



PRM-50-90

NATURAL RESOURCES DEFENSE COUNCIL

March 24, 2008

DOCKETED  
USNRC

Annette L. Vietti-Cook, Secretary  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001  
Attention: Rulemakings and Adjudications Staff

April 1, 2008 (4:00pm)

OFFICE OF SECRETARY  
RULEMAKINGS AND  
ADJUDICATIONS STAFF

**Subject: NRDC's Petition For Rulemaking to Ban Future Civil Use of Highly Enriched Uranium**

Dear Madam Secretary:

Pursuant to 10 C.F.R. § 2.802, the Natural Resources Defense Council, Inc. ("NRDC") hereby petitions the U.S. Nuclear Regulatory Commission ("NRC") to institute a rulemaking to amend the regulations applicable to the licensing and export of "special nuclear material" found in 10 C.F.R. § 50.64 and § 70 *et seq.*, and other applicable regulations.

The rationale and the bases for this petition in part can be found in the enclosed article, Thomas B. Cochran and Matthew G. McKinzie, "Detecting Nuclear Smuggling," *Scientific American*, Vol. 298, No.4, April 2008, pp. 76-80. We look forward to providing NRC Staff with substantial additional technical support for this petition, but only after arrangements have been made with the Commission and Staff to ensure that the unclassified information is appropriately protected.

Three extra copies of the petition for rulemaking have been attached. Please do not hesitate to contact us at (202) 289-6868 if you have any questions. NRDC appreciates your prompt consideration of this matter.

Sincerely,

Thomas B. Cochran, Ph.D.  
Senior Scientist  
Wade Greene Chair for Nuclear Policy

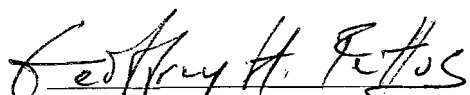
Matthew G. McKinzie, Ph.D.  
Senior Scientist

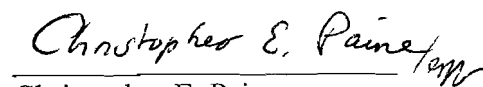
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The Honorable Dale E. Klein, Chairman  
The Honorable Gregory B. Jaczko  
The Honorable Peter B. Lyons  
The Honorable Kristine L. Svinicki

The Honorable Jeff Bingaman  
The Honorable Pete V. Domenici  
The Honorable Barbara Boxer  
The Honorable James M. Inhofe  
The Honorable Joseph I. Lieberman  
The Honorable Susan M. Collins  
The Honorable John D. Dingell  
The Honorable Joe Barton  
The Honorable Henry A. Waxman  
The Honorable Thomas M. Davis, III  
The Honorable Edward J. Markey

**NRDC'S PETITION FOR RULEMAKING TO BAN THE FUTURE  
COMMERICAL USE OF HIGHLY ENRICHED URANIUM**

**Summary and Proposed Actions**

NRDC requests that the Commission institute a rulemaking proceeding to effect the following policies:

1. Establish a date after which the NRC shall not license the civil use of highly enriched uranium ("HEU"), except for possible approval under 2 below.
2. For a limited number of existing licensees consider on a case by case basis the establishment of an intermediate  $^{235}\text{U}$  concentration limit less than 40 percent and a second date (after the date established under 1 above), such that between the date established under 1 above and the second date the NRC may license the civil use of HEU with a  $^{235}\text{U}$  concentration between 20 percent and the intermediate concentration limit.
3. As an alternative to 1 and 2 above, declare as a matter of NRC policy that after December 31, 2009 (or an alternative date) the NRC shall not license the use of HEU, except for use as reactor fuel in the MITR-II at the Massachusetts Institute of Technology ("MIT"), the Heavy Water Test Reactor at the National Institute of Standards and Technology ("NIST") and MURR at the University of Missouri at Columbia. MIT, NIST and the University of Missouri shall be required to establish in consultation with the NRC, the dates when their respective reactors must be converted to low enriched uranium ("LEU") fuel, and to report annually to the NRC on progress toward fuel conversion and whether the conversion date will be met.
4. Establish a date after which the NRC shall not license or otherwise authorize the export of highly enriched uranium ("HEU"), except for possible approval under 5 below.
5. For licensees that have been authorized within the past five years to export HEU to Canada to manufacture reactor targets for Mo-99/Tc99m production, consider the establishment of an intermediate  $^{235}\text{U}$  concentration limit less than 40 percent and second date (after the date established under 4 above), such that between the date established under 4 above and the second date the NRC may license or otherwise authorize export of HEU with a  $^{235}\text{U}$  concentration between 20 percent and the intermediate concentration limit.

HEU is defined as uranium with a concentration of at least 20 percent  $^{235}\text{U}$ . “Civil use” and export of HEU, as it applies to 1 through 5 above, shall apply to all NRC licensed use and export of HEU except:

- a) blending down of existing stocks of HEU;
  - i) to low enriched uranium (“LEU”) fuel for civil power reactors,
  - ii) to HEU (20-40 percent  $^{235}\text{U}$ ) to meet requirements under 2 and 5,
- b) HEU used for weapons and naval propulsion reactor fuel;
- c) irradiated direct use HEU, including HEU in spent fuel and radioactive waste regulated under 10 C.F.R. § 72;
- e) uses of HEU exempt under 10 C.F.R. Subpart B § 70.11-70-17; and
- d) small quantities of HEU, including possession and use of HEU covered under a general license (10 C.F.R. Subpart C § 70.19-70.20), the production of calibration or reference sources covered under 10 C.F.R. § 70.19; and materials containing less than one gram of contained  $^{235}\text{U}$  and thus exempt from the requirements of 10 C.F.R. § 74.

### **Rationale for the Rulemaking Petition**

In our view the time is ripe for the NRC to fix a date after which the NRC will no longer license the civil use of HEU. The importance of this cannot be overstated, for it will establish an urgently needed precedent that HEU is simply too dangerous for continued commercial use. There continues to be widespread civil use of HEU in other countries. In some of these countries there is an unacceptable risk of diversion of HEU for unauthorized use; and some of these countries are unlikely to forego the civil use of HEU as long as similar use of HEU is permitted in the United States. This issue has less to do with the security of HEU used for civil activities in the United States than it does in signaling to other countries the imperative of eliminating vulnerable sources of HEU elsewhere. Instituting a rulemaking petition to effect the policies listed above are of the highest national security interest to the United States because:<sup>1</sup>

- a) The greatest non-state threat to the United States is the risk that terrorists will use HEU to fabricate an improvised nuclear explosive device made with HEU.
- b) It is alarmingly easy to design and construct a “gun-assembly” type improvised nuclear explosive device made with HEU, if provided with a sufficient quantity of HEU. High-speed assembly, e.g., using a gun and/or gun propellant, is not necessary to achieve a yield in excess of a kiloton. To increase yields simple designs can be optimized using computer codes available to scientists and engineers worldwide.

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<sup>1</sup> Thomas B. Cochran and Matthew G. McKinzie, “Detecting Nuclear Smuggling,” *Scientific American*, Vol. 298, No. 4, April 2008, pp. 98-104

- c) A one kiloton surface burst nuclear explosion at some locations in the United States can produce casualties comparable to the 21-kiloton airburst over Nagasaki.
- d) HEU cannot be reliably detected with radiation portal monitors presently deployed at ports and other border crossings, and this situation is unlikely to be improved by the deployment of second generation devices—the advanced spectroscopic portals currently under development. Moreover, portal monitors are useless if they are bypassed. Millions of illegal aliens and much contraband have entered the United States without passing through prescribed portals.
- e) Consequently, the highest priority should be on eliminating HEU at its source.
- f) Existing federal government programs to eliminate existing stocks of HEU in other countries are progressing too slowly given the high national security risk.

There are no commercial power reactors in the United States that use HEU fuel, and there are no plans to deploy HEU-fueled power reactors licensed by the NRC in the foreseeable future.

The NRC continues to license the civil use of HEU to fuel seven existing research and test reactors in the United States that have not yet converted to LEU fuel. The NRC licenses one facility, the BWXT Lynchburg Technology Center, to manufacture reactor fuel for several of these reactors. In addition, the NRC licenses the export of HEU to Canada for use as a reactor target material to produce molybdenum-99 (Mo-99) for Tc-99m production. Tc-99m is the most widely used medical isotope. There are no other civil uses of HEU licensed by the NRC as far as we know.

Under 10 C.F.R. § 50.64, the NRC prohibits the continued use of HEU fuel in domestic non-power reactors if there is an LEU fuel alternative available. Since an LEU fuel has been developed for the three HEU-fueled TRIGA-type research reactors licensed by the NRC—namely, the reactors at Oregon State University, University of Wisconsin, and Washington State University—these three reactors will be converted to LEU fuel during this year, or next. Three of the remaining four research reactors, namely, the MITR-II at MIT, the Heavy Water Test Reactor at the National Institute of Standards and Technology (“NIST”) and MURR at the University of Missouri at Columbia,<sup>2</sup> are working with the Department of Energy (“DOE”) to develop LEU fuel alternatives for these reactors. DOE has announced that it intended to convert these reactors to LEU fuel by 2014. This schedule, however, appears optimistic, at least from the point of view of the reactor operators. This leaves only the very small (100 megawatt-thermal) Nuclear Test Reactor (“NTR”) at General Electric Vallecitos Nuclear Center, whose conversion plans are unknown to us. The NTR is used for radiography, a service that is also provided by the newer and larger LEU-fueled TRIGA reactor at the McClellan Nuclear Radiation Center, which is also in California.

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<sup>2</sup> MURR is used for commercial medical isotope production, research and development and education.

GE-Hitachi Nuclear Energy Americas, LLC, which holds the license for the NTR, is a joint venture of the General Electric Company and the Japanese firm, Hitachi. Under current NRC regulations GE-Hitachi has been permitted to continue to operate the NTR on HEU fuel by certifying to the NRC annually that the U.S. Department of Energy does not have the funds for the conversion to LEU. GE alone has assets exceeding \$400 billion, and Hitachi's are about \$90 billion. These two firms can well afford to promptly convert their NTR to LEU fuel without U.S. government support. If they believe it is not worth the investment to do so, the NTR should be shut down before it is refueled.

The NRC authorizes the export of HEU from the United States to Canada to manufacture reactor targets for Mo-99/Tc99m production. The targets are irradiated in the Canadian National Research Universal (NRU) reactor, and the Mo-99 is extracted by the Canadian firm, MDC Nordion. A two to three year supply of HEU target material has already been authorized by the NRC. The Canadians could then use LEU targets, which are used by at least two other Mo-99 producers. The Australian Nuclear Science and Technology Organization (ANSTO, formerly AAEC) has been producing the fission product Mo-99 in HIFAR (and its replacement, the OPAL reactor) using LEU targets for more than thirty years. Although the operating cost of using LEU targets would be similar or less than the cost of using HEU, MDC Nordion would incur an additional up front cost associated with the conversion to LEU. This is a small price to pay for the elimination of HEU from commerce.

We do not believe establishing a firm date for ending civil HEU will have a detrimental effect on medical isotope production. If contrary evidence is provided by others in this proposed rulemaking, we suggest that the Commission consider establishing an additional period of time, during which limited civil use would be permitted of 20 %- to 40 %-enriched HEU. This may reduce the potential inconvenience and cost experienced by the two principal affected parties, the University of Missouri and MDC Nordion. In this regard, the reduction from 93.5%-enriched to 40%-enriched-HEU would only increase the target material requirement for Mo-99 production by a factor of about 2.3. To achieve a one kiloton yield using an improvised nuclear explosive device of similar design, approximately four times more 40%-enriched HEU would be required than 93.5%-enriched material.

### **Conclusion**

There is no known civil use of HEU, including its use as reactor fuel, as a target material for production of Mo-99 (for Tc-99m production) and for the production of other medical isotopes, that either a) cannot be performed using LEU, LEU-fueled reactors or accelerators, or b) is so important that the benefits of its use outweigh the risks. The proposed changes to 10 C.F.R. § 50.64 and § 70 *et seq.* will clearly signal the leadership of the United States in the imperative of eliminating the civil use of HEU around the globe. As we noted in our cover letter for this rulemaking petition, the basis for some of these assertions are summarized in the enclosed *Scientific American*, article. We look forward to providing you with additional technical support for this petition, but only after

arrangements have been made with the Commission to ensure that the unclassified information is appropriately protected.

**Statement of Interest**

NRDC is a national non-profit membership environmental organization with offices in Washington, D.C., New York City, San Francisco, Chicago, Los Angeles and Beijing. NRDC has a nationwide membership of over one million combined members and activists. NRDC's activities include maintaining and enhancing environmental quality and monitoring federal agency actions to ensure that federal statutes enacted to protect human health and the environment are fully and properly implemented. Since its inception in 1970, NRDC has sought to improve the environmental, health, and safety conditions at the nuclear facilities operated by DOE and the civil nuclear facilities licensed by the NRC and their predecessor agencies.

an Article from

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The attached article entitled "Detecting Nuclear Smuggling", published in Scientific American, April 2008, Volume 298, No. 4 is copyrighted and has been removed as an attachment. A copy of the article maybe found at the Scientific American website using the following link:

<http://www.sciam.com/article.cfm?id=detecting-nuclear-smuggling>