 1988 to about $7 per pound in 1991, the nuclear industry was unaware of this scheme until mid-1991.

Concord /Nuexco's manipulation of the uranium market was not clearly illegal, but, once it became known, the U.S. uranium industry wanted to put a stop to it. This is part of the reason why the industry, with U.S. government support, decided to file an anti-dumping suit against the Soviet Union's uranium exports in late 1991. It is, of course, distinctly possible that an antidumping suit would have been filed even in the absence of Concord/Nuexco's market manipulation scheme, since the influx of Soviet uranium would have tended to suppress the price of natural uranium in any case. But Concord/Nuexco's manipulation of the market exacerbated this effect, thereby heightening the hostility of the U.S. nuclear industry toward the new Soviet imports.

On November 8, 1991, an ad hoc committee of domestic uranium interests asked the Department of Commerce to begin an anti-dumping investigation into uranium imports from the Soviet Union, at the time being handled exclusively by Concord/Nuexco. This committee (the "petitioners") consisted of 13 domestic uranium producers, eight of which are wholly or partially foreign owned, and the Oil, Chemical, and Atomic Workers' Union, which represents the workers at the U.S. enrichment plants.[28] The petition was also initially supported by the Department of

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28. See Energy Information Administration, *Domestic Uranium Mining and Milling Industry 1992 Viability , Assessment (DOE* /EIA-0477(92)), December 1993, note 37, and Bialos, Tritell, and Applebanm, "Trading with

Energy, which, as the owner of the only two non-military uranium enrichment plants in the United States, supplied roughly 90% of the U.S. and 46% of the world demand for SWU.[29] On November 19, 1991, the Department of Commerce agreed to conduct this investigation.

On December 23, the International Trade Commission issued a preliminary finding that material injury had occurred as a result of the alleged dumping of uranium from the Soviet Union. Two days later, Soviet President Mikhail Gorbachev announced the formal dissolution of the USSR. This prompted the company responsible for Soviet uranium exports, Techsnabexport (Tenex), to request that Commerce's investigation be terminated on the grounds that the country against which it was directed had ceased to exist.[30] The Department of Commerce denied this request, which caused Tenex and the uranium-exporting Soviet successor states to sue Commerce in the U.S. Court of International Trade. The court ruled in favor of the Department of Commerce, allowing it to continue its investigation against past uranium imports from the Soviet Union, and to apply the results of this investigation to future uranium imports from the former Soviet republics.[31] On May 29, 1992, the Department of Commerce issued a preliminary finding that sales of uranium from the former Soviet Union had occurred at less than fair value.

The Department of Commerce's calculation of the dumping margin of uranium imports from the former Soviet Union during the period under investigation illustrates the irrationality of U.S. anti-dumping law, in general, and the surrogate country constructed cost method, in particular. When Commerce made its ruling, the spot market price of U3O8 equivalent was between $7.60 and $7.85 per pound,[32] and the average price of the uranium imports from the former Soviet Union covered by the anti-dumping investigation was $9.47 per pound of U3O8.[33] Using Canadian data on the factors of production (i.e., labor, capital, electricity, and other inputs) for natural uranium, and factor price data from Portugal and Namibia, Commerce determined that the "fair value" of natural uranium imports from the former Soviet Union was $26.31 per pound

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Central and Eastern Europe," note 83, and "Energy Fuels Foresees Rebirth of Domestic Mining Industry,' *Businesswire*, December 22, 1993.

29. The initial participation of the Department of Energy in the anti-dumping petition was described as an "exceedingly rare" occurrence, since government agencies have almost never participated in anti-dumping cases. "Maybe Good News for U.S. Producers, Maybe Not," *NUKEM Market Report*, May 1992, p. 14.

30. Actually, at the time of the original anti dumping litigation, Tenex and the Soviet/Russian government had no lawyers of their own - they relied instead on law firms retained by Concord/Nuexco.

31. The Court of International Trade made separate rulings to this effect on May 21 and September 25, 1992. The sole issue on which the court ruled was "whether an antidumping duty investigation may he continued against newly-independent republics after the Country named in the original proceedings has dissolved." Marion B. Schnerre, "Antidumping, A Choice Between Unilateral Duties or Negotiation o1 a Suspension Agreement: The Aftermath of I Techsnabexport, Ltd. v United States," *Indiana International and Comparative Law Review*, Vol. 4 (1994).

32 These prices reflected the suppressive effect of the Soviet imports and Concord/Nuexco's market manipulation scheme.

33. "A Duty. An Injunction. Or a Settlement. Take Your Pick." *NUKEM Market Report*, June 1992, p. 5.

of U308. World spot prices for pounds of U308 had been well below that level since mid-1981, when the uranium market was still in the midst of its post-1970s decIine.[34] In effect, Commerce determined that to have been "fair," natural uranium imports from the former Soviet Union would have had to occur at mid-1981 price levels, or over three times the prevailing spot market price.[35]

The Department of Commerce's surrogate country constructed cost calculations for SWU imports from the former Soviet Union were similarly skewed. Using British data on the factors of SWU production, and Portuguese factor price data, Commerce determined that the "fair value" of SWU from the former Soviet Union was $141.15 per SWU.[36] At the time, the spot market SWU price was between $65 and $703.[37] In other words, Commerce determined that the fair market price for SWU from the former Soviet Union was twice the prevailing market level.

Rather than apply separate duties to the natural uranium and SWU components of uranium imports from the former Soviet Union, the Department of Commerce decided to apply a single duty to all uranium products, regardless of their chemical forms or enrichment levels. This single duty was 115.82%, which was the simple, unweighted average of the dumping margins calculated for natural uranium and SWU (177.87% and 53.77%, respectively). Since the SWU component has a disproportionate weight in the price of the enriched uranium (roughly two-to-one), the administrative decision to impose an unweighted average duty, applied equally to all uranium products, had the effect of yielding a substantially higher duty on enriched uranium, which served the commercial interest of the Department of Energy's enrichment operation.

Thus, on Mac 29, 1992, the Department of Commerce ordered the Customs Service to immediately begin to levy a 115.82% duty on uranium imports from the former Soviet Union. Commerce also ruled that critical circumstances existed, and therefore applied this duty retroactively to all uranium imports that had entered the United States in the previous 90 days. Importantly, in this preliminary decision, Commerce ruled that HEU and uranium derived from HEU would not be subject to these anti-dumping duties. The date for the final ruling on dumping was set for August 1992, but was later pushed ahead to October 1992.

The decision by Commerce to levy anti-dumping duties against uranium imports from the former Soviet Union provoked a harsh reaction in the Soviet successor states, particularly Russia. President Boris Yeltsin raised the issue at the G-7 summit in Munich in July 1992, arguing that the United States was being hypocritical to offer the newly independent states support, on the one

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34. "NUKEM Price Range," *NUKEM Market Report,* June 1992, p. 23.
35. "Market Overview," *NUKEM Market Report,* June 1992, p. 2.
36. "A Duty. An Injunction," p. 5.
37. This SWU price range reflected the suppressive effect of the Soviet imports and Concord/Nuexco's market manipulation scheme.

hand, while denying them access to the export markets in which they are most competitive, on the other. The Russian government claimed that the uranium anti-dumping ruling would cost Russia 14% of its projected hard currency earning in 1992, which would undermine Moscow's ability to service its foreign debt.[38] In part as a response to this intervention, in the summer of 1992 the Bush administration ordered the Department of Commerce to begin negotiating a uranium suspension agreement with the former Soviet republics, in the hope of appeasing Russia by allowing it to export some uranium into the U.S. market. In a closely related move, the Bush administration began to negotiate in earnest with Moscow on the purchase of HEU from dismantled Russian nuclear weapons, which produced an initial U.S.-Russian agreement that President Bush announced on August 31, 1992.

The negotiations on the anti-dumping suspension agreement between the United States and the governments of the former Soviet republics were conducted quietly by low-level officials in the Department of Commerce in the late summer and early fall of 1992. With preliminary findings of material injury and dumping by the ITC and the Department of Commerce. respectively, and with the legal challenge to the legitimacy of an investigation against a country that had ceased to exist rejected by the Court of International Trade, the uranium-exporting states of the former Soviet Union had little choice but to accept the suspension agreement proposed by Commerce. The alternative to signing a suspension agreement was to face a 116% duty on uranium exports - a prohibitive level. The Department of Commerce initialed suspension agreements with Russia, Ukraine, Kazakhstan, Uzbekistan, and Kyrgyzstan on September 16, 1992.'"

The centerpiece of these suspension agreements was a quota for uranium imports from each country that was pegged to the price of uranium. The trigger price for these imports was set at $13 per pound of uranium: as the price of uranium rose above this level, each republic would have a progressively larger import quota. At the time, the spot market price of uranium was less than $10 per pound and, with the market beset with flat demand, there was only a remote prospect that the price would rise above the $13 per pound trigger price, which meant that no imports from the former Soviet Union would be allowed. For this reason among others, Russia - the only former Soviet republic with real political leverage in Washington at the time - successfully insisted on a special one-time option to sell 4.1 million pounds of uranium to the United States Department of Energy outside of its quotas in the suspension agreement.

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38. Russia reportedly earned $500 million from uranium exports in 1991, and projected earnings of $1 billion in 1993- John Helmer, "West's Trade War Costing Russia $4bn,'" *Australian Financial Review,* July 16, 1992, p.10.

39. Tajikistan, the only other uranium-exporting former Soviet republic, was unable to represent itself during these proceedings.

The hope behind the suspension agreement, expressed by Commerce as well as the domestic uranium industry, was that the agreement, together with the planned U.S. purchase of Russian HEU, would cause the price of uranium to rebound, thereby revitalizing the U.S. uranium industry and creating new jobs. According to Raymond Larson. the chairman and CEO of Uranium Resources Inc., a Dallas-based uranium mining company, his firm was "optimistic that the elimination of CIS [Commonwealth of Independent States exports to the United States below $13.00 per pound selling price, plus the recently announced transaction between the U.S. Department of Energy and Russia to acquire Russian highly enriched uranium thereby eliminating the HEU overhang on the uranium market, will have a significant positive impact on market prices

for uranium."[40]

The most troublesome aspect of the suspension agreement for the LIEU deal, however, was that it unambiguously stated that HEU "is within the scope of this [dumping] investigation, and HEU is covered in this agreement."`41 Thus, Commerce decided to include HEU within the scope of its anti-dumping proceedings and the resulting suspension agreement. One of the reasons for this inclusion was that Commerce saw no other way to avoid circumvention of the quotas if importers could easily redesignate uranium as HEU-derived uranium, a difference which Customs could not readily verify. Commerce also came under heavy pressure from the domestic uranium industry, which filed three separate legal briefs with Commerce between June and September, 1992, arguing that HEU should be included within the scope of the dumping investigation. As a result, the Department of Commerce attempted to strike a compromise between the national security° interests served by the HEU deal and the commercial interests of the U.S. uranium industry by inserting a public interest finding in the suspension agreement that specifically exempts the Russian HEU or blended-down HEU from the Russian natural uranium import quota, but that prohibited the reselling of the feed uranium delivered to USEC by utilities pursuant to enrichment contracts that were affected by the HEU imports.-t2

This complicated relationship between the suspension agreement and the HEU deal deserves further clarification. The suspension agreement required the executive agent of the HEU deal - USEC - to "quarantine" an amount of natural uranium exactly equal to the feed component of an ' HEU-derived enriched uranium products sold on the U.S. market. This natural uranium would be taken from the feed that would normally be delivered to USEC pursuant to a standard

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40. "Proposed Settlement Agreement by Department of Commerce on Dumping Case Announcement." *Businesswire*, September 17, 1992.

41. "Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation," Section 111, in *Federal Register*, Vol. 57, No. 211, October 31, 1992, p. 49235.

42. "Agreement Suspending the Antidumping Investigation on Uranium from the Russian Federation," Section IN M.2 and Section IV.M2(2).

long-term SWU contract. When the suspension agreement was signed, it was assumed that USEC would use this material as overfeed, which the suspension agreement does not prohibit. As explained above, however, overfeeding is apparently not cost effective for USEC because of its subsidized cost of production. Thus, with USEC as the sole executive agent and overfeeding apparently not cost effective, the suspension agreement meant that it would be virtually impossible for Russia to be promptly compensated for the value of the uranium component of the blended-down HEU that Russia was supposed to ship to the United States.

The LIEU Deal and the Creation of USEC

The Bush administration began to negotiate toward the HEU deal in the summer of 1992, after the Russian government protested the May 1992 decision to impose anti-dumping duties against its uranium exports into the U.S. market. These negotiations proceeded relatively rapidly, and yielded on August 31 an initial agreement for the United States to buy approximately 500 metric tons of HEU from dismantled Russian warheads over an unspecified number of years. At the time, President Bush announced that the deal would have "no adverse effect on U.S. consumers or jobs in [uranium] processing or mining," and the government indicated that it would have no effect on the U.S. budget since the purchase price of the HEU would be recouped after it was sold as reactor fuel. The president called for the conclusion of an implementing contract within 12 months.

The Creation of USEC

The White House also announced in August 1992 that the U.S. executive agent in the HEU deal would be the U.S. Enrichment Corporation (USEC), a not-yet-formed government company that, assuming Congress passed the privatization legislation then under consideration, would inherit the Department of Energy's two civilian enrichment plants. The creation of USEC, or something like it, had been discussed for many years, and Congress finally passed the USEC privatization legislation in the fall of 1992, as part of the Energy Policy Act of 1992. This law specified that USEC would become a government-owned but independent company on July 1, 1993; then, at sonic point in the future, USEC shares would be sold to the public, with the proceeds of this sale (estimated at over $1 billion) going to the U.S. Treasury. According to the Department of State, the HEU deal was seen as a way of making USEC more competitive in the international enrichment market, since USEC "can use blended-down HEU to replace some production at its gaseous diffusion plants, which use large amounts of electricity. About 2 million SWU would not have to

be produced if 10 MT of HEU were blended down each tear."[43] This, in turn, would help maximize the eventual U.S. government revenue that would result from the privatization of the government's enrichment operation. Importantly, the Energy Policy Act of 1992 codified President Bush's administrative decision to make USEC the executive agent of the HEU deal, but went one step further by giving USEC an apparently exclusive right to import and market the blended-down Russian HEU.[44]

Although the decision to privatize USEC was a sound one, driven by valid concerns about the need to downsize the government and subject the U.S. enrichment enterprise to market discipline and professional management, giving USEC executive authority over the HEU deal was bound to lead to problems with Russia over the planned purchase of blended-down HEU. The USEC privatization act lists eleven purposes for USEC, none of which is to implement the HEU deal; the first two of these purposes are to "operate as a business enterprise on a profitable and efficient basis," and to "maximize the long-term value of the Corporation to the Treasury of the United States." As put by Senator Wendell Ford of Kentucky, Congress "set up [USEC] to protect American lobs and America's energy security. We did not set it up to be just a broker. We expect USEC to remain a producer [of enriched uranium]. We did not set it up to finance foreign policy initiatives, or to solve budget woes of other domestic programs."[45] Even while its shares were wholly owned by the U.S. Treasury, the privatization of USEC would turn it into an independent company, with its own interests and incentives that have no necessary relationship to the national interests of the United States as expressed by the president. USEC's interests, it will be recalled, were represented by the Department of Energy among the original petitioners in the anti-dumping proceedings. After July 1, 1993, the U.S. government lost its right to direct USEC's operations, and the executive branch has no formal authority over USEC except that the president can nominate and fire the members of its board of directors. For these and additional reasons that are explained in greater detail in the next section, USEC was and remains an unsuitable executive agent for the HEU deal.

The HEU Deal Takes Shape

In the fall of 1992, the Russian government began to complain more bitterly about the effects of the suspension agreement. Since the price of uranium did not rise above the S 13 per pound trigger price specified in the suspension agreement, no Russian uranium could be directly sold on the U.S. market. In late October, the Russian ambassador to the United States, Vladimir Lukin, wrote

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43. Michael Knapik, "U S. Agrees to Buy Russian HEU, but Details Must be)Worked Out," *Nucleonics Week*, Vol. 33, No- 36 (September 3. 1992).
44, See note 5 above.
45. Pamela Newman, "Republicans Slain Clinton Nuclear Budget proposal," *Energy Daily*, February 9, 1994.

to the Department of Commerce asking for a series of changes in the Russian suspension agreement. Among these, Lukin asked for the "exclusion of a paragraph in the suspension agreement that brings HEU under the scope of the agreement 'since deliveries of HEU would be covered by a separate'" arrangement - the HEU deal.[46] The Department of Commerce made no effort to enact these changes, so no *new* Russian uranium was imported into the United States during 1992.[47]

Simultaneously, the negotiations toward a government-to-government agreement on the purchase of HEU from dismantled Russian weapons proceeded along a separate track, run on the U.S. side out of the office of General William Burns, the head of the U.S. Safe and Secure Dismantlement (SSD) delegation.[48] Burns and the Russian Minister of Atomic Energy, Victor Mikhailov, signed the government-to-government agreement on the HEU deal on February 18, 1993, shortly after Clinton had entered office. This agreement settled the amount and the time frame of the U.S. purchase of Russian HEU: 500 metric tons over twenty years, beginning with at least 10 tons in the first five years, and rising to at least 30 tons yearly thereafter, with efforts to be made to accelerate this delivery schedule. This agreement also specified that the blending down of HEU from dismantled weapons into low enriched uranium (LEU) would take place in Russia. Although the February agreement did not resolve the price issue, it designated Minatom and the Department of Energy as the executive agents for the HEU deal (with the understanding that this role would later be assumed by USEC). This agreement cleared the way for detailed negotiations between Minatom and the USEC transition team toward a formal HEU purchase contract to implement the government-to-government agreement. Burns and Mikhailov called for the conclusion of the implementing contract within six months. February 1993 marks the point at which responsibility for the HEU deal began to shift decisively from official agencies of the U.S. government to the future USEC management team. After this point, the key figure in the negotiations on the HEU contract was Philip Sewell, a Department of Energy employee who later joined the USEC management.

A long-term contract with USEC as the sole U.S. executive agent was not the format for the HEU deal originally desired by Minatom. Rather, Minister Mikhailov first proposed the

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46 Wilson Dizard III, "Russian Letter to Commerce Calls for 'Clarifications' of Suspension Pact," *Nuclear Fuel*, November 9, 1992.

47. Even after the imposition of the anti-dumping duties, however, substantial amounts of Soviet-origin or CIS origin uranium continued to be sold in the United States, since some previous imports were exempt from the duties under a grandfathering clause, while other importers were able to circumvent the duties by enriching the uranium in Europe.

48. Among other things, the SSD delegation was responsible for negotiating with Russia, Ukraine, Belarus, and Kazakhstan on the umbrella agreements that were needed to use U.S. funds, from the newly established Nunn-Lugar program.

formation of a Russian-American joint venture that would combine low-cost Russian supplies with American marketing talents, allowing the two states to share in the profits of selling highly competitive LEU fuel derived from Russian HEU.[49] This approach was rejected by Department of Energy officials who would later become USEC officials. According to the trade press, these Department of Energy officials wanted to use the HEU deal to enhance the competitiveness of the U.S. enrichment operation by buying Russian SWU at below its own cost of production. Thus, the United States originally offered to buy the Russian SWU for between $30 and $40 - an "absurdly low" level.[50] A Russian-American joint venture like the one proposed by Minatom would have had an effect exactly opposite that desired by the Department of Energy officials: it would have undermined, rather than enhanced, the future competitive position of USEC.

In May 1993, Russia and the United States initialed the draft contract for the HEU purchase, which was identical to the final contract signed on January 14, 1994, in Moscow. The May 1993 draft set the initial purchase price for the Russian HEU at $82.10 per SWU and $28.5 per kilogram of uranium. At this time, the two states also announced that there would be a transparency protocol to the HEU deal to ensure that the LEU delivered to the United States came only from newly dismantled warheads in Russia, and was used solely for non-military purposes in the United States. A preliminary transparency protocol was signed by Vice President Gore and Prime Minister Chernomyrdin in September 1993.

Two key issues in the HEU deal remained unresolved by mid-1993. The first was the U.S. insistence that the revenue from the HEU sales be shared with Belarus, Kazakhstan, and Ukraine. The reason for this insistence was that the complete denuclearization of these three states was one of the highest priorities in U.S. foreign policy in 1993, and Washington wanted to provide them, particularly Ukraine, with an added incentive to transfer the warheads on their territories to Russia for dismantlement. On the other hand, the Russian government, and especially Minister Mikhailov, strongly objected to the U.S. demand that it share the LIEU revenue with the other republics. Moscow charged that this demand was interference in Russia's private affairs with the other former Soviet republics, and argued that Russia would bear all of the costs associated with implementing the HEU deal, including the dismantlement of the warheads, the blending of the HEU, the internal transportation of the HEU and LEU, and the disposition of the plutonium released during the dismantlement process.

The second issue that needed to be resolved before the HEU contract could be signed concerned the suspension agreement. Minister Mikhailov insisted that the HEU implementing

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49. "An Enigma Wrapped Up in a Warhead ... (On the U.S. Side)," *NUKEM Market Report*, October 1993, p. 12.
50. "An Enigma Wrapped Up in a Warhead ...," p. 12.

contract could not be signed until the United States amended its suspension agreement with Russia so as to permit at least some Russian uranium exports to the U.S. market. This demand was made clear at the April 3-4, 1993, summit between Presidents Yeltsin and Clinton in Vancouver, though in all likelihood it was made earlier as well. Mikhailov went public with this demand for the first time in September 1993,[51] but in the intervening period it appears that the Department of Commerce made little if any progress toward amending the Russian suspension agreement. The two main reasons for this lack of movement appear to be the low level of attention that the HEU deal and the suspension agreement received from the Clinton administration's senior national security officials, and pressure from the domestic uranium industry, USEC, and Congress not to relax the suspension agreements. Senator Malcolm allop of Wyoming, for example, wrote President Clinton in September 1993 stating that while he "recognize[d] the significance of the HEU agreement to foreign policy goals of the United States, its execution cannot come at the expense of appropriate enforcement of U.S. trade law."[52] Furthermore, the domestic uranium industry's criticism of the suspension agreement became increasingly intense toward the end of 1993, since uranium importers and speculators had begun to exploit a loophole that allowed them to bypass the quotas (still set at zero) on imports from the former Soviet Union. The bypass involved buying natural uranium in the former Soviet Union, shipping it to Europe to be enriched, and then shipping the enriched product to the United States, or "swapping" it with a like amount of enriched uranium already in the United States.[53] Importantly, this bypass directly impacted the competitive position of USEC by helping the European enrichers.[54]

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51. In a September 9, 1993, interview with the *NUKEM Market Report,* Mikhailov stated explicitly that “We’ve always linked - especially me-the anti-dumping agreement to the signing of the HEU contract… If the[anti-dumping] issue is resolved, we will sign the [HEU] agreement. If resolution is delayed, so will be the signing of the final [HEU] contract." Elizabeth Martin, "A Conversation with Viktor Mikhailov," *NUKEM :Market Report,* October 1993, p 25,

52. Michael Knapik and Wilson Dizard III, "Spot U Price Drifts Below $10.20/Ibs.; Miners, Nuexco Urge scrapping of Suspension Pacts." *Nuclear Fuel,* November 8, 1993.

53. This loophole existed because the suspension agreement stated that the enrichment of uranium in a third confers on that uranium a new country of origin, which was consistent with general U.S. trade practice country regarding the substantial transformation of a product. For a discussion of the bypass issue, see "Clogging the Enrichment at *Bypass," NUKEM Market Report,* May 1995, pp. 4-17.

54. According to USEC president Nick Timbers, buying natural uranium in the former Soviet Union and having it enriched in Europe "generally translates into a savings of $10 or more per SWU," which requires USEC "to choose between losing the sale or reducing its price by at least an equal amount to remain competitive." Michael Knapik "Uranium Price in U.S. Moves Up Slightly; USEC Calls for Shutting Down Bypass Option," *NuclearFuel,* December 19, 1994.

The Trilateral Statement

Ironically, the decisive event in the final negotiations on the HEU contract happened not in Washington or Moscow. but in Kiev. On November 18, 1993, the Ukrainian parliament passed a resolution that ratified the START Treaty subject to an array of conditions. The resolution stated that the START Treaty applied only to 42% of the warheads and 36% of the launchers on Ukrainian territory; stipulated that Ukrainian President Leonid Kravchuk could exchange START I articles of ratification only after gaining international guarantees of Ukraine's security; and demanded that Ukraine be given compensation for the fissile material in the nuclear warheads transferred from Ukraine to Russia. Furthermore, the Rada annulled Article V of the May 1992 Lisbon Protocol, in which Ukraine had pledged to accede to the Nuclear Non-Proliferation Treat% (NPT) as a non-nuclear weapons state. This resolution confirmed the worst fears of the international community about Ukraine's nuclear ambitions, fears which had grown steadily since early 1992, as Kiev took even opportunity to postpone the fulfillment of its own repeated commitments to complete nuclear disarmament.

Given the Importance of Ukrainian denuclearization in President Clinton's national security policy, and with the president scheduled to go to Moscow in January 1994, the vote by the Rada in November 1993 catalyzed a burst of foreign policy activism at the upper echelon of the administration. During his December visits to Moscow and Kiev, Vice President Gore played a crucial role in fashioning a trilateral agreement between Russia, the United States, and Ukraine that would put the denuclearization of Ukraine back on track. To make this agreement possible, Gore had to find a way to compensate Kiev for the HEU uranium contained within the strategic nuclear warheads Ukraine was supposed to transfer to Russia.[55] With Russia refusing to pay Ukraine in cash, and with the Clinton administration unable to pay Ukraine directly for the fulfillment of Kiev's own disarmament commitments, Vice President Gore brokered a deal in which Ukraine would be compensated with LEU fuel assemblies for its power-generating rcactors.[56]

Fuel assemblies for Ukraine had to come from Minatom, so securing Minatom's cooperation in resolving the Ukrainian nuclear problem suddenly became a high priority for the Clinton administration. For this reason among others, the White House ordered the Department of Commerce to negotiate an amendment to the Russian suspension agreement, and put pressure on

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55. Ukraine had also demanded retroactive compensation for the fissile material in the tactical nuclear warheads that had been transferred from its territory to Russia between December 1991 and May 1992; Russia rejected this argument out of hand, while the United States avoided taking a position on the matter. Similarly, some Ukrainians had argued that Ukraine should be compensated for the plutonium as well as the uranium in their relinquished warheads; Russia and the United States were united in their rejection of this position.

56. The idea of compensating Ukraine with reactor fuel for the warheads it was supposed to transfer to Russia had first emerged in the Russian-Ukrainian accord signed in September 1993 in Massandra, but that agreement collapsed almost immediately after it was signed when both states unilaterally rewrote its provisions.

USEC to finalize the HEU purchase contract. To clinch the deal, the White House persuaded USEC to make a $60 million advance payment to Minatom to cover the immediate costs of providing fuel assemblies to Ukraine, which would be credited against the bill for the first deliver% of blended-down HEU to the United States.

On December 15, 1993, the Department of Commerce and Minatom initialed an amendment to the Russian suspension agreement that would allow Minatom to export substantial quantities of uranium into the U.S. market through the year 2003.[57] Then, on January 14, 1994, Minister Mikhailov and William "Nick" Timbers, the USEC transition manager, signed the HEU purchase contract. One hour later, Presidents Clinton, Yeltsin, and Kravchuk issued the "trilateral statement" which started the reciprocal flow of strategic warheads and LEU fuel assemblies between Russia and Ukraine, and which laid the basis for Ukraine's latter ratification of the START Treaty and accession to the NPT as a non-nuclear weapons state. This was an achievement of historic proportions, but in the rush and the urgency to get an agreement, the Clinton administration inadvertently allowed the HEU deal to take shape in a way which virtually ensured that it would not be implemented as originally conceived.

The HEU Contract

At the time of the Trilateral Statement, the HEU deal was publicly described by the United States government as sealed. In fact, in its details the HEU contract signed by Mikhailov and Timbers in Moscow diverges considerably from the commonly held understanding of the HEU deal. Although the HEU contract is regarded as commercially proprietary by USEC and has never been released to the public, three facts about the contract make the U.S. commitment to purchase HEU From dismantled Russian nuclear weapons substantially less ironclad than many officials in the Clinton administration seem to have believed, as their public statements have offered few hints of these qualifications to the HEU deal.

First of all, the HEU contract signed by Timbers does not *obligate* USEC to purchase any Russian HEU; rather the contract gives USEC an *option* to purchase up to 500 metric tons of Russian HEU, starting with 10 metric tons annually in the first five years, rising to 30 metric tons annually for the fifteen years thereafter. This material would be blended down to an enrichment level of approximately 4.4% in Russia, and would then be shipped to the United States as UF6. USEC alone would decide how much HEU the United States would order from Russia each year. Thus, the HEU contract signed and negotiated by USEC differed in an important respect from the February 18, 1993, government-to-government agreement on the HEU deal, which stated that the

57. The amended agreement is examined in detail below.

United States would purchase at least 10 MT in the first five years, and at least 30 MT thereafter, with efforts to be made to increase the rate of purchase.

Second, the agreement set an initial price of $780 per kilogram of 4.4% enriched uranium, which would give the total deal a present undiscounted value of $11.9 billion.[58] Prices for enriched uranium products are a composite of the prices of the natural uranium feed and SWU that go into making the enriched product. In this case, the $780 price reflected a natural uranium price of $28.50 per kilogram of uranium and a SWU price of $82.10. The contract specifies that the price will be renegotiated every October to reflect inflation and changes in market conditions, but there is no provision specifying how pricing disputes will be resolved. If the two sides cannot agree on a price, then no deliveries will occur. As Nick Timbers, the President of USEC, has put it, "the Russian deal, after all, is cancelable."[59]

Third, the contract specifies that Minatom will receive payment for the SWU content in the blended-down HEU within 60 days of delivery, but will receive payment for the uranium feed component only when the material is sold or used to overfeed USEC's enrichment cascades, or at the end of the 20-year contract.[60] The reason for this peculiarity in the HEU contract was that the suspension agreement constrained USEC from reselling the uranium feed component of the Russian HEU on the U.S. market until after the suspension agreement lapsed, in the year 2000.[61] USEC was therefore unwilling to pay Minatom up front for this natural uranium portion of the HEU's value. There is a provision in the contract allowing Minatom to take back the feed component of the HEU rather than have it stockpiled under USEC's custody in the United Suites, but USEC has the right to override a Russian request to do so.[62]

In Moscow, Minister Mikhailov gave Timbers a written proposal repeating Minatom's offer to form a joint venture for the sole purpose of implementing the HEU deal, and which would blend some of the Russian HEU in the United States. Timbers did not respond to this proposal.

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58. The $780 per kilogram price for 4.4% enriched uranium translates into a SWU price of $82.10 and a natural uranium price of $28.50 per kilogram of uranium, which equals approximately $10.91 per pound of 0308 equivalent. In January 1994, the restricted market price of 4.4% enriched UF6 was $813 per kilogram.

59. Edward Giltenan, "A Conversation with Nick Timbers," *NUKEM Market Report,* October 1993, p. 40.

60. Since the price that Russia would receive for the uranium feed component of the blended-down HEU would he determined by USEC, as would the timing of the payment, the $780 per kilogram of 4.4% enriched uranium was a meaningless number, as was the much quoted $11.9 billion total value for the HEU deal.

61. Although one provision of the original suspension agreement (Sect. IV.M.2) stipulates that the uranium component of the Russia HEU sales *is* not subject to the suspension agreement's quotas, a different provision (Sect. IV.M.2(2)) prohibits USEC from reselling the displaced feed component that is delivered to USEC by utilities that receive 1.1317 fuel from the Russian HEU. This second provision was designed to ensure that the HEU deal is implemented in a manner that is neutral in the natural uranium market - in other words, in a manner that does not suppress the price of natural uranium.

62. "Weapons Dismantlement: More Details - and Controversy - Appear Concerning U.S.-Russia HEU Deal," *Nuclear Fuel*, January 31, 1994.

Mikhailov had been pushing for a Russian-American joint venture to implement the HEU deal since at least July 1992, when Minatom signed an initial agreement with Allied-Signal and Nuclear Fuel Services, Inc., two U.S. companies.[63] Allied-Signal has a plant in Erwin, Tennessee, that is licensed for HEU blending operations, and reportedly has a capacity to blend about 6-10 metric tons of HEU per year, which approximately equals the annual capacity of the one Russian blending facility at Ekaterinburg. After receiving a non-committal or negative response from USEC, Mikhailov raised the issue of a bilateral joint venture for implementing the HEU in a June 1, 1994, letter to Vice President Gore.[64] The purpose for the proposed joint venture is fairly clear: Mikhailov wants to speed the flow of revenue from the HEU deal to Russia and Minatom, and he realizes that a properly configured joint venture would have a much higher incentive to quickly - implement the HEU deal than USEC does. For its part, USEC wants to keep control of the HEU deal and therefore has opposed the creation of such a joint venture. There appears to have been no U.S. government response to Minister Mikhailov's letter to Vice President Gore.

A separate point worth emphasizing about Minister Mikhailov's proposal to create a joint venture for implementing the HEU deal is that he specifically offered to sell HEU directly to the United States, to be blended down at U.S. facilities. This belies the statements made by some U.S. government officials that the decision to blend the HEU in Russia was made because of Russian concerns over the secrecy and security of their nuclear stockpile. In fact, Minatom is somewhat schizophrenic about the idea of allowing blending in the United States: Minister Mikhailov strongly favors the U.S. blending option if it speeds and increases the flow of hard currency to his ministry, but others in the ministry would prefer to blend in Russia to provide for the continued operation of the blending facility in Ekaterinburg. It appears that the United States has so far not seriously considered Minatom's offer to allow blending in the United States.

In addition to a number of legitimate environmental and security concerns, one of the main reasons for the U.S. reluctance to allow blending in the United States is that USEC is not equipped for it. Therefore, the blending would have to be done at some other facility, such as the Nuclear Fuel Services plant in Tennessee or the Babcock and Wilcox plant in Lynchburg, Virginia. If. however, another U.S. firm were given responsibility for blending Russian HEU down to LEU for subsequent sale to fuel fabricators and utilities, then that firm would in effect become a second supplier of enrichment services (i.e., SWU) on the U.S. market, thereby breaking USEC's monopoly. USEC, with roughly 90% of the domestic SWU market, sells SWU to domestic

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63. "Allied-Signal, Russian organizations plan to convert uranium," *Aerospace Daily*, July 31, 1992.

64. Wilson Dizard III, "Matek Teams Russian, U.S. Entities to Implement HEU Deal, Courts USEC," *Nuclear Fuel*, June 20, 1994.

utilities at about $120/SWU, but has a production cost of only $60/SWU.[65] As any commercial operation would, USEC wants to preserve this large profit margin and prevent the emergence of alternative suppliers. In terms of the HEU deal, however, the effect of blending only in Russia is to slow and perhaps prevent the movement of fissile material out of Russia and into safe, secure nuclear power reactors.

Finally, almost immediately after the HEU contract was signed, USEC began to complain about the price it was to pay Russia. USEC made clear that it would only execute the HEU deal if it were as profitable as any alternative business activity. According to George Makes, the executive vice president for operations at USEC, the "HEU deal will be viewed like the rest of our capacity, we will look at our ability to produce and our costs, and we'll look at our marketing posture, what the customer requires, and we will try to meet the requirement at the least cost- So the HEU is just going to come into the cost picture. "[66] As USEC officials repeatedly made clear in nuclear industry fora until a change in corporate strategy in mid-1995, if executing the HEU deal forces USEC to accept a lower profit margin, USEC would regard this as a "national security premium," and would expect the government to make up the difference.[67] The government was unwilling to provide USEC with a direct cash subsidy, though the Department of Energy has been willing to compensate USEC indirectly with free grants from the government's stockpile of excess uranium, a move that has been strongly criticized by others in the nuclear industry.[68] Despite these indirect subsidies, however, USEC has repeatedly called on Minatom to accept a lower SWU price for its blended-down HEU - it offered $68 per SWU in February 1995. Minatom has so far refused to do this.

The Amendment to the Russian Suspension Agreement

The amendment to the Russian suspension agreement contained an innovation that was designed to simultaneously serve the interests of Russian and American uranium producers - no mean feat,

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65. Ed Lane, "Uncertainty Clouds Uranium Enrichment Corporation's Plan," *Energy Daily,* March 24, 1993; Michael Knapik and Wilson Dizard III, "U.S. Weapons HEU May Be Given to USEC To Aid Economics of Russian Deal," *Nuclear Fuel,* May 24, 1993; and Wilson Dizard III, "Zarb Leaves USEC Board, Takes New Job; Corporation Issues New Pricing Policy," *Nuclear Fuel,* July 4, 1994.

66. "USEC Marketing Officials Cite Inflated Expectations as Major Challenge," *Nuclear Fuel,* January 7, 1994.

67. "More Details -and Controversy-Appear Concerning U.S. Russia HEU Deal," *Nuclear Fuel,* January 31, 1994.

68. See William J. Broad, "Quietly, U.S. Converts Uranium Into Fuel for Civilian Reactors," *New York Times,* June 19, 1995, p. A 12.

given the nature of the uranium market. It did this by beggaring uranium producers in all other countries. [69]

The amendment to the Russian suspension agreement introduced a provision for "matched sales" of natural uranium and SWU on the U.S. market, replacing the system of import quotas pegged to the price of uranium in the original agreement. Under matched-sates quotas, Russian-origin uranium or SWU may be imported into the U.S. market if it is matched with an equal amount of uranium or SWU that is "newly produced" by domestic producers.

As the next step in a matched sale, the Russian and the U.S. products would be bundled together and sold to a utility as a single package. Although the matching ratio would be 1:1, the Russian and American producers would not split the proceeds equally: the amended agreement requires that the U.S. producer receive a higher unit price for the combined sale than the Russian producer. To see this, consider the following illustration. A U.S. uranium producer signs a matched-sales agreement with a Russian producer to sell 2,000 pounds of uranium subject to a 70-30 revenue split. The U.S. producer would then try to find a buyer for the 2,000 pounds of uranium. If the uranium were sold to a utility for $9 per pound, giving the deal a total value of $18,000, the Russian producer would receive $5,400 and the U.S. producer would receive $12,600. (The treatment of matched SWU imports is analogous but slightly more complicated.) In effect, therefore, the amended suspension agreement requires Russian producers to subsidize U.S. producers if they wish to sell uranium products on the U.S. market.[70] Nonetheless. Minatom officials acquiesced to the matched-sales arrangement, not least because one company partially owned by Minatom was well positioned to reap hard-currency profits from the matched sales.[71]

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69. The Department of Commerce has not signed similar amendments to the uranium suspension agreements with the non-Russian former Soviet republics, mainly because these states lack Russia's political and economic leverage. Another factor, however, is that the legality under international trade law of the Russian amendment has been challenged by other states, such as Canada, as noted below.

70. In economic parlance, this is a "rent transfer": a transfer of wealth from one entity (Russian uranium producers) to another (U.S. uranium producers) for reasons having to do the preferential status of one of them (in this case, the greater political and legal influence of U.S. uranium producers), not with any sort of normal, productive economic activity. The value of the rent is an implicit production subsidy to the U.S. producer from its Russian partner in the matched sale. In the illustration above, the size of the rent transfer is $3,600.

71. The company was Tenex, the former Soviet uranium trading firm, which is the partial owner of Global Nuclear Services & Supply Ltd. (GLASS). GNSS had a pre-existing partnership with Concord/Nuexco. The proposal of the matched-sales scheme was first made publicly by Concord/Nuexco and GNSS in November 1993, before the amendment to the Russian suspension agreement was initialed. Michael Knapik and Wilson Dizard Ill, "Spot U Price Drifts Below $10.20/lbs.; Miners, Nuexco Urge Scrapping of Suspension Pacts," *Nuclear Fuel*, November 8, 1993.

The amendment imposed a new set of quotas on the amount of Russian-origin uranium and SWU that could enter the United States under matched sales. These quotas are allocated among U.S. producers on an administrative basis: that is, the Department of Commerce receives a matched-sales proposal from a U.S. firm and, if it meets minimal acceptability criteria, approves it. For 1994 and 1995, the amended agreement allowed 2,539 metric tons of uranium and two million SWU to be imported from Russia into the United States. During 1996-2003, smaller amounts of Russian-origin uranium would be allowed into the United States each year under matched sales, but no further SWU imports would be allowed, as shown in Table 2.

Table 2. - Annual Matched-Sales Quotas for Russian Uranium

(in millions of SWU, and metric tons of uranium)

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
SWU Quota	2.0	2.0	0	0	0	0	0	0	0	0
Natural Uranium Quota	2,539	2,539	742	1,042	1,385	1,554	1,627	1,554	1,881	1,654
HEU Feed Component	2,970	2,970	2,970	2,970	2,970	8,937	8,937	8,937	8,937	8,937

Note: The matched-sales uranium quotas in the amendment to the suspension agreement are given in pounds of 1;308. The figures listed above have been standardized in MT of uranium. The conversion factor is 1 kg. U equals 2.6lbs. U308

The amended Russian suspension agreement generated controversy in the nuclear industry, and there are a number of problems with it. The first is that it conflicts with the principles of U.S. antitrust law by encouraging price collusion among suppliers who are supposed to be in competition with one another; for this reason, the Department of Justice is reportedly examining the agreement. [72] Second, the amended agreement violates the North American Free Trade Agreement (NAFTA), and probably also the weaker General Agreement on Tariffs and Trade (GATT), by offering preferential treatment to U.S. producers at the expense of foreign sellers. Canada, the key U-S. partner in NAFTA, is the world's leading uranium exporter, and stood to suffer an economic loss as a result of the matched-sales agreement. In its economic effects, the matched-sales agreement would directly displace uranium sales in the U.S. market that could otherwise go to

72. "Clogging the Enrichment Bypass," *NUKEM Market Report*, May 1995, p. 10.

Canadian or other foreign uranium producers, and, if it were to encourage new production of U.S. uranium or supply of Russian uranium that would not otherwise occur, could tend to depress the world price of uranium. Both of these effects run against the interests of uranium exporters, so Canada lodged a formal protest with the U.S. government in early 1994, and, after receiving an unsatisfactory response, began legal proceedings under Article 309 of NAFTA, which bars the discriminatory treatment of imports.[73]

The effect of the amendment to the Russian suspension agreement on the HEU deal was not immediately clear, requiring subsequent clarification by the U.S. government. The amended suspension agreement excludes the SWU content of the blended-down HEU from the matched sales quotas, and therefore places no limit on the amount of Russian SWU that USEC can resell on the U.S. market. The amendment also did not change the original agreement's procedure for dealing with the uranium feed component of the Russian HEU, which was to require an amount of natural uranium equal to the feed component in the enriched Russian uranium to be quarantined by USEC from the U.S. market if and when USEC imports blended-down Russian HEU. Under the amended agreement, therefore, the only possible way in which this quarantined feed could be released on the U.S. market would through a matched sale. [74] The power to determine whether such matched sales will take place currently lies with USEC. As shown in Table 2, the annual quotas for matched sales of Russian natural uranium on the U.S. market are well below the feed component of the blended-down HEU that USEC is supposed to import for the first ten years of the HEU contract, making it impossible to compensate Russia for the full value of its blended down HEU through U.S. sales until after the suspension agreement expires.

This complex arrangement for dealing with the feed component is best understood with reference to Figure 4. Since the feed component of 10 metric tons of blended-down HEU is 2,179 metric tons of natural uranium, USEC is required to quarantine 2,979 metric tons of its own I feedstock. As Figure 4 shows, the amended suspension agreement allows four things to be done with this material.

First, the material can be sold abroad. Unfortunately, demand for uranium is relatively flat. much of it is tied up in long-term contracts, and Russia is already selling as much uranium as it can outside of the U.S. market. Furthermore, the right to decide how, when, and at

73. Michael Knapik, "Russians Said to Want Higher U.S. Prices; USEC Concludes Deal with Nuclear Electric," *Nuclear Fuel,* April 11. 1994.

74. Whether or not the Russian feed component can be sold in the context of a matched sale is somewhat ambiguous: there *is* nothing in the suspension agreement that would prohibit such sales, but it seems that Canada may have been given the impression by the Clinton administration that such sales would not take place. There have so far been no matched sales of blended-down HEU in the United States, and whether they are permissible at all seems to be up to the discretion of the Department of Commerce. This paper will assume that matched sales using Russian HEU feed are in fact permissible.

what price the feed component is sold currently belongs to USEC, which can be expected to dispose of the material in a manner that serves its own interests, not Minatom's.

Second, USEC could use this natural uranium to overfeed its enrichment cascades. This is, however, apparently not cost effective at a price of $28.5 per kilogram of uranium, so USEC has refused to purchase the Russian feed component for this purpose.

Third, the material can be quarantined until the suspension agreement expires, which guarantees that Russia will not be paid for it until at least 2003.

Fourth, the material could probably be sold on the U.S. market as part of a separate matched-sale agreement.[75] Such sales would count against the annual Russian quota shown in Table 2, so only a relatively small portion of the total uranium feed in the blended-down HEU could be released in the U.S. market in this manner. Moreover, such sales would be controlled by USEC, not Minatom.

Since none of these options is particularly viable, the amended suspension agreement ensures that Russia cannot be readily compensated for the feed component of the blended-down HEU it ships to the United States.

If there were any doubts as to the effect of the amended suspension agreement on the U.S. ability to compensate Russia for the feed component of its HEU, they were resolved in the context of bilateral trade negotiations with Canada. Canada, as already noted, protested against the matched-sales arrangement and, when that failed to resolve the issue, began legal proceedings under the non-discrimination clause in NAFTA.

Not wanting a new trade dispute with its largest trading partner, the Clinton administration worked to settle this issue with the Canadians during late 1994 and early 1995. The task was handled by the office of the U.S. Trade Representative, Mickey Kantor, and the Under Secretary of State for International Security Affairs, Lynn Davis. On February 21, 1995, Davis persuaded the Canadians to drop their year-old challenge to the amended Russian suspension agreement with an exchange of official letters that was based on a consultation between the two governments held on October 20, 1994. Although the U.S. State Department and USEC take a different view, Canada regards the Davis letter as an official assurance that the United States will allow no more Russian-origin uranium - including the feed component of the Russian HEU - to be released on the U.S. market beyond that which is already allowed by the matched-sales quota.[76] In this way,

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75. See note 74.

76. According to nuclear industry sources, the reason for this ambiguity in the Davis letter is that USEC has questioned the interpretation of Section IV.M.2 of the suspension agreement that enjoins USEC from reselling

Canada was reassured that the combined market impact of the HEU deal and the amended suspension agreement would be no greater than the market impact of the matched sales of Russian natural uranium permitted by the amended suspension agreement alone. In effect, therefore, in order to protect the amended suspension agreement from a legal challenge, the United States offered its closest trading partner an assurance that the sales of the teed component of the blended down Russian HEU would be limited by the quotas shown on Table 2. This, in turn, implied a further constraint on the U.S. ability to compensate Minatom for the full economic value of the
Russian HEU.

USEC's Four-Tiered Approach and the $100 Million Advance

In 1994, USEC ordered six metric tons of Russian blended-down HEU at the originally negotiated price ($82.10 per SWU) to be delivered in 1995, which was somewhat more than the amount that USEC would need to purchase to cover its $60 million advance to Minatom. The shipments of this material began in spring 1995, but even as the uranium was moving across the Atlantic, the two sides were still disputing how the $60 million advance would be credited against USEC's order, and how Minatom would be compensated for the feed component. Minatom wanted to credit the advance against the full value of the enriched uranium, whereas USEC wanted to credit the advance only against the value of the SWU component, not the feed component. In effect, Minatom was asking for a change in the HEU contract provision stipulating that payment for the teed component will occur only when it is sold or used as overfeed, or when the contract expires in 2014. Privately, Minatom was threatening to cancel the HEU deal unless some way around this provision in its contract with USEC was found.

At the annual price review consultations that began in October 1994, the two sides were unable to agree on the price that USEC would pay for additional deliveries of HEU beyond 1995. According to a February 1995 protocol, USEC wanted to buy Russian SWU for $68 or less, while Minatom held out for the originally negotiated price of $82 per SWU, as well as some sort of prompt compensation for the feed component. Because of this price dispute, USEC placed no further orders until June 1995, when it and the Clinton administration began to be criticized in the media for allowing the HEU deal to bog down. [77] On June 15, 1995, USEC informally offered to purchase (but did not formally order) 12 additional metric tons of Russian HEU at a SWU price of

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utility-delivered feed that is displaced by blended-down Russian HEU on the U.S. market. "Clogging the Enrichment Bypass," *NUKEM Market Report.* May 1995, p. 13; Michael Knapik, "Analysts Expect Rise in Spot U Price," *Nuclear Fuel*, February 27, 1995.

77. See William J. Broad, "Deal for U.S. to Buy Bomb Grade Fuel From Russia Said to be in Peril," *The New York Times*, June 12, 1995, p. Al; "An Endangered Nuclear Bargain," *The New York Times*, June 13, 1995, p. A24; and "Mutually Assured Cooperation," *The Boston Globe*, June 15, 1995, p. 20.

not less than $82.10.[78] USEC also offered to pay Minatom up front for the feed component, but linked this concession to Congressional action that would exempt USEC from the suspension agreement quotas and the anti-dumping duties, allowing it to sell the material on the U.S. market without penalty.

As the basis for its request for an exemption from the suspension agreement, USEC developed a four-tiered approach to disposing of the Russian feed component - that is, four different and sequential means by which the Russian feed could be sold. The first tier was sales outside of the United States, which were already allowed by the suspension agreement. The second tier was a "futures" sales mechanism. The USEC proposal would create a one-month window (each year) in which buyers could bid for the Russian feed to be delivered five years later; USEC would have the right to reject the bids. Third, the Russian feed could be sold to U.S. uranium miners at USEC's acquisition cost, though the level of this acquisition cost could be determined by USEC. Finale, in the fourth tier, USEC would he able to sell all uranium not sold in the previous three tiers on the spot market without restriction.

The main effect of the four-tiered approach would be to give USEC total control over the Russian feed and an exceptionally secure and privileged position in the global uranium market. Each of the four tiers is flawed as a means of compensating Russia for the feed component of the blended-down HEU. The first tier - sales outside of the United States - represents no improvement over the current situation. As previously noted, Russia is already selling as much uranium abroad as it can, and is limited chiefly by market conditions and the various trade barriers that Russian nuclear exports face around the world. Also, the first tier would put USEC into the position of competing with other Russian sales in the international market. The second and third tiers - forward sales and pass-through sales at cost to U.S. miners - are unlikely to work, either, because of the market effects of the fourth tier.

By giving USEC the right to engage in unrestricted domestic sales of the Russian feed component, the fourth tier would give USEC the power to severely depress short-term uranium prices.[79] Since no uranium buyer will want to pay a relatively high current price when it expects lower prices in the near future, there is unlikely to be significant demand for the Russian feed in the second and third tiers-and, even if there were, USEC would have the power to prevent the sales if it chose to do so. The four-tiered approach is effectively a license for USEC to dump Russian

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78. The original HEU contract specified a SWU price of $82.10 for 1994, and stipulated that this price would apply in 1995 if the two sides were tenable to agree on a new SWU price. (the contract did not specify what would happen if the two sides failed to agree on a SWU price after 1995.) The June 1995 protocol between USEC and Minatom simply extended the start date for the contract until 1995, so that the default SWU price of $82.10 would apply for 1996 if the two sides failed to agree on a different SW price before then

79. Since there is relatively little uncommitted short-term demand for uranium, sudden spot sales by USEC of the Russian feed component could have an enormous effect on the spot uranium price.

uranium on the spot market, a right which has already once been denied to Concord/Nuexco. More generally, the four-tiered approach would strengthen the market position of USEC to the detriment of every other firm in the nuclear industry. Uranium producers and traders would lose because of USEC's unique right to sell low-cost Russian uranium on the U.S. market, and utilities, while they may temporarily benefit from lower uranium costs, fear that USEC would use its dominant position in the feed market to demand higher prices for its SWU, which accounts for two-thirds of the price of LEU fuel.[80] Moreover, continued price depression in the spot market is likely to result in a severe price rebound later if the lower spot prices discourage investment in new mines or cause more firms to leave the industry. The four-tiered approach also would seriously undermine the suspension agreement and the matched-sales concept, possibly provoking - challenges from U.S. miners as well as important trading partners like Canada. Finally, since compensating Russia for the full value of its blended-down HEU ultimately depends on a healthy uranium market, the USEC four-tiered approach is likely to have a damaging effect on the long-term commercial viability of the HEU deal.

USEC's conditional offer to pay up front for the Russian feed under the four-tiered approach represented a significant change in corporate strategy for USEC. Until mid-1995, USEC treated the HEU deal as something of a liability, and claimed that it should receive a government subsidy equal to the "national security premium" contained in the politically negotiated SWU price. As it began to be criticized for allowing the HEU deal to bog down, however, USEC changed its tack. Now USEC argues that the HEU deal is threatened principally by the suspension agreement's effect on USEC's ability to compensate Russia for the feed component in the blended-down HEU. This effectively turns the national security argument on its head, since it is now those who resist USEC's proposal to exempt itself from the suspension agreement that seem to be undermining the national security benefits of the HEU deal. In fact, USEC's four-tiered approach for dealing with the uranium feed component is both seriously flawed and plainly self-serving, and the focus of the debate on the suspension agreement issue has served mainly to distract attention from the much more fundamental issue of USEC's own conflicts of interest as the sole executive agent of the HEU deal.

The HEU deal was one of the main items on the agenda at the meeting of the Gore-Chernomyrdin Commission in Moscow in late June and early July 1995, and prior to this meeting the Office of the Vice President apparently decided to support the USEC in its proposals for dealing with the feed component issue. In Moscow, USEC and Minatom signed a protocol in which USEC agreed to pay for the full value of the Russian HEU (uranium and SWU) upon delivery. However, this concession was linked to the "enactment of legislation in the United States

80. See "Choice -The HEU Deal or USEC," *The Ux Weekly,* June 12, 1995.

necessary to authorize the President to waive anti-dumping duties and other trade restrictions against LEU under the HEU Contract."[81] If such legislation is not in place by November 1, 1995, Minatom will cease to regard the protocol as binding. In fact, Minatom has informally let it be known that the failure to resolve the uranium feed issue by November could be the end of its relationship with USEC. This arrangement, in turn, puts great pressure on the Clinton administration and the Congress to do as USEC asks, since the national security benefits of the HEU deal are now effectively linked to granting USEC special trade law exemptions and expanded commercial advantages.

USEC, in the protocol signed in Moscow, also offered Minatom a $100 million advance payment for future deliveries of blended-down HEU. This loan by USEC has been privately guaranteed by the Department of Energy: if Russia fails to deliver $100 million worth of blended-down HEU to USEC, or if USEC cannot recoup its expenses by selling the Russian feed, then the Department of Energy will reimburse USEC in kind out of the government's uranium stockpile. Ironically, Minatom did not ask for this advance and, indeed, would be satisfied if it were simply paid a fair market price upon delivery of the blended-down HEU. Public statements by USEC and the Clinton administration suggest that the $100 million advance was needed to underwrite the continued flow of fuel assemblies to Ukraine according to the Trilateral Statement, but Russian officials have privately suggested that this was a cover story concocted to mask the real purpose of the advance payment.

The $100 million advance was USEC's idea, and the motives behind it were transparent. First, the $100 million advance reduced the odds that Minister Mikhailov would reject USEC's four-tiered approach out of hand. The Russians could see that the four-tiered approach was less than ideal: by giving USEC privileged control over the price and timing of the HEU feed sales, the four-tiered approach almost guaranteed that Russia would not receive a fair market price for its uranium, and that USEC would emerge with its own market position considerably strengthened. Since a Russian rejection of USEC's proposal would have been highly damaging to USEC's political standing in Washington, securing Russia's approval was very important for USEC at the Moscow meeting of the Gore-Chernomyrdin Commission. In this respect, the $100 million was basically a bribe. Second, with a $100 million loan outstanding to Minatom, the costs of stripping USEC of its current role as the exclusive executive agent in the HEU deal were increased, making it even less likely that the government will do so.

Although the Clinton administration described the agreements on the HEU deal reached at the Moscow meeting of the Gore-Chernomyrdin Commission as a great success, in fact they amount to little more than a flawed and temporary fix to a profound problem in the U.S. strategy

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81. Protocol between Minatom and USEC, June 30, 1995.

for buying HEU from dismantled Russian nuclear weapons. Congressional enactment of a trade law exemption for USEC will not put the HEU deal on sound commercial footing. It will, however, postpone the day on which the White House must confront the fundamentally flawed system for buying Russian HEU that the Clinton administration allowed to be put in place.

The Fate of the HEU Deal

If the president and Congress enact USEC's special exemption from the suspension agreement, Russia is likely to deliver the 18 metric tons of blended-down HEU that USEC has pledged to purchase by the end of 1996. If there is no special trade exemption, however, or if no other means of compensating Russia for the feed component is found, then Minatom could well cancel the HEU deal on its own accord - something which it had already threatened, but which USEC claims Moscow has no legal right to do without first abrogating the February 1993 government-to government agreements.[82]

Even if the president and Congress do what USEC asks on the suspension agreement issue, it is far from certain that USEC will place new orders for Russian HEU beyond this initial 18 metric tons, for the simple reason that USEC and Minatom are unlikely to agree on a SWU price. The original SWU price of $82.10 was agreed upon by the State Department, and USEC is adamant that it must be reduced if additional HEU is to be purchased from Russia. Minatom, on the other hand, feels that it has been promised a SWU price of $82.10, and appears unwilling to go substantially below that, especially given the fact that the average SWU sale price in long-term contracts around the world is in excess of $100. Thus, although Minatom and USEC are supposed to agree to a new SWU price in October 1995, it is distinctly possible that they will be unable to do so. As of mid-1995, much of the U.S. government did not understand or acknowledge the SWU price aspect of the problem with the HEU deal, and those U.S. officials who did had no plan for solving it, and indeed appear determined to avoid confronting it until the SWU price negotiations between USEC and Minatom actually collapse. This, however, is exactly what USEC wants, since by then the privatization of USEC should be well under way or complete. Once the privatization is complete, the government will have even less ability to influence USEC's behavior than it does now. A solution to the SWU price problem - which is, in fact, really a problem having to do with the commercial interests of the executive agent - will be harder to find the longer the government delays in addressing the issue.

82. See Sonm Efron, "Russian Says U.S. Is Not Paying for Uranium from Warheads," *Los Angeles Times*, June 14, 1995, p. 3.

III. The Five Mistakes of the Executive Branch

Aside from U.S. anti-dumping law, a lamentable though probably immutable feature of the American political economy, there have been no fewer than five specific failures by the executive branch in its implementation of the HEU deal. Several of these failures are clear from the preceding narrative, but will be laid out here in somewhat greater detail. In each instance, senior national-security officials in the U.S. government had the power to influence the evolution of the HEU deal in a positive way, but failed either to perceive the trouble that was unfolding for the HEU deal, or failed to exercise sufficient influence to change the course of events. As a consequence of these lapses, the HEU deal is in danger of being implemented only in the most desultory fashion, far from the ambitious scope and speed of the plan enthusiastically endorsed by Presidents Bush and Clinton.

Including HEU in the Anti-Dumping Investigation

When it issued its preliminary finding that dumping had occurred in May 1992, the Department of Commerce specifically announced that HEU and blended-down HEU were not within the scope of the anti-dumping investigation. However, by September 1992, when the original suspension agreements were initialed, Commerce specifically included HEU within the scope of the suspension agreement.

That the Bush administration allowed Commerce to include HEU within the scope of the suspension agreement was a serious mistake. Unlike November 1991, when it allowed the Department of Energy to join the anti-dumping petition, by September 1992 the initial agreement to purchase 500 metric tons of HEU from dismantled Russian weapons had already been reached. Thus, the administration knew that the United States would be buying a very large amount of enriched uranium. If the Bush administration had examined the cost effectiveness of the overfeeding option, it would have seen that USEC would be unlikely to voluntarily purchase the Russian feed component at competitive market prices for use as overfeed. This fact meant that the Russian feed component would have to be resold to compensate the Russian government for the full value of its blended-down HEU. The suspension agreement effectively shut off this option a well.

In short, the Bush administration gave insufficient thought to the relationship between the HEU deal and the suspension agreement.

Making USEC the Executive Agent in the HEU Deal

The decision to make USEC the executive agent of the HEU deal was made sometime in the summer of 1992, when USEC's role in the HEU deal was first publicly announced, so the blame for this decision clearly belongs to the Bush administration. There were three main reasons for giving the HEU deal to USEC. First, regardless of whether or not it was the executive agent, USEC's involvement in the HEU deal was desirable, since USEC would have to overfeed its enrichment cascades for the United States to reap the full economic benefit of the HEU purchase without driving down the price of uranium. Second, because of the budget deficit, the Bush administration wanted the LIEU deal to be kept "budget neutral," and one certain way to do this was to commission an organization with a separate and independent financial standing as the executor of the purchase agreement. Third, giving USEC the HEU deal was seen as a way to enhance USEC's competitiveness in the international marketplace. This, in turn, would strengthen U.S. industry, protect jobs, possibly increase U.S. export earnings, and increase the proceeds to the U.S. Treasure that would result from USEC's eventual privatization.

These were sound reasons for giving USEC the HEU deal, but if the Bush administration had looked deeper, it would have discovered that USEC would have little incentive to implement the HEU deal at the speed or scope envisioned by the president and his key advisors. The first reason for this has already been described: as a monopoly, USEC was accustomed to very high profit margins - on the order of 100%. "Budget neutral," therefore, has a decidedly different meaning for USEC than it does for the U.S. Treasury: whereas the government would regard anything which causes no net increase or decrease in the budget deficit as "neutral," for USEC "budget neutral" means "earning exactly the same profit as the alternative activity." In USEC's case, the alternative activity would be to produce SWU on its own, at a unit cost of $60, and sell it to utilities at a unit price of about $120. Thus, a key failing of the Bush administration was that it confused budget neutrality for a government with profit neutrality for a firm.

The second reason why USEC is a poor executor for the HEU deal is that USEC has an inherently adversarial relationship with Minatom. There are four suppliers of enrichment services in the world: USEC; Cogema, a French conglomerate; Urenco, a British-Dutch-German consortium; and Minatom. USEC and Minatom are oligopolistic competitors. In the enrichment sector alone, Minatom claims to have 20-25% of the world enrichment capacity, but only 5% of the world enrichment market - a percentage that Minatom desperately wants to increase.[83] As a rational market actor, USEC has no incentive to be a mere broker for its competitors, especially when that competitor has a dire shortage of hard currency. By funneling hard currency to Minatom

53. Ann MacLachlan, "Euratom Has Approved Some CIS U Contracts Under $13/lb. to Block 'Undue' Trader Profits," *Nuclear Fuel*, June 7, 1993.

through the HEU deal, USEC would inadvertently be helping its commercial rival become more competitive in the international marketplace, thereby increasing the risk that USEC will lose market share or be forced to accept lower prices in the future. Not surprisingly, Minister Mikhailov has grasped this conflict of interest, which is part of the reason why he and his ministry have always pushed for the creation of a separate U.S.-Russian joint venture to implement the HEU deal.

Third, by reselling Russian HEU on the U.S. and world market, USEC inevitably accentuates its own problem with excess production capacity. USEC's two gaseous diffusion plants have an annual production capacity of 192 million SWU, but, with the global SWU market beset with excess supply, are together producing only about 13 million SWU per year. A decision to close one of the plants has long been described as inevitable, but USEC has no interest in doing so any sooner than absolutely necessary- Certainly, so long as its privatization legislation is before Congress, USEC will postpone its plant-closing decision, which would inevitably alienate legislators from either Ohio or Kentucky. Since 10 metric tons of HEU contains 1.9 million SWU, and 30 metric tons of HEU contains 5.7 million SWU, it is easy to see that implementing the HEU deal conflicts with USEC's political interest in keeping open both of its enrichment plants for as long as possible.

Finally, USEC is an inappropriate government executor of the HEU deal because USEC is not subject to conventional governmental control. Even though it is wholly owned by the U.S. Treasury, USEC is not a government agency: the president cannot easily order USEC to take actions which USEC regards as against its economic interest. And, once USEC goes public, the government will have no more formal authority over USEC than it does over any other publicly field company. Although the Clinton administration has sought to define the LIEU deal as "strictly commercial," in fact the HEU deal is an initiative whose value is measured primarily in terms of national security. As such, it is irresponsible to relegate its implementation to a private actor that the highest authority in the United States cannot easily and directly control, and which has incentives that do not coincide with the national security interests of the United States. That the Bush administration permitted an initiative as important to U.S. security as the HEU deal to be implemented by just such an entity was a major intellectual failure with damaging policy consequences.

To be perfectly clear, it is worth re-emphasizing that USEC is not to blame for the trouble with the HEU deal. USEC has behaved as any other rational economic actor in its position would: it has taken those actions which it believes will maximize its total profits and its market competitiveness, and to do anything else would be a violation of the managing team's fiduciary responsibilities to its present and future shareholders. Rather, the blame for the failure of the HEU deal lies with those officials responsible for protecting the national security interests of the United

States. These officials never should have allowed executive authority over the LIEU deal to be given to an entity manifestly unsuited to that role.

In short, the Bush administration gave insufficient thought to the relationship between USEC and the HEU deal.

Ignoring the Russian Interest in U.S. Blending

National security officials in the U.S. government also should have been more supportive of the option of buying HEU directly from Russia and blending it in the United States. This would reduce the proliferation risks attendant with the large stockpile of fissile material in Russia, accelerate the implementation of the HEU deal, speed the flow of funds to Minatom, and provide business for a number of U.S. firms in the nuclear industry who have been shut out of the HEU deal by USEC. There would, of course, be environmental and legal hurdles to overcome if blending in the United States were to occur, but it appears that little serious effort has been made by the national security officials in either the Bush or the Clinton administrations to analyze the advantages and disadvantages of allowing blending in the United States. The Clinton administration's national security team, for example, seems to have taken USEC on its word that blending in Russia is the only viable option, and, in fact, many senior officials were not even aware that Minister Mikhailov has repeatedly proposed to ship Russian HEU from dismantled nuclear weapons directly to the United States.[84] This is an oversight that should be promptly corrected.

Aside from removing HEU from Russia more quickly and reliably, blending in the United States would have the advantage of allowing U.S.-produced natural uranium to be used as the blendstock. As it currently stands, the Russian HEU is to be blended with *1.5%* enriched uranium in Russia. If, however, the U.S. government were to allow blending in the United States, then U.S.-produced natural uranium could be used. This blending, in turn, would create additional demand for U.S. uranium, thus meeting the major concern of all of the anti-dumping petitioners - except USEC. Whether or not USEC would benefit from this arrangement depends on who would control the SWU sales, the price that would be paid to Minatom for the Russian SWU, and the effect of the transaction on demand for USEC's own SWU.

81. In early 1995, I asked no less than six senior or mid-level officials in the White House, the Department of Defense, and the Department of State if they were aware of Mikhailov's June 1994 letter to Vice President Gore, which repeated the offer to sell HEU directly to the United States. None were.

The Amendment to the Russian Suspension Agreement

The fifth mistake of the U.S. government - one for which the Clinton administration bears sole responsibility-has to do with the amendment to the Russian suspension agreement. As described earlier, the snatched-sales quotas on Russian natural uranium imports are also too low to permit the implementation of the HEU deal - even if the sale of blended-down HEU through matched-sales is permissible. This was shown in Table 2, which compares the annual matched-sales quota to the size of the feed component in 10 and 30 tons of suitably blended-down Russian HEU.[85] Obviously, as Table 2 shows, in no year does the amended suspension agreement permit the reselling on the U.S. market of the full feed component of the HEU that the United States should import in that year pursuant to the HEU deal. To make matters even worse, in its negotiations with Canada, the Clinton administration gave the Canadian government the impression that the feed component of the blended-down HEU would be released on the U.S. market only in the context of the matched-sales quotas - if at all. In other words, if the U.S. government finds a way to promptly sell the Russian feed component on the U.S. market, Washington will likely have on its hands yet another dispute with the most important U.S. trading partner. This, of course, will dampen enthusiasm in Washington for finding a solution to the HEU feed component problem with Russia.

The Clinton administration is also at fault for failing to take the opportunity of the amendment negotiations to establish once and for all a firm legal basis for domestic sales of uranium products derived from the HEU deal. It appears, however, that no attempt was made within the negotiations to determine where the priorities of the U.S. government should lie in the matter of the anti-dumping case and the HEU deal.

Supporting USEC's Four-Tiered Approach

When Vice President Gore went to Moscow in June 1995 for his regular meeting with Prime Minister Chernomyrdin, public and media attention was focused on the HEU deal to an unprecedented extent.[86] The White House had a rare opportunity to discuss the structural flaws in the HEU deal with the Russian government at a very high level, something which will eventually be required if a viable long-term means of implementing the HEU deal is to be put in place. Instead, the administration decided to use the occasion of the Gore-Chernomyrdin meeting to enact

85. Thus, the table assumes that 10 metric tons of HEU will be imported annually between 1994 and 1998, rising to 30 metric tons per year front 1999 onward. In fact, the actual imports of Russian HEU in 1994 and 1995 have not come close to these targets.

86. Matthew Kaminski, "Gore to Lead Talks on Financing for Uranium Deal," *Financial Times*, June 29, 1995.

a temporary and deeply flawed fix to a fundamental problem in the U.S. strategy for purchasing HEU from dismantled Russian warheads. The result was a short-term public relations victory, not a long-term solution.

In the hurried preparations leading up to Vice President Gore's trip to Moscow, the Clinton administration decided to support USEC's four-tiered approach to the suspension agreement problem. To improve the chance that the Russians would accept this proposal, the administration also decided to volunteer the $100 million advance to Minatom. On both counts, the administration apparently had insufficient time to scrutinize the likely effects of these innovations and the motives behind them- The four-tiered approach will require the president to seek a special trade law exemption for USEC from the U.S. Congress, something which will have an array of damaging . effects but which will not resolve the fundamental problem in the HEU deal - USEC's conflict of interest. As already argued (pp. 35-38), the main effects of the four-tiered approach and the $100 million advance will be to strengthen USEC's position in the nuclear fuel market and to postpone a major price dispute with Minatom until after USEC is fully privatized. In other words, rather than develop a policy of its own, the administration decided to follow the self-interested policy pushed by USEC. In so doing, the administration once again subordinated the national security interests of the United States to the commercial interests of a government-owned monopoly.

IV. Salvaging the HEU Deal

Salvaging the HEU deal requires policy changes in two closely related areas: the incentive structure of the executive agent and the suspension agreement. A policy change in a third area - whether or not blending is allowed in the United States - is desirable but not essential.

All of the possible policy changes described below will be legally and politically difficult to implement. Low-level national security officials in the administration are unlikely to have the clout or the authority to carry out any of these changes, as each proposal would encounter opposition from the vested interests that would be affected. The effort to repair the HEU deal will fail unless the upper echelon of the Clinton administration's foreign policy team becomes involved in and committed to the task.

The Executive Agent

The most important point to understand about the HEU deal is that it is unlikely to be implemented unless the agent given executive authority over the transaction has an incentive to carry it out. As explained in detail above, USEC has no positive economic incentive to implement the HEU deal unless Minatom agrees to reduces its SWU price from $82 to USEC's cost of production, which is

about $60. Moreover, even if Minatom does accept the lower price, the fact that USEC and Minatom are oligopolistic competitors will work against the smooth implementation of the HEU purchase.

There are three basic ways to create incentives for the HEU deal to be implemented by its U.S. executor. The first is for the U.S. government to subsidize USEC's purchases of blended-down Russian HEU. The second is for the Congress, when it passes the final privatization legislation for USEC, to create a statutory requirement for USEC to fully and faithfully implement the LIEU deal. The third is to designate an alternative executive agent for the HEU deal, which can be done in a variety of different ways. Each of these options is described and evaluated below, though this discussion defers for the moment an analysis of how the amended Russian suspension agreement would need to be changed to make any of these options fully viable.

Subsidize USEC

A key obstacle to USEC's implementation of the HEU deal is that unless Minatom accepts a SWU price of $60 or less, it is more profitable for USEC to produce its own SWU than to import it from Russia. Minatom has thus far refused to go this low in price, which is unsurprising since the long term SWU prices worldwide tend to be in excess of $100. One solution to this problem, therefore, is for the U.S. government to pay USEC the difference between its cost of production - $60 - and the lowest price Minatom will accept. In this case, if Minatom accepted a SWU price of $75, the purchase of 10 metric tons of HEU from Russia would cost the U. S. taxpayer about $27 million, giving the HEU deal a total cost to the government of $1.35 billion.

This is a very bad option for salvaging the HEU deal, for three reasons. First, a U.S. government subsidy for implementing the HEU deal would be pure profit for USEC, which monopolizes the U.S. enrichment market and demands profit margins of close to 100% front its domestic customers. With USEC simultaneously gouging U.S. consumers and the Russian government, it is absurd to hold that USEC deserves further government assistance. Second, if it is known that the U.S. government will make up the difference between USEC's cost of production and the price paid to Russia, Minatom will never agree to a lower price. Third, and most importantly, *the HEU deal does not need to be subsidized.* There is more than enough economic value in the HEU from Russian warheads to allow the HEU deal to be fully implemented at no net cost to the executor. The only reason why this issue has arisen at all, in fact, is that the U.S. government decided to give executive authority over the HEU deal to an entity with a serious conflict of interest that wants to implement it on a profit-neutral, rather than budget-neutral, basis. Rather than compound this mistake by further subsidizing USEC, another solution to the problem should be found.

Statutory Requirement

In mid-1995, Congress had before it legislation to allow the public sale of USEC shares, the proceeds of which would go to the U.S. Treasury. Congress could insert a provision into this legislation stipulating that USEC must fully and faithfully implement the HEU deal, and this provision could explain at length exactly what full and faithful implementation means. Among other things, for example, Congress could require that USEC import 10 metric tons of Russian HEU for the first five years of the HEU, rising to 30 metric tons for the following 15 years.

The USEC privatization legislation should stipulate that USEC has an obligation to implement the HEU deal fully and faithfully, but this alone cannot solve the problem. USEC is virtually certain to find a way around this stipulation if the implementation of the HEU deal is not in its economic interest. This would be different if USEC were a government agency, but it is not: USEC is a private corporation that for the moment happens to be solely owned by the U.S. Treasury but that sometime in the future will become publicly held. Thus, no matter how carefully Congress writes the mandate to implement the HEU deal, the issue would almost certainly become mired in the judicial system, freezing the HEU deal in place. Therefore, simply mandating that USEC implement the HEU deal is insufficient.

Designation of a Different Executive Agent

The bulk of the analysis in this study renders obvious one option for salvaging the HEU deal: strip USEC of its executive role, and designate in its place some other entity with a more appropriate incentive structure. There is much to commend this idea, but there are several problems with it a s well - not least of which is the amended Russian suspension agreement, the necessary changes in which are discussed below.

First, it is important to understand that keeping control of the HEU deal is very important to USEC. Giving executive authority to some other entity - be it a private company , joint venture. or government agency- would create an alternative SWU supplier on the U.S. market, which would erode USEC's monopoly, reducing its market share and probably forcing it to accept lower domestic prices for its SWU. USEC does not want this to happen. Thus, USEC is certain to strongly oppose any initiative to appoint an alternative executive agent for the HEU deal. It is also important to recall that the Energy Policy Act of 1992 gave USEC (somewhat ambiguously) the exclusive right to be the executive agent of the HEU deal; obviously, this provision in the law will need to be changed if any of the options outlined below are to succeed.

The key advantages to appointing an alternative executor are three. First, most firms in the nuclear industry-indeed, in any industry- are willing to operate at profit margins far lower than USEC's. Second, the nuclear-industry firms that are best suited for implementing the HEU deal - firms such as Allied-Signal, Nukem, Babcock & Wilcox, and Nuclear Fuel Services-are not now

SWU producers, which means that they, unlike USEC, do not regard implementing the HEU deal as merely displacing production which they would otherwise undertake. For every other U.S. firm but USEC, implementing the HEU deal offers an opportunity for a major expansion of its business in a lucrative new market; for USEC, implementing the HEU deal offers the opportunity to funnel hard currency to a competitor and to close one of its two plants sooner than would otherwise be necessary. Thus, firms other than USEC would have a powerful incentive to initiate and expand the flow of HEU from dismantled Russian nuclear weapons into civilian reactors, since this means new business, greater revenue, and probably increased profits; USEC has no such incentive. Finally, none of these other firms are locked into an oligopolistic competition for global market share with Minatom, which means that they, unlike USEC, have no disincentive to transfer hard currency into Minatom's bank accounts.

There are four basic ways of changing the executive agent for the HEU deal. The first and most simple would be to strip USEC of its role as exclusive executive agent and transfer that right permanently to a state-sanctioned joint venture, which is the option Minatom has preferred since 199[1]. This option would likely be a highly effective one for implementing the HEU deal, but it would also create the greatest challenge to USEC's commercial interests. Importantly, this option would give the purchasers of Russian-origin SWU a relatively high degree of confidence in the certainty of their supply over the long term.

The second, third, and fourth options would involve systems of competitive bidding. Under one system, the HEU deal would be changed to allow firms other than USEC to bid for the right to import Russian HEU into the United States. This would force USEC to offer Minatom the full market value of the Russian HEU, since if it did not, another firm would gain access to the material and reduce USEC's share of the U.S. SWU market.

Under a third option, the U.S. government (probably the Department of Energy) would retain for itself the right to designate an alternative executor for the HEU deal if USEC and Minatom fail to agree on a price for the Russian HEU at their annual review consultations each October. This option would give USEC an incentive to offer a higher price, but it would also loner Minatom's incentive to accept USEC's bid. A further disadvantage is that this proposal would undermine the ability of USEC's competitors to offer reliable long-term contracts to their clients, since they could never be certain of the availability of future supplies.

Finally, the government could retain the right to designate alternative importers for any amount of the Russian HEU that USEC chooses not to purchase. Under this system, USEC would have the first right to import 10 or 30 metric tons (depending on the year) of Russian HEU into the United States. USEC would have the option to import the full amount of Russian HEU each year if it so desired. At the beginning of each year, USEC would have to declare how many tons it would purchase in the coming year, and would then be obligated to import no less than that

amount of HEU. If USEC elected to import less than the full 10 or 30 metric tons of HEU in that year, then the rights to import the difference between the amount USEC ordered and the amount Russia was supposed to ship would be tendered to private industry and allocated on the basis of competitive bidding. USEC would not have the right to prevent these sales from occurring This option would give USEC an incentive to place orders for Russian HEU so that other firms could not become alternative SWU suppliers, but would do so without denying USEC its special role in the implementation of the HEU deal. Yet, like the previous proposal, this approach would undermine the ability of USEC's competitors to offer reliable long-term contracts to their clients.

All these competitive options have virtues and disadvantages, and each deserves to be carefully studied by U.S. officials involved in the HEU deal. What is clear, however, is that any - of them would be preferable to perpetuating USEC's exclusive executive control over the HEU deal.

The Suspension Agreement

As far as the HEU deal is concerned, the most damaging aspect of the suspension agreement is that it currently allows the sale of the Russian HEU feed component on the U.S. market only in the context of a matched sale and subject to Russia's annual matched-sale quota for natural uranium imports.[87] Thus, the suspension agreement requires USEC to quarantine an amount of feed material equal to the feed material in the blended-down HEU that USEC sells on the U.S. market. This quarantined material would come from the uranium feed that utilities normally deliver to USEC pursuant to their enrichment contracts, thereby making the blended-down LIEU imports "market neutral."[88]

The suspension agreement currently allows the natural uranium feedstock to be disposed of in one of three ways: first, it can be used to overfeed USEC's enrichment cascades, in which case USEC would pay Russia directly for the feed; second, it can be sold outside of the U.S. market: and third, it might be sold inside the U.S. market in a matched sale and subject to the matched

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87. See note 74. This interpretation of the suspension agreement is held by most of the U.S. government, though there is some ambiguity on precisely what the suspension agreement says about this point. Thus interpretation is clearly held by the U.S. enrichment workers' union (the petitioners in the original anti-dumping suit), the government of Canada (based on the results of its October 20, 1994, consultations with the U.S. Trade Representative and the State Department), and apparently also the Department of Energy. See the written testimony by Dale L. Alberts. President of the Uranium Producers of America, before the Senate Committee on Energy end Natural Resources, June 13, 1995.

88. The suspension agreement does not specify how the feed component of the blended-down Russian HEU would have to be handled if an entity other than USEC - that is, one that had no "utility-owned uranium products delivered pursuant to enrichment contracts affected by purchase of HEU or IIEU products" - were responsible for importing the Russian HEU. In a literal sense, in fact, it appears that the suspension agreement as currently written would not apply to the feed component of the Russian HEU if some entity other than USEC were importing it. This interpretation has not, however, been tested.

sales quota. Since USEC does not regard overfeeding as cost effective, and since Russia's sales of natural uranium on the world market are already close to the maximum possible level given demand considerations and other countries' barriers to Russian uranium imports, the only real possibility for reselling the feed component of the Russian HEU is in the context of matched sales, which itself is not clearly legal. But, as shown in Table 2, even if the entire matched-sales quota were given to USEC to allow it to sell the feed component of the Russian HEU on the U.S. market, it would still be too little to permit the reselling of the full feed component. Thus, as it currently stands, the suspension agreement in effect requires USEC to stockpile Russian uranium teed until it can sell the material, which will occur at the earliest when the amended suspension agreement expires in 2003 - assuming, of course$_s$ that no new protectionist measure emerges.[89]

These provisions in the amended Russian suspension agreement are an obstacle to promptly compensating Russia for the natural uranium component of its blended-down HEU sales to the United States, and Minatom has threatened to cancel the HEU deal unless it is paid up front for the uranium component as well as the SWU component of the blended-down HEU. In mid1995, the U.S. government began to devote considerable energy to finding a solution to this particular problem in the HEU deal There are basically three options under consideration: (1) USEC's four-tiered approach; (2) altering the matching ratios and/or quotas for the blended-down Russian HEU; and (3) allowing the Russian feedstock to be sold on the U.S. market through a schedule of forward sales, a proposal known as the "Domenici approach." Each of these ideas is described below.

USEC's Four-Tiered Approach

As argued earlier (pp. 35-38), USEC's four-tiered approach will not solve the problem of fairly compensating Russia for the feed component of the blended-down HEU: the first three tiers are non-viable, and the fourth one will depress the price of uranium to a level that could well make the price received for the feed sales unacceptable to Minatom. This approach would, however, give USEC an exceptionally strong and privileged position in the worldwide SWU and uranium markets, and is also likely to precipitate a new trade dispute with Canada and possibly other U.S. trading partners. For these reasons, virtually all segments of the U.S. nuclear industry other than USEC strongly oppose the four-tiered proposal. Congress should too.

Alter the Matching Ratios and/or Quotas

The administration could try to amend the Russian suspension agreement once again by inserting a new provision designed to allow the resale of more Russian feedstock than currently allowed.

89. The agreement does not explain what would happen if utilities stop sending USEC uranium feed for the LEU fuel derived from Russian HEU.

There are many different ways that this could be done, but the two most obvious ones are changing the matching ratio for blended-down Russian HEU (e.g., by allowing one ton of U.S. uranium to be matched with more than one ton of Russian uranium), or by creating a separate and substantially higher matched-sales quota for the natural uranium in the blended-down Russian HEU.

The principal advantage of this option over the four-tiered approach is that it could have a less severe impact on the domestic price of uranium, since there would be greater certainty in the market with a quota system than there would be with a simple exemption. Its disadvantages are that: (1) the resale of the Russian uranium would still be dependent on USEC; (2) the quotas would have to be raised quite substantially it they were to accommodate the full amount of the uranium component of the blended-down Russian HEU; and (3) such a substantial increase in the allowable level of Russian-origin uranium imports into the U.S. would probably incite a new legal challenge from the U.S. uranium industry, and would also probably cause Canada to reopen its case against the amended Russian suspension agreement. For these reasons, this option is not appreciably superior to the second option of simply exempting the blended-down Russian HEU from the suspension agreement.

The Domenici Approach

Finally, in an approach proposed by Senator Pete Domenici (R-N.M.), Russia would be given title to the feedstock in USEC's custody displaced by the blended-down HEU imports and a legislated guarantee that it could sell this material on the U.S. market in the future.[90] This arrangement would have two major advantages. First, it would allow Russia to offer forward contracts for the material, which in turn would allow Minatom to receive immediate compensation for the natural uranium component of its HEU sales. Second, it would have a predictable effect on the near-term price of uranium, which would tend to make this option more acceptable to the U.S. uranium industry and to Canada.

Senator Domenici's proposal would allow deliveries of Russian uranium to take place alter 2002, though the U.S. nuclear industry has proposed moving this date forward. Under Domenici's proposal, Russia could sell up to 10 million pounds of U308 equivalent annually between 2002 and 2011, and up to 20 million pounds of U308 equivalent each year thereafter. This would allow Russia to receive immediate compensation for some or all of the natural uranium component of the blended-down HEU it delivers to the United States; the size of this compensation would depend on the price that uranium buyers offer Russia for promised deliveries early in the next century. If the permissibility of such sales were guaranteed by Congress, it is possible and perhaps even likely that uranium buyers would be willing to buy forward contracts for all of the

90. See "Domenici Bill a Winner," *The Ux Weekly,* June 5, 1995; and "Some Additional Observations," *The Ux* Weeklv, June 19, 1995.

Russian feed at a price acceptable to Minatom. Because it would deprive USEC of control over the Russian feed, USEC has opposed the Domenici approach.

Senator Domenici's approach is. however, supported by most of the rest of the U.S. nuclear industry. According to one trade press editorial:

> The USEC [four-tiered] proposal is bad for all the reasons the Domenici bill is good.... If one thinks about the problem of selling uranium contained in the HEU as bringing a large uranium mine into production, maximum revenue would be obtained by selling this material forward into a period where there is a large uncommitted demand, rather than in the near term where demand is much thinner and the capability for sales to depress price is much greater. To put this another way, Western producers who do not face sales restrictions do not bring on new mines without contracting forward because they realize that sales opportunities in the spot market are limited. The Domenici bill best captures this type of sales behavior while at the same time slightly relaxing existing trade restrictions.[91]

In other words, it is possible to serve the national security interest in removing HEU from Russia without necessarily undermining the commercial interests of the wider U.S. nuclear industry - and without unduly enhancing USEC's already considerable market power.

The concept of forward sales is a sound one, and it deserves the support of the Clinton administration.

The Blending Question

Finally, as noted earlier, the U.S. government should revisit the idea of importing HEU directly from Russia and blending it in the United States. The national security advantages of this option, as opposed to blending solely in Russia, are considerable: it would speed the removal of the HEU from Russia, minimize the internal movement of the material within Russia, and lower the risks of theft at the Russian uranium blending plant. Blending in the U.S. would also have the important political and economic effects of offering new business opportunities to U.S. firms other than USEC, and of allowing U.S. uranium to be used as blendstock, which would help quiet the antidumping complaints of the U.S. uranium mining interests. There would undoubtedly be environmental opposition to blending the LIEU in the United States if this issue were ever seriously considered by the government- indeed, several local environmental groups have already expressed their opposition to blending Russian HEU at the Allied-Signal plant in Erwin, Tennessee.[92] HEU is, however, a far less hazardous material than plutonium or spent reactor fuel, so there is a strong

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91. "Choice - The HEC Deal or USEC," The *Ux Weekly,* June 12, 1995.

92. "Transportation of Nuclear Fuel Worries Council," *Greensboro News and Record,* July 6, 1994; and Jesse Tinsley, "Erwin firm to Process Uranium from Russia; Transport Secrecy Worries State Council," *Knoxville News Sentinel,* July 5, 1994.

case to be made that HEU blending would have less damaging environmental consequences than many other industrial activities.

V . A Bolder Alternative

Beyond the policy options described in the preceding discussion, there is one final possibility for salvaging the HEU deal - a bold option which to date has received almost no official attention.

The U.S. government could simply execute the HEU deal by itself: a Project Sapphire writ large, as it were. In this option, the U.S. Treasury would buy as much Russian HEU as possible, as quickly as possible, and ship it directly to the Department of Energy's weapons-grade uranium facility at Oak Ridge, Tennessee. The material would be stockpiled there for later gradual release into the uranium economy. In this way, the market effects of the HEU deal could be carefully regulated by the government. Exactly how and when the material would be resold in the civilian economy could be determined ad hoc, based in part on proposals submitted by industry. The cost of the transaction would initially be borne by the U.S. Treasury, but there are a number of creative financing options that could be used to lessen the budgetary impact of the purchase. First, like private industry, the government could finance the deal by borrowing against the value of the uranium. The government should have no trouble securing such loans because the uranium clearly has market value, and because the government can exercise great influence over the legality of the sale of Russian-origin uranium products. Second, the U.S. government may be able to finance part of its purchase of Russian HEU by relieving part of Russia's debt to the United States, though admittedly, this is little more than a budgetary subterfuge because the loss of future revenue is analytically equivalent to a new outlay.

Regardless of how Washington finances the deal, however, the important point is that the Russian government should receive prompt compensation for the HEU it ships to the United States. This influx of hard currency into the Russian nuclear complex will increase the Russian incentive to continue or accelerate their dismantlement of nuclear weapons and the shipment of the resulting HEU to the United States, and will give the United States invaluable leverage over Minatom, leverage which it should use to persuade Minatom to enact comprehensive improvements in its nuclear security and accounting systems.

This option is inconsistent with the prevailing wisdom that the HEU deal should be executed on a strictly commercial basis. But the HEU deal is above all else a tool for promoting the national security interests of the United States. The reasons for direct government execution of the HEU deal are no less compelling than they were in Project Sapphire, when the U.S. government acted with great initiative, secrecy, and speed to extract six-tenths of a ton of HEU from an insecure location in Kazakhstan. Why the removal of 500 tons of HEU from Russia,

where it is stored in only marginally more secure conditions than was the material in Kazakhstan, merits such low priority from the U.S. government has never been clear. The U.S. government could quickly and effectively improve the security of the United States and its allies if Washington were to take control of the HEU deal, dramatically accelerate the speed and scope of the annual HEU transfers from Russia, and begin accepting normal HEU as well as blended-down HEU. Those responsible for the finances of the federal government should rely on the premise that when the material is ready to be resold commercially, and the government is ready to resell it, a determined White House will be able to find a way to recoup most if not all of its initial expenses. In this way, those responsible for the national security of the United States could salvage the good idea which lies behind the HEU deal from the quagmire of incompetent implementation where it now resides.

Figure 1: Basic USEC Enrichment Operations (No HEU Imports)

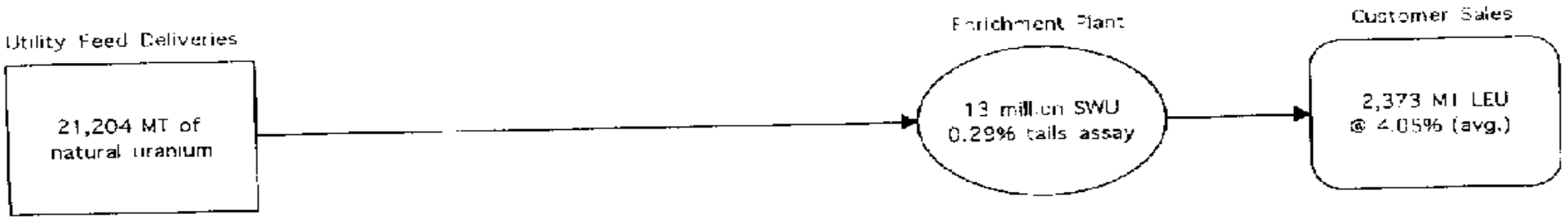


Figure 2: HEU Imports with No Overfeeding

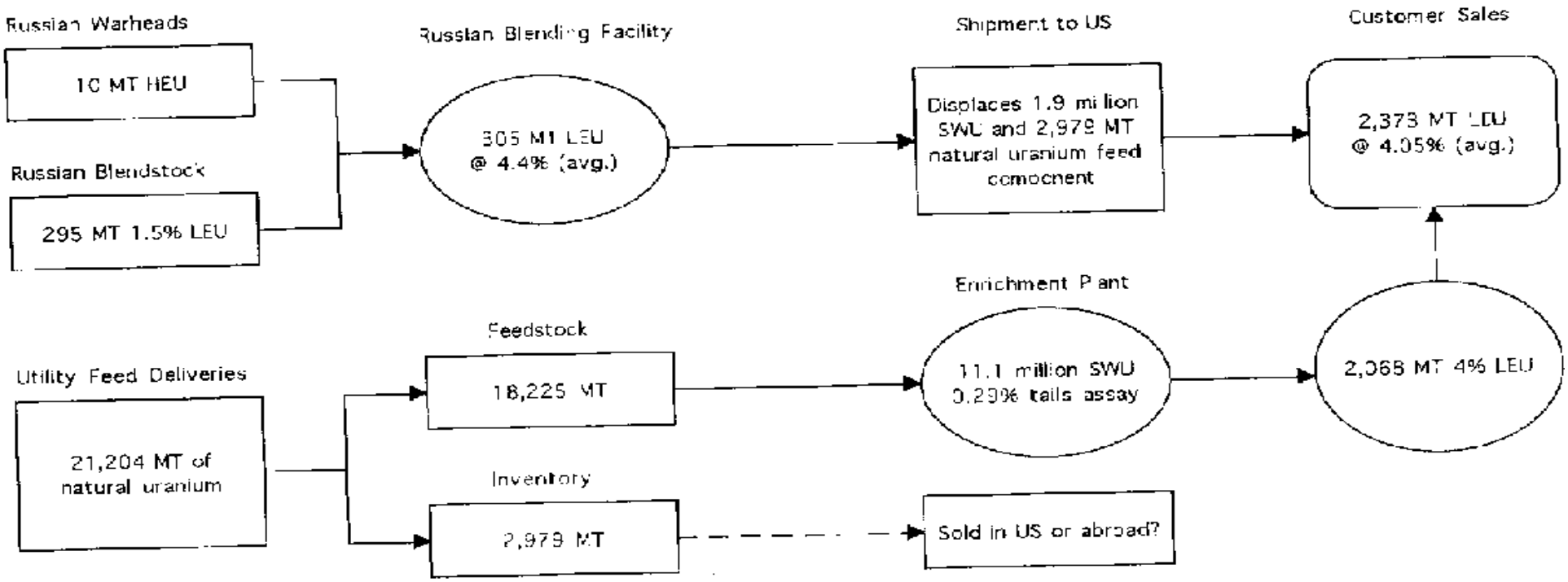
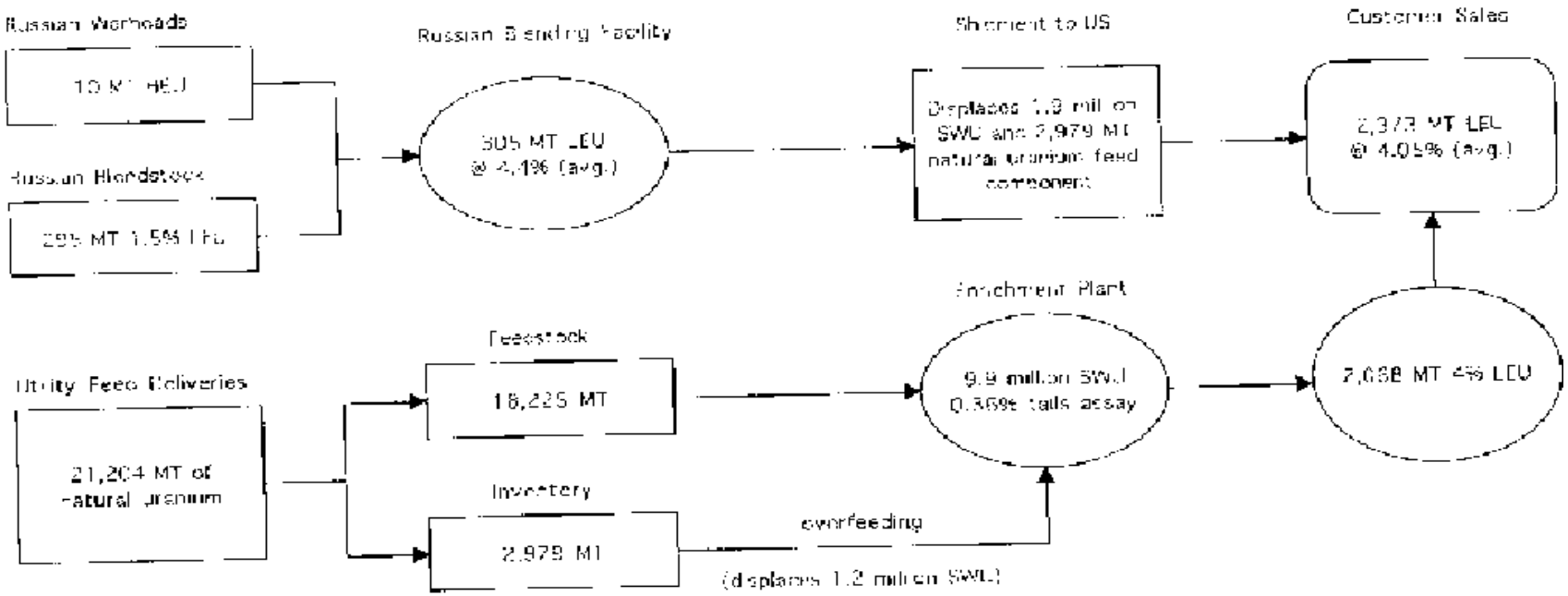


Figure 3: HEU Imports with Overfeeding



Avoided enrichment cost without overfeeding = 1.9m SWU @ $60/SWU = $114m

Additional avoided enrichment cost by overfeeding = 1.2m SWU @ $60/SWU = $72m

Cost of overfed uranium to USEC = 2,979 MT @ $28.5/kgU = $85m

Assuming a $60/SWU marginal cost, the price of uranium for USEC would fall to $24.2/kgU for overfeeding to be commercially viable

USEC has no incentive to purchase the Russian feed component for overfeeding when the price is $28.5/kgU

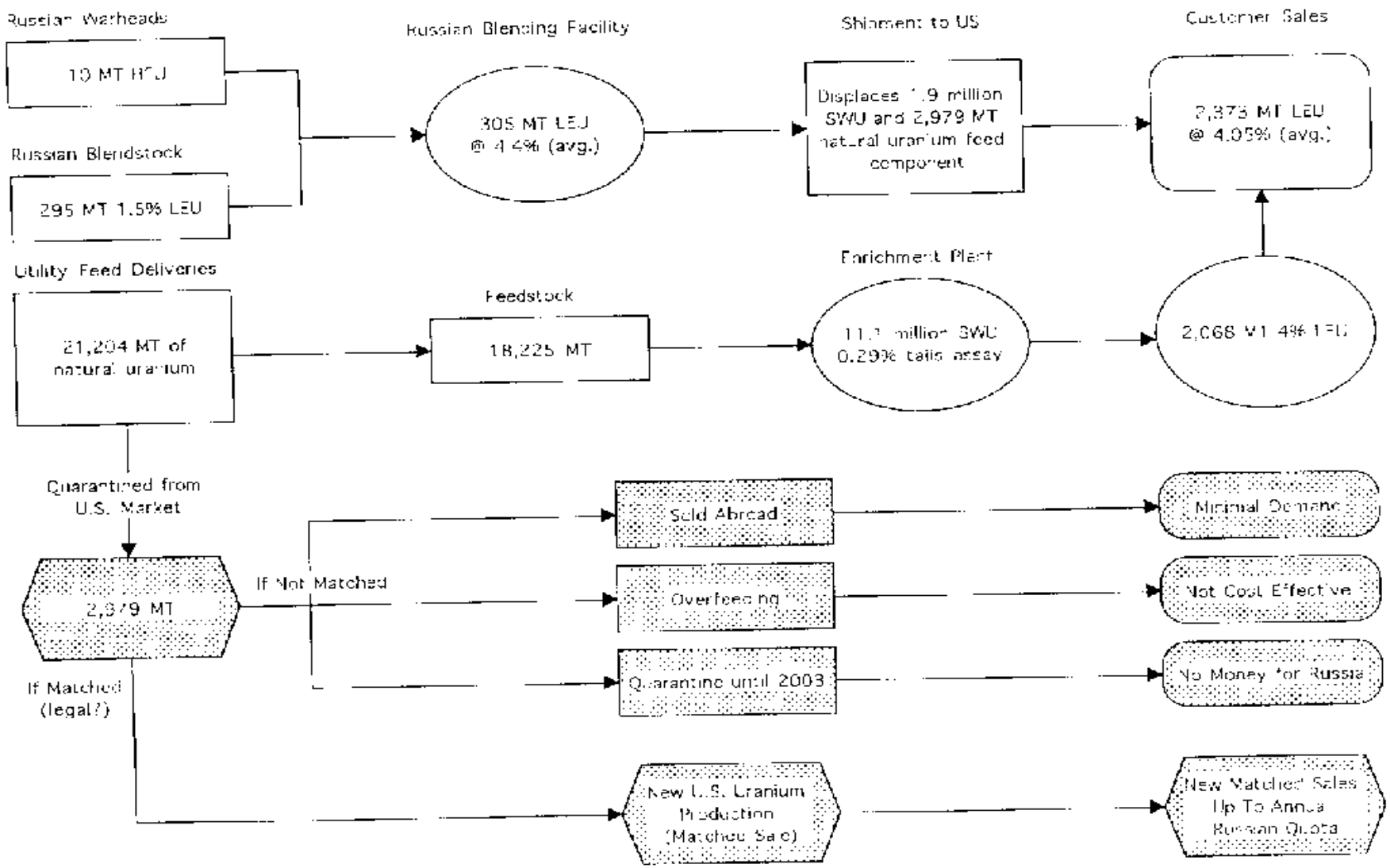



Figure 4: HEU Imports under the Amended Suspension Agreement