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**LWV LEAGUE OF WOMEN VOTERS**

**HILTON HEAD ISLAND, S.C.**

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TO: Department of Energy
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c/o SAIC - PEIS
P.O. Box 23786
Washington, D.C. 20026-3786

RE: Weapons-Grade Plutonium Disposal
Plutonium Disposition Educational Forum
April 25, 1996
North Augusta Community Center, SC

Attached is a statement and newspaper article prepared by Dr. David Jordan for the League of Women Voters of Hilton Head Island, SC on the Disposal of Weapons-Grade Plutonium. Dr. Jordan attended this Forum as our representative and prepared the following comments after studying the Fissile Materials Disposition Overview materials. The League of Women Voters submit this paper as our statement on this vital and sensitive issue. Dr. Jordan is a Chemistry Professor during the summer months at Potsdam College of the State of New York and resides the balance of the year in Hilton Head Island, South Carolina. His addresses and phone numbers are:

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WEAPONS-GRADE PLUTONIUM DISPOSAL
Store it or Convert it to an Unattractive Hazardous Material through Using it as Fuel?

Government agencies and organizations such as the National Academy of Science have considered over thirty options for managing excess weapons-grade plutonium, arising from the dismantling of nuclear warheads. The Plutonium Disposition Educational Forum held in North Augusta on April 25 discussed two of these options.

Very pure metallic plutonium (Pu), containing a high percentage of the 239-isotope, for use in a bomb is a finely machined sphere roughly the size of a billiard ball. Some panelists emphasized the point that Pu-239 was not much of a health hazard, because it emits only alpha particles, which cannot penetrate far into tissue. Furthermore, the emission rate of these particles is slow, since particle emission by half of the plutonium atoms takes approximately 25,000 years. External contact with plutonium limits the radiation effects to the body surface.

However, health hazards become greater if the Pu metal is converted to its oxide, for the oxide can form dust particles, which may enter lung cavities. Plutonium oxide in the lungs increases ones risk for the development of lung cancer, because the emitted alpha particles will continually affect the closely surrounding tissue. The risk of a cancer is a function of the dose of plutonium inhaled.

Never mentioned at the forum is the fact that nitrate salts, which are produced during reprocessing of plutonium metal or the oxide, are water-soluble, so if by accident or storage tank corrosion these salts enter the public water supply, concentration of plutonium at other parts within the body is possible. At the end of 1994, the Savannah River Site was storing 126,300 cubic meters of highly radioactive solutions derived from reprocessing. Only in 1996 has treatment of these solutions begun. In 1960 the Savannah River site had a leak of 100 gallons of high-level radioactive waste into the ground water. The storage tanks at Hanford, Washington, a facility similar to the Savannah River Site have been leaking continuously since 1956, and have released over 750,000 gallons of liquid waste into the ground; it has been detected in test wells.

Reportedly there is a warehouse in Russia where twelve-thousand thermos bottles of Pu materials are stored; the contents of just three would be sufficient to make a bomb. The security supervision of this Pu is eroding. Sufficient Pu-239 to construct a bomb could be smuggled out hidden in a worker's clothing. Forum speakers conveyed a sense of urgency that international agreements for the strict control of plutonium materials should be arranged soon.

The Department of Energy has narrowed the disposal options to three: 1) usage as a fuel in nuclear reactors. 2) placement into deep dry boreholes or mines (geologic disposal), and 3) immobilization in glass or ceramic with secure storage. The latter two could be combined. Forum speakers generally voiced opinions consistent with what one would expect from the companies or agencies that they represented": oxide reprocessors and nuclear power plant service employees favored the first option. There was wide agreement that there will be a large monetary cost for disposal of plutonium, no matter what the method.

The fuel option uses plutonium oxide mixed with uranium oxide (called a MOX fuel) in a nuclear reactor. Nuclear power plants now fission uranium oxide, and if properly modified, could fission MOX to generate electricity. Using plutonium oxide alone would be rather hazardous because it is more difficult to keep the fission process under control than it is with MOX or uranium oxide alone.

The majority of panelists supported the MOX fuel option and argued that in the foreseeable future there will be an insatiable need for energy, which nuclear fuel can partly supply, thus preserving petroleum for other purposes. The Russians, in fact, regard their plutonium stocks as a "National Treasure", and will not readily dispose of it. Storing weapons-grade plutonium in this country in a way which would make it easily retrievable would not seem to the Russians and others to be good-faith disposal, and the overriding concern is to quickly come to agreements to stop the proliferation. Very importantly, spent reactor fuel is so much more radioactive and hazardous than unspent fuel that only nations with highly sophisticated technology will be able to process it for further disposition, thereby eliminating the threat of its acquisition by rogue parties.

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On the other hand, immobilization advocates argue that MOX fuel is cheaply available (as is solar energy) but expensive to utilize. A MOX industry will perpetuate the supply of Pu because it can be reprocessed, and it is the continued vulnerability to theft and wider dispersal of this supply that is the issue of greatest concern. There are few reactors in the US (more in Europe) that are presently suitable to burn MOX. Modification of existing reactors will require substantial capital investment.

Although immobilization of wastes is not yet a highly developed technology, glass is durable and environmentally acceptable and glass technology is well established. Geologic disposition is stalled partly due to political opposition and the tedious pace of federal governmental action. It seems that these methods could be available much earlier if an appropriate sense of urgency existed.
If immobilization ensures that highly-radioactive wastes are included in the glass encasements, nations, individuals or terrorist organizations lacking sophisticated technology would not be able to reprocess the materials without subjecting themselves to severe health effects. Immobilization preserves the material for future use, while minimizing the creation of new wastes. Even with the fuel option, not all of the potential fuel is of suitable quality for burning; a disposal program for this will be required anyway. Inventories of material, openly published and verifiable, would alleviate suspicions, permit careful monitoring and promote international agreements. 1/08.03.01

According to one speaker, "urgency is the name of the game" to prevent the dangers of a return to weapons production or the consequences of weapons-grade plutonium reaching the hands of terrorists.

It seems to this observer that although there are valid arguments for each of these possible methods of disposal, sustaining the plutonium cycle with the present technology by reprocessing and burning MOX fuel looks like a pork-barrel program for electric utilities, compounds the risks of nuclear proliferation, and certainly leads to even greater waste disposal and clean-up costs. 2/08.03.01 To be able to urge other nations to place decreased reliance upon plutonium and to allay their suspicions regarding the United State's intended use of our plutonium, we must store it so that it is not readily recoverable, openly publish our inventory of stored nuclear wastes, and freely allow others to verify the disposition of these materials. 1/08.03.01 cont.

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**08 03 01 Comment Number 1**

The Department of Energy acknowledges the commentor's support for the immobilization disposition technologies. Immobilization disposition would place the material in a form which is not readily recoverable, and would permit verification of the disposition of the materials.

**08 03 01 Comment Number 2**

The Department of Energy acknowledges the commentor's opposition to the Reactor Alternative using MOX fuel. Decisions on disposition of weapons-usable fissile materials will be made based upon environmental analyses, technical and economic studies, national policy considerations, and public input.

Society is not presently managing these materials and wastes well. If in the not-too-distant future the nuclear energy in these stored materials becomes essential for society, the waste-treatment technology and security procedures may have improved and be comparable with those of a still-evolving reactor technology. In twenty-five thousand years, the plutonium will still have half of the energy value that it has now.

A thorough discussion of this issue may be found in the 1994 report of the National Academy of Sciences: *Management and Disposition of Excess Weapons*.

David Jordan

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