INTERNATIONAL URANIUM FUEL SEMINAR

OCTOBER 8 - 11, 1995 WILLIAMSBURG LODGE WILLIAMSBURG, VIRGINIA

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LES-02664

LES Exhibit 52

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by

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NEI International Uranium Fuel Conference
Williamsburg, Virginia

October 10, 1995

The historic government-to-government Agreement between the Russian Federation and the United States, regarding the disposition of Highly Enriched Uranium (HEU) extracted from nuclear weapons, was executed on February 18, 1993. Since that time, uncertainties surrounding this issue have been among the most important factors in the market for commercial nuclear fuel. Many observers have expressed doubts about the effectiveness of the program. Nevertheless, this past June the Russian enterprises began delivery to the United States of commercial-grade LEU produced from HEU. Today we are here to discuss some of the progress which has been made in overcoming the technical obstacles of HEU-to-LEU implementation.

Some of you may remember that at the March 1994 NEI Fuel Cycle conference in Boston, we explained the technical process which the Russian enterprises were to perform for handling and blending down weapons HEU. At the Ural Electrochemical Integrated Plant, this process has been employed in the blend-down testing of 30 kgs of HEU.



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At the Boston conference, we noted the importance of initiating an industry dialogue with regard to the quality specifications of the commercial LEU derived from HEU. There had been a proposal for the following increases to isotopic limits found in ASTM Specification C996-90:

-- Increasing the $U^{234}$ limit to 11,000 $\mu g/g$ $U^{235}$

-- Increasing the $U^{236}$ limit to 10,000 $\mu g/g$ $U^{235}$

-- Increasing alpha activity of transuranic impurities to no more than 0.1 Bq/gU, and

-- Increasing gamma activity of fission products to no more than $1.1 \times 10^5$ MeV per second per kgU.

This proposal was widely discussed among fuel fabricators and utility representatives. Ultimately, the feedback indicated that increases such as these could pose difficulties in terms of fabrication exposures and fuel performance. As a result, we concluded that it would be necessary to initiate some changes to the technical process of blending HEU in order for the resulting LEU to meet the existing ASTM C996-90 requirements.

Our enterprises introduced into the process an additional stage -- the selective extraction and purification of the HEU oxide from plutonium, fission products and alloying elements. The pilot-plant experience of blending the HEU demonstrated that the inclusion of this extraction/purification process, after fluorination of the purified HEU oxide, made it possible to produce high-quality HEU in $UF_6$ form. This high-quality HEU as $UF_6$ contained levels of plutonium and fission products that were below the detection limits of ASTM procedures, and eliminated the need for centrifuge purification of $UF_6$ from fluorides of elements with

lesser molecular mass.

The LEU used for dilution purposes -- 1.5% $U^{235}$ assay and reduced $U^{234}$ and $U^{236}$ content -- had been produced by centrifuge cascades specifically for the purpose of producing blended LEU from HEU that met ASTM C996-90, particularly in the $U^{234}$ limit of less than 10,000 $\mu$g per g $U^{235}$ and the $U^{236}$ limit of less than 5,000 $\mu$g per g $U^{235}$.

Figure 1 shows the modified technological scheme now in place for blending Russian weapon HEU into commercial LEU. The Siberian Chemical Integrated Plant at Tomsk is carrying out the metal HEU oxidation and extraction/purification stages. The Ural Electrochemical Integrated Plant in Novouralsk, near Ekaterinburg, handles the fluorination, blending and other steps of the process. From there, the commercial LEU is loaded into standard 30B cylinders and transported by rail to St. Petersburg, where it is shipped to the United States.

At present, our plants have successfully blended down approximately six metric tons of HEU since June 1994. The resulting commercial LEU, at an assay of 4.4 weight-percent $U^{235}$, is being delivered to USEC's Portsmouth, Ohio gaseous diffusion facility. Russian and American analysts have verified that the commercial LEU is consistent with the requirements of ASTM C996-90.

In summary, we are very pleased with the success of the blending program to date. The benefits to mankind are clear -- nuclear weapons are being converted to peaceful electrical energy, and together we have converted enough HEU to fuel at least eight large commercial reactors for one year.

At the same time, we fully realize that converting 10 metric tons of Russian HEU per year will result in the additional supply

of about 6% of the world's current uranium and enrichment demand. Increasing the rate to 30 MTU as HEU per year, and including the potential blending of 10 MTU of US HEU per year, would result in new supply equivalent to the two largest world uranium producers plus another large enrichment services supplier. For this reason, we support the efforts to balance the important geopolitical goals of converting HEU with the need to maintain stable and productive markets for natural uranium and enrichment services. Perhaps most importantly, we hope to see a resurgence in the construction and development of nuclear power plants to help absorb weapons material and to meet the needs of the world's electricity demands in the next century.

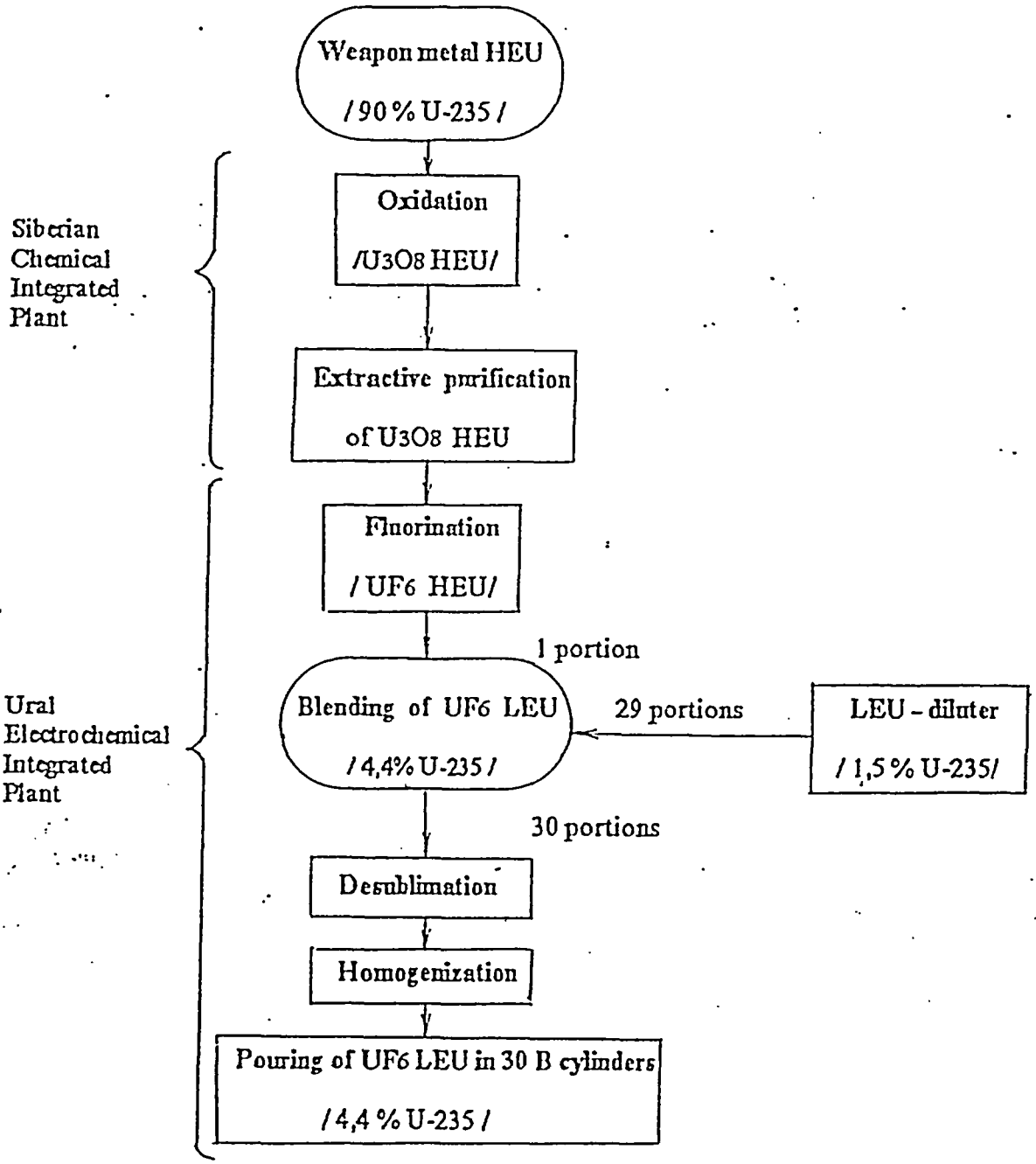


Fig.1. Industrial technological scheme of reprocessing weapon HEU into commercial LEU

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