COMMENTOR NO. 1: HOLLINGER, WADE
OAK RIDGE, TENNESSEE

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

Make a reasonable risk based, economical decision, hire a team of lawyers and get on with getting rid of the stuff! Just take it for granted someone is going to sue DOE because they want you to make it so that it was never here in the first place (impossible) and put your lawyers to work, by the time it gets out of court you'll have the stuff gone. MAKE THE DECISION AND DO IT! I'm tired of supporting all you do nothing beaurecrats! A NEPA review and going out to the public was not necessary for this. You know what has to be done — DO IT!

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name Wade Hollinger (optional)
Organization _____
Address 117 Westwood Lane (optional)
City Oak Ridge State TN Zip 37840
Phone number _____ (optional)
E-mail address _____ (optional)

☐ Please add my name to the Depleted UF_6 mailing list.
☑ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF_6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 •301/903-4781

1-1

COMMENTOR NO. 2: RAGAN, GUY
LAS VEGAS, NEVADA

Name: Guy Ragan

Date Sent: 1/6/98

Document Ref.: PEIS: S.4 SUMMARY AND COMPARISON OF IMPACTS FOR ALTERNATIVEMANAGEMENT STRATEGIES

----- COMMENT -----

What is the basis for the consequences stated? In other words, if the no-action alternative creates 110 jobs over 40 years, that is as compared to what? Compare it to continuation of the present situation? But continuation of the present situation is not an option. The PEIS states its impacts relative to an inconceivable baseline. According to DOE's "Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements, "the no-action alternative provides an environmental baseline against which impacts of the proposed action (and alternatives) can be compared." Therefore, the consequences should be stated as deviations from the no action alternative. For example, as compared to the No Action alternative, for operations, Long-Term Storage creates 10 jobs per year over 20 years. Then there are 110 federal jobs from 20 to 40 years. For construction, no jobs are created relative to No Action. Comparisons like this should be made explicit by stating all consequences as deviations from the No Action alternative. This comment applies to all types of enviromental consequences, not just socioeconomic impacts.

2-1

COMMENTOR NO. 3: ELLISON, PHILLIP
IDAHO FALLS, IDAHO

Depleted Uranium Hexafluoride Management Program

Comment Form

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- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

I briefly Reviewed the UF_6 DRAFT PEIS. It appears to be a well developed and documented effort. ONE area that you may ~~wish~~ wish to improve is the hazardous analyses of the HF and UF_6 tank farms. OTHER events including tornado induced missiles may wish to be addressed. ~~the~~ These events may have been considered but I was unable to locate data on the Results of Analyses

Phil Ellison

3-1

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name Phillip Ellison (optional)
Organization INEEL
Address P.O. Box 1625 (optional)
City Idaho Falls State ID Zip 83415
Phone number 208-526-5863 (optional)
E-mail address pje@inel.gov (optional)

☑ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF_6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 •301/903-4781

COMMENTOR NO. 4: DYER, ROBERT
HARRIMAN, TENNESSEE

DYER ENTERPRISES

301 Old Suddath Road * Harriman, TN 37748 * (423) 882-2623
bdyer@hotmail.com
January 12, 1998

Mr. Charles E. Bradley, Jr
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Friends and Former Associates,

I was happy to see that you are getting better at meeting schedules, only six months late in getting out the two volume Draft PEIS for the alternative strategies for the future of the few cylinders of depleted that are stored around.

I have spent some time reading it and thinking about the way it is presented, both from the my own point of view as one who knows what the stuff is and also from the point of view of one whose only knowledge of depleted UF_6 is from these writings. As you can see by my comments, I think you missed your opportunity to inform the unknowing and get them on your side once you make the long term management strategy.

I am interested in your reaction to my comments, and maybe we can work together to improve the document.

4-1

Bob "Captain Fuddy Duddy" Dyer

Robert Dyer

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

VER ENTERPRISES
301 OLD SUDDATH ROAD * HARRIMAN, TN 37748 (423) 882-2623

January 12,1999

Comments as a Result of Reviewing the PEIS for
Alternative Strategies for the
Long-Term Management and Use of
Depleted Uranium Hexafluoride

As a result of several days of pouring through the two volumes of the referenced document, I have the following comments and suggestions to make. I believe that I am qualified to review the work because I have had 53 years of experience in the operation and design of the gaseous diffusion process in Oak Ridge while working 35 years for the operating contractor followed by 15 years for DOE . I have seen the depleted cylinders at all three of the plants, I actually filled some of them in Oak Ridge, I know the chemistry and physical properties of UF_6, I was on the committee to investigate the cause and effect of the wall failures of the two Portsmouth cylinders, and I am a voting member of the ANSI N14.1, *Uranium Hexafluoride - Packaging for Transport* standards committee that establishes cylinder design and fabrication criteria. Twice, I have presented my training course "Fundamentals of Gaseous Diffusion Plant Operations" to members of the Argonne National Laboratory staff who have prepared this report.

I will start with some general comments and proceed to some specific ones.

4-1 (Con't.)

UF_6 Storage Cylinder Description

Let me quote some of the words in the box on Page S-1 in Volume 1. "*Sufficient information must be included in the EIS for reviewers to evaluate the relative merits of each alternative.*"

It seems to me that you have to describe the problem in order for reviewers to see the merits of any of the possible solutions, including continued long term storage. In this case, the problem is what to do with the large quantity of depleted uranium hexafluoride that has accumulated at the gaseous diffusion plants in Oak Ridge, TN, Paducah KY, and Portsmouth, OH. I think you have to accept the fact that UF_6 is not a commodity that is familiar to the general public, especially those living

4-2

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

in the vicinity of the plants. Therefore, the description of depleted UF_6 in the storage cylinders on page S-2 is grossly understated "*Depleted UF6 is stored as a solid at all three sites in steel cylinders. Each cylinder holds approximately 10 to 14 tons (9 to 12 metric tons) of material.*"

The next mention of stored cylinders of UF_6 that I found was on page B1 in Volume 2. "*Depleted UF_6 has been stored in steel cylinders in outdoor yards at the three DOE storage sites since the 1950s. Most cylinders have either a 10- or 4- tons (9- or 12- metric tons) capacity and a nominal wall thickness of 5/16 in. (0.79 cm or 312.5 mil).*" It is a little more correct, in stating the cylinder capacity as 10 or 14 tons but is still oversimplified:

I, as a reviewer, know the details of the design criteria and methods of fabrication for the storage cylinders, and know that the UF_6 is being safely stored at the plants. I do not think the smidgen of information you have included will sufficiently inform and convince the farmer working the fields next to the plant, or the housewife in Wakefield, Ohio, or the new tenant in one of the K-25 buildings that they have nothing to worry about. These people should not forced to imagine what is in those somewhat rusted cylinders they see stored in the yards. I think you should at least use some of the pictures and descriptions of the cylinders from the ORO 651 series of documents. I can give you copies of ORO 651 Rev 5 and ORO 651 Rev 6, but you will have to buy the successor document USEC 651 Rev 7 from the USEC for which they charge $5.00. Also, and more importantly, you should point out that there is an American National Standard, ANSI N 14.1, *Uranium Hexafluoride - Packaging for Transport* which governs the quality of the material in and fabrication of these cylinders. You should be sure to point out that the cylinder has only one valve for filling and emptying. This valve is located at the 12 o'clock position on one of the ends.

4-2 (Con't.)

Assuming you expand your description of the cylinders, then you need to tell the people what is in them. You need to tell them that the ^{235}U isotope concentration has been reduced from the naturally occuring 0.711% to 0.2 - 0.3 % resulting in a proportional increase the concentration of ^{238}U.

You need to tell them that UF_6 is a chemical compound that has one atom of uranium combined with six atoms of fluorine. It can be either a solid, a liquid or a gas depending on its temperature. In the storage yards it is a solid in the bottom of the cylinders and a gas at subatmospheric pressure in the top. If a cylinder is heated, the solid will melt to a boiling

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

liquid at 147°F. You need to tell them that it is a greater chemical hazard than a radioactive one.

You need to tell them how UF_6 reacts with the iron on the inner surfaces of the steel cylinder to form a corrosion inhibiting, protective surface layer of iron fluoride. This protective coating insures the UF_6 inside the cylinder will not react with and corrode the cylinder wall, i.e. if you protect the outside of the cylinder, and prevent it from rusting away, the UF_6 can stay in storage in the cylinders forever. *4-2 (Con't.)*

Cylinder Fill Limits

There are long standing specific requirements that have been used to determine the quantity of UF_6 that can be safely stored in an approved design cylinder. The fundamental concepts of the approach to assuring the safety of the many cylinders of depleted UF_6 stored at Paducah, Portsmouth, and Oak Ridge are ***certified minimum volume.*** and ***5% ullage,*** In particular, my comment concerns the UF_6 fill-limit and heating temperature limit for 48G cylinders, although the same rationale applies to the other sizes of UF_6 cylinders.

The crucial concept is the ***certified minimum volume*** of the cylinder. UF_6 cylinders are fabricated in strict accordance with the drawings and criteria in the American National Standards Institute standard ANSI N14.1, ***Uranium Hexafluoride - Packaging for Transport***. One of the code requirements is that upon final fabrication, in order to determine its exact internal volume, the cylinder will be completely filled with 60°F water and weighed on a scale accurate to 0.1%. The actual water weight obtained is recorded for the individual cylinder certification data and stamped on the cylinder nameplate to conclusively demonstrate that the requirement has been met. For a cylinder to be acceptable, the quotient of the certified full cylinder water weight divided by 62.37(the weight in pounds of 1 ft^3 of water at 60°F) shall not be less than the published minimum volume. For a 48G cylinder, the minimum volume is 139 ft^3. equivalent to a water weight of 8669 lbs. Using this method of measurement, the actual internal volume of a cylinder can be determined and if it is not greater than the ***minimum volume,*** the cylinder is destroyed. *4-3*

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

The density, or weight of a cubic foot of UF_6 has to be known in order to use the ***certified minimum volume*** to determine a safe-fill quantity of UF_6 for the cylinder. During the first 20 years of the atomic age, much research work was done to determine the physical properties of UF_6. R. DeWitt of the Goodyear Atomic Corporation made an extensive literature search and compiled the results in a document, GAT 280, ***Uranium Hexafluoride: A Survey of the Physico-Chemical Properties January 29,1960.*** Data from this source has been used to produce Figures 1 and 2. Solid UF_6 undergoes a significant expansion as it is heated and melts from a solid to a liquid. This is illustrated in Figure 1, Density of Solid UF_6, and Figure 2, Density of Liquid UF_6 235 - 300°F.

Knowing that all cylinders are larger than the ***certified minimum volume*** allows the establishment of a safe UF_6 fill limit for them. This weight is obtained by using the density of liquid UF_6 at the 250°F design temperature of the cylinder and determining how much of this 250°F liquid UF_6 will fill 95% of the cylinder's ***certified minimum volume***. Because all cylinder volumes are certified to be greater than the minimum, this guarantees that there will be at least 5% of the ***certified minimum cylinder volume*** as ullage(space above the liquid in the cylinder) when the full cylinder is heated to its design temperature of 250°F, and thus there will be no possibility of hydraulic forces developing in the liquid to cause cylinder rupture. *4-3 (Con't.)*

From ANSI N14.1, the minimum volume for a 48G cylinder is 139 ft^3 and from Figure 2, the density of liquid UF_6 at 250°F is 203.7 lbs/ft^3. For a 48G cylinder the calculation of the fill limit is:

95%(139 ft^3) (203.3lbs/ft^3 of UF_6) = 26840 lbs of UF_6

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

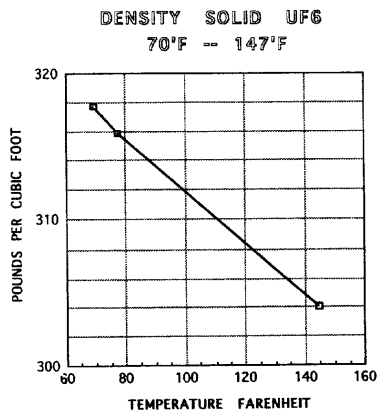

Figure 1

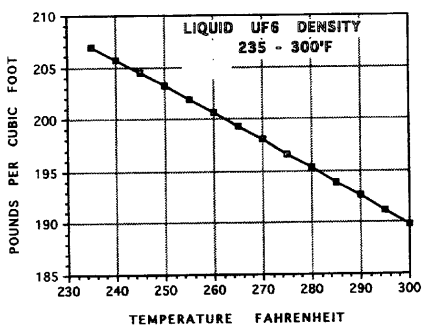

Figure 2

4-3 (Con't.)

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

Keep in mind that because all cylinders are required to prove that they have greater than a minimum volume, there will always be at least, if not more than, a 5% ullage to prevent hydraulic rupture at the design temperature. At lower than design temperatures, because the density of liquid UF_6 expressed in lbs/ft³ increases as the temperature is lowered to the freeze point of147°F, the percentage of the cylinder volume occupied by gaseous UF_6 will increase and be larger than 5%. For example, prior to going to the storage yards, after all the air was evacuated from inside them, the depleted UF_6 cylinders were filled to the fill limit with liquid UF_6 at a temperature of 160°F with a density of 224 lbs/ft³. The ullage in this case is at least 14%. There can be no hydraulic rupture as long as gas in the ullage provides a cushion.

This fill-limit calculation assures safety if the cylinder is heated to the design temperature and before any material is removed from it. In diffusion plant practice, the cylinder is never heated above 100°F. As UF_6 gas is withdrawn, there is a smaller mass of liquid UF_6 in the cylinder so the ullage increases. Any volatile impurities that may have been in the cylinder will be expelled when feeding is first started so the pressure of the system will correspond to the vapor pressure of UF_6 for the temperature.

When the cylinder is filled with liquid UF_6 to its proper fill limit, and has cooled to room temperature, based on the data in Figure 1, showing the density at 68°F to be 317.8 lbs/ft³, the solid UF_6 will occupy 26,840 lbs/317.8 lbs/ft³ = 84.45 ft³/139 ft³ = 61% of the *certified minimum volume*. The remaining 39% of the volume will be filled with UF_6 gas at subatmospheric pressure or vacuum.

4-3 (Con't.)

Minimum Cylinder Wall Thickness

The 0.25" minimum wall thickness specified in ANSI N14.1 and the ORO 651 series for the 48G, 48H, 48 HX, 48 O, and 48 OM cylinders is for a pressure vessel rated at 100 PSIG. However, this pressure is only achieved if the cylinder of solid is heated 147°F to liquefy the UF_6 and the heating of the liquid continued until the temperature of the liquid is increased to 200°F, as is done in gaseous diffusion plant operations requiring rapid emptying of the cylinder's contents. However, if by strict administrative control, the cylinder is only heated to a skin temperature of 133°F, 14°F below the liquefaction temperature, the UF_6 gas pressure in the cylinder will be atmospheric pressure(14.7 psia), and the UF_6 can be changed directly from solid to gas without going through the liquid phase

4-4

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

in order to remove it from the cylinder at a slow rate. (This is the way the French feed their diffusion plant, and is what you have heard referred to as "cold feeding". 4-4 (Con't.)

Radiation Emanating from a Depleted Cylinder of UF_6

There is another aspect of the filled cylinders that I do not think has been adequately covered. There should be a statement concerning how many, or few, curies or sieverts of radiation emminates from one cylinder. Depleted UF_6 is by definition ^{238}U. The handbooks show ^{238}U to have a half life of 4.47 billion years (about as long as the earth has been around). The thorium and protactinium daughter products have melting points in the range of 1650-1850°F. This means that any daughter products that may be in a cylinder of normal assay UF_6 being fed into the cascade will not be vaporized and expelled from the cylinder with the UF_6 gas at 200°F. In essence, since no uranium daughter products are fed to the cascade, the only ones in depleted UF_6 are the ones that have grown in the past 50 years. With ^{238}U's half life, there can't be more than a handfull!

I know from experience that it is very difficult to measure any gamma radiation when scanning the outer surface of a full cylinder in storage with a radiation meter. However, after a cylinder has been heated, liquefied, emptied, and cooled, the scan will show a small amount of gamma radiation on the bottom of the cylinder. Keep in mind that the purpose for which the diffusion plants were built was to prepare uranium for fission, either in a weapon or a nuclear reactor. The diffusion process removes 70% of the fissionable isotope found in naturally occurring uranium. The stored depleted uranium has never been used as fuel in a nuclear reactor where fission products occur in great abundance. There are very few gamma emitting fission products in the depleted UF_6. The gamma radiation in the depleted uranium is coming from uranium decay daughter products. These non-volatile daughter product form extremely slowly throughout the cake of solid UF_6 as uranium decays. They are homogeneously mixed with the solid UF_6 resulting in their gamma rays being shielded by the uranium atoms. Because the daughters are chemically different than UF_6, they will not vaporize and be removed from the cylinder as a gas. They concentrate in an ever diminishing pool of liquid until they are all that is left on the bottom. In this location, their radiation is directed downward away from people working with the cylinders. If you sit on top of a cylinder, your butt is at least four feet from the emitters. 4-5

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

I make no pretense of being a Health Physicist, so I find it hard to understand how you can estimate the exposures that people will get, if you don't state the intensity of the radiation at the source. Just one of many examples, Table D.1 page D-6 states as an Impact during Storage(1999 - 2039), the *total collective dose to population within 50 miles (3 sites)* will be 0.38 person-rems. How can you be accurate to two decimal points when you don't know how much radiation, if any, is coming from a cylinder of depleted UF_6? Here is an area where you could do a lot of good in taking the hocus pocus out of Health Physics and educating the public about radiation and its effects! Don't let them learn it from the Simpsons on the anti-nuke Fox Network! 4-5 (Con't.)

Specific Comments VOLUME 1

- Table S.3 Page S-46 What are the quantities of uranium compounds and HF considered to be released from a *"Corroded cylinder spill, dry conditions,"* and *"Corroded cylinder spill, wet conditions"*? Without these numbers, it is difficult to understand the postulated consequences. The rest of the table has the same problem of not stating how much UF_6 or HF or UO_2 is released in the accidents 4-6
- .PAGE 1-1 SECTION 1.1 BACKGROUND INFORMATION The statement is made: *"At atmospheric pressure, UF_6 is a solid material below a temperature of 134°F and a gas at temperatures above 134°F (additional information about the characteristics of the chemical UF_6 is provided in Appendix A)."* When I go to the Appendix A, I was amazed at the paucity of information presented not only for UF_6 but also for the other uranium compounds and HF. I thought at least, I would find the phase diagram of UF_6 that clearly shows the inaccuracy of the above statement but, alas, it wasn't there! UF_6 can be a gas below 134°F as well as above 134°F, and a solid all the way up to 147°F. 4-7
- PAGE 3-50 TABLE 3.13 FOOTNOTE c The footnote states *"Radiation dose could result from drinking 365 L of K-25 site water(0.3 mrem/yr) and ingesting the maximally contaminated fish (1.6 mrem/yr) "* Do you have to drink all 96.5 gallons(365 L) of water and eat the fish at one sitting? If you do, this is nonsense and serves no purpose. If you don't, what is the time period? 4-8

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

- PAGE 4-14 DEFINITIONS *"Involved Worker - Might be exposed to direct gamma radiation emitted from radioactivematerials such as depleted UF_6 or other uranium compounds"* Here again, the question has to be asked, "How much radiation does depleted UF_6 or other uranium compounds emit/unit quantity of the substance?" Is the UF_6 still in the cylinder? Do you take credit for the shielding of the uranium in the UF_6 in the cylinder? The way this is written does absolutely nothing to allay the fears of the uninformed. 4-9
- PAGE 8-18 DEFINITION OF TRANSURANIC WASTE The word "transuranic" means "beyond uranium" i.e. elements that have a greater than the 92 atomic weight of uranium. like plutonium, neptunium, americium, etc. They probably do have half-lives greater than 20 years. Plutonium is deliberately made in nuclear reactors and extracted from spent reactor fuel. In the late '70s, a very small quantity of uranium recovered from spent reactor fuel was refined, converted to UF_6, and fed into the diffusion plant complex. They do not exist in sufficient quantity in depleted UF_6 to be a problem. Here again is a place where you could do good in educating. 4-10

Volume 2

- PAGE A-2 TABLE A-1 It seems incredulous that the particle and bulk density of UF_6 are each 4.6 g/cm^3, and neither one of them is the generally accepted 5.1 g/cm^3 at 68°F. 4-11
- IBID. A.1.2 I think you should mention that uranyl fluoride picks up water of hydration from humid air and in doing so changes color from brilliant orange to yellow. If a cylinder should break open in the storage yard, this color change would probably be observed. 4-12
- PAGE A-4 A.2.1 UF_6 is essentially inert to copper, witness all the copper tubing instrument lines in the plants. Also don't forget Teflon that was developed specially for the Manhattan Project. 4-13
- PAGE B-7 4TH FULL PARAGRAPH, LAST SENTENCE *"It was assumed that uranium would be released as solid uranyl fluoride (UO_2F_2),which would be deposited on the ground."* You should do more than say it lays on the ground. Uranyl fluoride (UO_2F_2) has a characteristic of being very soluble in water, so as soon as it rains, its will go into solution which, because of the HF, will be acidic and be neutralized by the cement or limestone construction materials of the storage yard. The resulting calcium salts will 4-14

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

probably be insoluble in water and lay where they have been formed.

- PAGE C-3 C.2.1 CONTINUED CYLINDER STORAGE 1ST PARAGRAPH 3RD SENTENCE *"Because of their age, potential direct contact with the ground, and skirted ends, many of the cylinders show signs of corrosion."* Unless you include the ORO 651 series of documents, how is the reviewer to know what you are talking about when you suddenly introduce "skirted ends"? 4-15
- PAGE E-20 FIGURE E.1 The design of the Horizontal "Clamshell" Overcontainer looks interesting, and since you will have to use it at all three plant sites, while you are at it, why don't you design to be a 100 PSIG pressure vessel and use the steam heated autoclaves that you have at the plants to empty the defective cylinders? Otherwise you have to come up with an autoclave designed for hot air heating which will require different than your presently approved safety systems to avoid gross overheating with hot air. 4-16
- PAGE E-21 E.2.2 CYLINDER TRANSFER You will have some damaged cylinders at all three sites, and if you can't get a DOT permit to ship them off the plant site, how would one of these expensive cylinder transfer facilities at each site be of value to the enterprise? 4-17
- PAGE F-3 SITE LAYOUT FOR A CONVERSION FACILITY Why do you store the full cylinders outside, and build the biggest building on the site for the empties to be under cover? 4-18
- PAGE F-11 1ST PARAGRAPH Why wash the empty cylinders with water when a nitric acid solution would do a better cleaning job? The used solution could also be evaporated to dryness for disposal. 4-19
- PAGE F-13 F.2.3 CONVERSION TO METAL. 3RD PARAGRAPH, 4TH SENTENCE *"The more dense molten uranium/iron would settle to the bottom of the reactor where it would be continuously withdrawn"* What kind of material are you going to use for the reactor and liquid uranium/iron draw off piping? I have always been told that liquid uranium at 2100°F, and uranium alloys at lower temperatures are the universal solvents. Nothing, even yttrium lined equipment will contain them for very long. 4-20

  If you go with the Fe/U alloy just to lower the molten metal temperature, how good a radiation shield will your alloy be as compared to pure uranium?
- PAGE F-14 IMPACTS OF OPTIONS The amount of HF produced from any of the conversion options should be expressed because it is the big safety hazard. The design rate of 2300 48G cylinders of UF_6 a year equates to 6.3*26,840 lbs or169,100 lbs UF_6 a day. Using a molecular 4-21

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

weight of 352 for UF_6, these 6.3 cylinders contain 480 lb/mols of UF_6. Each lb/mol of UF_6 that reacts with water will create six lb/mols of HF. Thus 480 lb/mols * 6 = 2880 lb/mols HF/day. Using a molecular weight of 20 for HF, this equates to 57,000 lbs or 6600 gallons of anhydrous HF/day produced. Remembering that HF boils at 60°F, this is a lot of HF to handle day in and day out in plastic pipes and tanks. You are buying a much bigger safety problem than I think you are portraying in these tomes. You should know that a drop of this liquid will burn a hole through your unprotected hand and the fumes can kill as happened at Kerr McGhee in Gore OK! *4-21 (Con't.)*

- PAGE F-23 TABLE F.7 In the Conversion to U_3O_8 section, the last accident is a U_3O_8 drum spilling its contents onto the floor after an accident with a forklift. These drums contain 1600 lbs of U_3O_8 powders, and you are asking the reviewer to believe that the spill quantity will only be 63 milligrams! This tends to lose your creditability for the whole study! Later on in the Table, you show a 2400 lb drum of UO_2 in a similar accident only spilling 25 milligrams, but you have an extremely unlikely 3, UF_6 cylinders bursting from some kind of fire and dumping 24,000 lbs in 30 minutes. I believe you lose integrity when you ignore the historical fact that this cylinder rupture scenario has not occurred, or even come close, in the past 50 years of cylinder storage. On the other hand, you seem to completely accept speculation about future accidents in plants that have not been built. It sure looks like you are trying to make people think this UF_6 stuff is the most hazardous thing there ever was? *4-22*
- PAGE F-29 CYLINDER TREATMENT FACILITY EXTREMELY UNLIKELY ACCIDENTS Why is the amount released in an earthquake where 50% of the stored drums are breached only 1.9 lbs, whereas in a Tornado that pierces only one drum of U_3O_8 the quantity released is 69 lbs? You need to cross check all these tables you publish. I am sure that I have not found all the inconsistencies. *4-23*
- IBID. The 3.4 lbs of HF released when the evaporator tank fails and the pool of HF evaporates into the building is just plain wrong. I can tell that none of you ever worked at Fernald! If the temperature is above 60°F, 3.4 lbs of anhydrous HF will become 61 standard cubic feet of extremely toxic and obnoxious gas.
- PAGE G-16 SECTION G.2.2 I don't find recognition of the cylinder sweating problem in any of the inside storage options. During the winter, the 10 or 14 ton cake of UF_6 in each cylinder cools approaching the temperature of the coldest day. When spring comes and the warm *4-24*

COMMENTOR NO. 4: DYER, ROBERT (CONT'D.)
HARRIMAN, TENNESSEE

humid days return, the outer surface of the cylinders becomes a condenser for the water in the air, not unlike the sweating on your evening rum and coke glass. Unless you air condition the buildings, vaults, and mines, the cylinder wall corrosion will continue especially in the spring. *4-24 (Con't.)*

- PAGE H-16 TABLE H-5 Why is that the drop of a single 2400 lb drum of UO_2 only releases $7.3X10^{-7}$ pounds (3.3 mg) of UO_2 in this accident whereas the same accident in Table G.6 page G-26 releases $1.1X10^{-4}$ lbs (50 mg)of UO_2? Once again, what you got don't make no sense! *4-25*
- PAGE J-28 SECTION J.3.4.3 CYLINDER TREATMENT FACILITY I question the assumption that emptied UF_6 cylinders will retain a 22 lb heel. Why not use dry air to purge the UF_6 gas from the emptied cylinder in the autoclave and let these purge gases go directly to your conversion apparatus. If you do this you should get your heels to be around 10 ppm UF_6. However, even if you do this, you will still have to wash the cylinders to get the daughter products out *4-26*

COMMENTOR NO. 5: DENTON, MARK S., DR.
OAK RIDGE, TENNESSEE

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

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- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

I am currently reviewing the Draft PEIS Summary, Vol I and Vol. II. Although for the opportunity to provide comment, I have been tracking this problem (which I feel is of the the highest priority along with the Gunite Tanks and Melton Valley Storage Tanks at ORNL) since 1992 at Oak Ridge (K-25 PGDP and POTS).

Please add me to your mailing list as indicated below.

Thank you again

Paul S. Denton Ph.D., CET CHMM, REP

5-1

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name Dr. Mark S. Denton (optional)
Organization Mountain Technologies Network (MTN) Group
Address P.O. Box 5901 (optional)
City Oak Ridge State TN Zip 37831
Phone number (423) 544-0779 (optional)
~~E-mail~~ FAX address (423) 457-8350 (optional)

☒ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

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Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 •301/903-4781

COMMENTOR NO. 6: WEIGEL, RUDY
OAK RIDGE, TENNESSEE

Depleted Uranium Hexafluoride Management Program

Comment Form

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- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

NO COMMENT AT THIS TIME. THE PUBLIC MTG SHOULD ELICIT VARIOUS COMMENTS WHICH EITHER WILL ENHANCE OR DISTRACT FROM THE DECISION MAKING PROCESS.

QUESTION – I DIDN'T THINK "ECONOMICS" WAS A CONSIDERATION OF THE NEPA PROCESS. IF IT'S NOT, WHY IS IT PRESENTED IN THE PEIS?? IT'S BEING PRESENTED COULD ADVERSELY INFLUENCE ULTIMATE DECISIONS FOR THE PROJECT – PEOPLE WILL LOOK @ THE ~~BA~~ INSTEAD OF THE BEST PROJECT OPTION

6-1

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name RUDY WEIGEL (optional)
Organization STAKEHOLDER
Address 107 TIDEWATER LN (optional)
City OAK RIDGE State TN Zip 37830
Phone number (423) 481-8108 (optional)
E-mail address N/A (optional)

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COMMENTOR NO. 7: PEELLE, BOB
OAK RIDGE, TENNESSEE

Depleted Uranium Hexafluoride Management Program

Comment Form

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- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

In discussing possible future uses of depleted uranium, you prominently mention radiation shielding. True for x-rays and gamma rays, and sometimes true for electrons. Never true for neutrons! (fast or slow. I was associated with some simple minded experiments 40 yr ago that made the point dramatically.) The neutrons produce fissions, and the (subcritical) multiplication ruins the shield. 7-1

Uranium pellets would ruin concrete blocks, if many neutrons are around. So for any application including around an accelerator, an analysis would have to be made.

So, qualify the statements to apply only to X-ray or X-ray shields.

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name Bob Peelle (optional)
Organization self in this case
Address 130 Oklahoma Ave (optional)
City Oak Ridge State TN Zip 37830
Phone number 423 483 8974 (optional)
E-mail address 76533.226@compuserve.com (optional)

☐ Please add my name to the Depleted UF_6 mailing list.
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19901 Germantown Road • Germantown, MD 20874 •301/903-4781

COMMENTOR NO. 8: PLANSKY, LEE, DR.
IDAHO FALLS, IDAHO

Name: Dr Lee Plansky

Date Sent: 1/28/98

Document Ref.: PEIS: APPENDIX I: ENVIRONMENTAL IMPACTS OF OPTIONS FOR DISPOSAL OF OXIDE

----- COMMENT -----

A. re: Disposal Options U- minerals are deposited in reducing environments. It would seem that you would chose a *grout* that would tend to be chemically neutral or also reducing, perhaps a glass or synroc. The oxidizing environment implied in the present scenario (cement grouts, implies rapidly rusting metal drum, and oxidation of U to U ++++++ (+6, or +5) and we mobilize what we don't want to. 8-1

B. The PEIS downplays the importance of U-toxicity as a metal. Refer to any simple MDSDS on U METAL and you and the public will all be shocked. 8-2

C. The way I understand it, the new proposed 20 micrograms/liter EPA MCL on U-238 is inviolable. Depleted uranium material would be disposed of as low-level radioactive waste. The disposal options assessed in the PEIS were defined on the basis of the chemical form of the uranium and the type of disposal facility. The following disposal options were considered: Disposal as U3O8. Depleted uranium could be disposed of as U3O8, either ungrouted (bulk) or grouted U3O8, following conversion. The disp al facilities considered included shallow earthen structures, belowground vaults, and an underground mine. Disposal as UO2. Similar to U3O8, depleted uranium could be disposed of as UO2 following conversion, either in ungrouted or grouted form. The disposal facilities considered were the same as those considered U3O8: shallow earthen structures, belowground vaults, and an underground mine. 8-3

COMMENTOR NO. 9: MILITARY TOXICS PROJECT LEWISTON, MAINE

MILITARY TOXICS PROJECT

National Office
471 Main Street, 2nd Floor
Lewiston, ME 04240

phone: (207)783-5091
fax: (207)783-5096
e-mail: mtp@igc.apc.org

February 4, 1998

Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley

Secretary Pena recently held a press conference in Washington D.C. to tout his Openess Intiative. We hope that this willingness to be open includes efforts to be more inclusive in DoE's outreach to impacted, or potentially impacted communities.

Specifically of concern to the Military Toxics Project and the Indigenous Environmental Network is the **Draft Programmatic Environmental Impact Statement For Alternative Strategies For The Long-Term Management And Use Of Depleted Uranium Hexafluoride**.

We believe that all of the strategies that proposed have serious environmental justice concerns and potential impacts to communities that you have not adequately reached with the draft PEIS. We also believe that the meetings that the DoE has held in the past, as well as the ones that are beginning on February 19, 1998 in Paducah, are not properly reaching people who are or may be impacted by decisions that your agency will be making regarding the long-term plan for the use of this dangerous material. *9-1*

Keeping with the spirit and intent of **President Clinton's Executive Order on Environmental Justice**, and **Secretary Pena's Openess Intiative**, we feel that it would be reasonable to request that the DoE initiate roundtable meetings, much like the **Federal Facilities Restoration Dialogue** meetings. We beleive that it is necessary and just to bring in grassroots leaders from community, labor and environmental justice groups to further discuss the implications of strategies that have been proposed. *9-2*

We further request that the comment period be extended to six months to give these folks the opportunity to meet with you, in addition to the hearings that are taken place now, as well as the opportunity to obtain expert technical advice regarding the impact of the various different strategies. *9-3*

Please respond to our request in writing. We will be happy to suggest participants for a roundtable discussion.

Sincerely,

Cathy Lemar, Director
Military Toxics Project

Tom Goldtooth, Director
Indigenous Environmental Network

Dan Fahey
Swords To Plowshares

cc: Energy Secretary Federico Pena

MTP is a project of the Tides Center

recycled paper

COMMENTOR NO. 10:

[Comment letter submitted but since withdrawn.]

COMMENTOR NO. 11: ADKISSON, RON
OKLAHOMA CITY, OKLAHOMA

Depleted Uranium Hexafluoride Management Program

Comment Form

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- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments One long-term alternative which has not been considered to date for long-term storage of the converted uranium (i.e., U02, U308, etc.) is the placement in a uranium mill tailings impoundment for long-term retrievable storage. Mill tailings impoundments are designed for 1,000 year stability and the long-term care and maintenance is legally the responsibility of the Department of Energy. Quivira Mining Company's mill tailings site in New Mexico, for example, is presently licensed to dispose of 5,000,000 tons of byproduct materials even though the structural stability of the site was designed for an additional 43,000,000 tons. **11-1**

The primary advantages of using a mill tailings site are (1) the inventory would be consolidated and isolated from the environment; (2) placement in a tailings impoundment would be relatively simple and with minimum personnel exposure; (3) it would remain in the custody of the US Government for long-term monitoring and care; and, (4) it could be retrieved at any time in the future should the need arise.

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name Ron Adkisson (optional)
Organization Rio Algom Mining Corp.
Address 6365 Waterford Blvd. #325 (optional)
City Oklahoma City State OK Zip 73118
Phone number 405-842-1773 (optional)
E-mail address _____ (optional)

☐ Please add my name to the Depleted UF_6 mailing list.
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COMMENTOR NO. 12: BALDING, ANDREW
KEVIL, KENTUCKY

Nane: Andrew K. Balding

----- COMMENT -----

Appendix D, pg. 5, 1st Para. - The assumption that any further breaches would be a result of handling damage vs. corrosion is very valid, however the follow on assumption that this breach or damage would go undetected for 4 years is not a valid assumption. The same detailed Inspection of a cylinder is required each and every time it is handled as it is Quadrennially or Annually, the Inspections in fact almost identical, the same procedures and checklists are used regardless of the type of inspection or frequency. Any damage that might occur under the current regimented and proceduralized handling activities whether during painting, cylinder relocation to improved storage, or just normal storage yard operations, would be immediately noted and dealt with at the occurrence. Therefore there would be no release and no "Environmental Impact" whatsoever, furthermore the one handling damage induced breach (the Paducah cracked cylinder) was caused by handling damage in 1987; since that time this Site has handled thousands of cylinders without breaching a cylinder due to handling damage, the current Project alone has handled over 30,000 cylinder relocations since 1992 without causing damage to a cylinder sufficient to cause a breach. The facts do not support the conclusions of the predicted number of cylinder breaches portrayed in the "No Action Alternative": the estimate of 444 at Paducah over the next 40 years with only one under old handling practices (even disregarding that those practices have been improved) is sensationalistic. **12-1**

COMMENTOR NO. 13: YGDRASIL INSTITUTE GEORGETOWN, KENTUCKY

Ygdrasil Institute
PO Box 131
Georgetown, KY 40324
502-868-9074

February 21, 1998

Charles E. Bradley, Jr.
US Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

We are writing to you to request that you extend by six months the period for comment on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*. The material in the draft is very technical and complex, and many people concerned with the management of the hexafluoride have only recently received copies of it. **13-1**

We should also like to recommend that people in the affected communities be invited to roundtable meetings like those for the Federal Facilities Restoration Dialogue. The affected communities should include those likely to be at risk if transportation of uranium hexafluoride on a large scale takes place. **13-2**

Sincerely,

Mary B. Davis

Mary B. Davis, PhD
Director

cc: Energy Secretary, Federico Peña

In Norse mythology, Ygdrasil is the world tree.
Ygdrasil Institute is a project of Earth Island Institute

COMMENTOR NO. 14: WHITEHEAD, CORINNE BENTON, KENTUCKY

Depleted Uranium Hexafluoride Management Program

Comment Form

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- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

WE URGE DOE TO DETERMINE ALL LEAKING CYLINDERS AT PGDP. TRANSFER THE CONTENTS OF LEAKING CYLINDERS INTO HEAVY GUAGE NEW CONTAINERS. STORE IN A EARTHQUAKE PROOF CONCRETE STRUCTURE OFF THE FLOOR SO THEY CAN BE MONITORED FOR LEAKS. NO MAJOR EFFORTS TO TRANSFER CONTENTS AND WASH OUT CONTAINERS IN A PROCESS TO CHANGE TO URANIUM OXIDE SHOULD BE AT THE PADUCAH FACILITY. DOE HAS KNOWN DETAILS OF SEVERE SEISMIC POTENTIAL SINCE THE LATE 1970'S AND HAS TAKEN LITTLE OR NO ACTION TO PROTECT THE WORKMEN OR THE COMMUNITY. NEGLIGENCE IS NOT AN "ACT OF GOD" IF ACUTE DAMAGE IS DONE TO THE FACILITY OR THE COMMUNITY DURING SEISMIC EVENTS. **14-1**

WE URGE A COMPREHENSIVE ENVIRONMENTAL IMPACT STUDY BE MADE WITH FULL REPORT TO THE PUBLIC. WE URGE ATTENTION TO DAMAGE AND HAZARD REDUCTION RE: THE EARTHQUAKE POTENTIAL UTILIZING NATIONAL & INTERNATIONAL EARTHQUAKE ENGINEERING AND SEISMIC SCIENTISTS, WHO ARE RESPECTED IN THAT FIELD. WE DEPLORE THE USE OF DEPLETED URANIUM IN MILITARY EQUIPMENT **14-2**

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name CORINNE WHITEHEAD (optional)
Organization COALITION FOR HEALTH CONCERN
Address 1891 U S 641 NORTH (optional)
City BENTON State KY Zip 42025
Phone number 502-527-1217 (optional)
E-mail address _____ (optional)

☒ Please add my name to the Depleted UF_6 mailing list.
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Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 • 301/903-4781

COMMENTOR NO. 15: JACOBS ENGINEERING GROUP, INC. PADUCAH, KENTUCKY

JACOBS ENGINEERING GROUP INC.
Paducah Site

Page 1 of 5

DOCUMENT REVIEW RECORD

Document Title: *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

Control Number: _____ WBS Code: _____

Reviewers: L. Lee Hamblin

Review for: Editorial ☐ Peer ☐ Regulatory ☒ Technical ☐ QCC

Review Requested by: _____ **Date:** _____

REVIEWER'S SIGNATURE

2/23/98
DATE

☐ Approved (only if no comments)
☒ Not Approved
☐ Not Reviewed (indicate reason(s) for not reviewing below)

Concurrence in Comment Incorporation

REVIEWER'S SIGNATURE

DATE

☐ Approved

Cmnt No.	Page and Location [Revised Location]	Comments	Comment Disposition
1.	Page S-1; Para. 2; Sent. 4; and Page S-4; Sect. S.1.2; Sent. 2	Text states: "Additional NEPA analyses, as appropriate, will be prepared once a long-term management strategy has been selected..." "This PEIS examines the environmental consequences of alternative strategies of long-term storage, use, and disposal of the depleted UF_6 inventory." This document does not appear to analyze completely the use and disposal of the depleted UF_6 inventory when it defers the analysis of future siting, design, and construction to possible separate NEPA analyses (as appropriate) in the future when, in effect, they appear to be "connected actions" and/or "cumulative actions" and should be evaluated thoroughly in this PEIS.	

15-1

COMMENTOR NO. 15: JACOBS ENGINEERING GROUP, INC. (CONT'D.) PADUCAH, KENTUCKY

JACOBS ENGINEERING GROUP INC.
Paducah Site

Page 2 of 5

DOCUMENT REVIEW RECORD

Document Title: *Proposed Remedial Action Plan for Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Date: February 13, 1998

Cmnt No.	Page and Location [Revised Location]	Comments	Comment Disposition
2.	Page S-42; Sect. S.4.13; Sent. 1	Text states: "All depleted UF_6 management alternatives would result in environmental impacts that, even when combined with other activities that could occur at the three current storage sites, would be expected to be relatively minor." This statement does not adequately address cumulative impacts from all alternatives considered in this draft PEIS. This statement conflicts with the statement on page 4-27 that states: "The cumulative impact analysis was conducted by examining those impacts resulting from depleted UF_6 management activities that would occur at the three current storage sites (Paducah, Portsmouth, and K-25). The impacts from these activities - including continued cylinder storage and cylinder preparation - were then added to the impacts of other past, present, and reasonable foreseeable future actions at these sites to assess potential cumulative UF_6 impacts." What past, present, and reasonable foreseeable future actions at these sites (specifically) were assessed, and where is the methodology discussing such assessment?	
3.	Page 3-12; Sect. 3.3.6.3; Sent. 1	Text states: "No wetlands were identified on the Paducah site by the National Wetlands Inventory (ANL 1991a)." This may be a true statement; however, jurisdictional wetlands were delineated by a wetlands survey performed in 1995 and confirmed by the U.S. Army Corps of Engineers in 1996 in some of the drainage ditches on the Paducah site. So the text stated above may be true, but it is inaccurate as far as the current wetland scenario on the Paducah site. Is it possible old information has been quoted?	

15-2

15-3

COMMENTOR NO. 15: JACOBS ENGINEERING GROUP, INC. (CONT'D.)
PADUCAH, KENTUCKY

JACOBS ENGINEERING GROUP INC.
Paducah Site

Page 3 of 5

DOCUMENT REVIEW RECORD

Document Title: *Proposed Remedial Action Plan for Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Date: February 13, 1998

Cmnt No.	Page and Location [Revised Location]	Comments	Comment Disposition	
4.	General	Cumulative impacts are not analyzed thoroughly throughout this document. The storage and management scenarios are well known and scoped; however, the unknowns (siting, design, and construction) are described in enough detail (with enough siting criteria described) to narrow the likely locations at which of these facilities possibly will be sited and constructed to be evaluated for cumulative impacts in this document. These "Phase II actions" appear to be "connected actions" and should be analyzed in this PEIS. Phase II is described as "... implementation of the strategy selected."(page S-5, 1st paragraph, 1st sentence). It would be difficult to implement efficiently a strategy of this magnitude that has "connected actions" that are not fully described, planned, and evaluated in this document.		15-4
5.	Pages 5-2, 5-18, 5-55, 5-66, 5-78, and 5-94	No cumulative impacts discussions were included for each of these alternative discussions even though Figure 4.1 on page 4-7 shows "Areas of Potential Impact Evaluated in the PEIS for Each Alternative." The "Cumulative Impacts " box appears in the center at the bottom of this figure.		15-5
6.	Page 5-104; Sect. 5.8; Sent. 4	Text states: "No non-DOE actions have been identified that would have potential cumulative impacts at the three sites." How was this conclusion reached? What "non-DOE" entities were contacted and what past, present, and reasonably foreseeable actions were analyzed that considered these "non-DOE" entities' actions? Were local governments, municipalities, regional planning agencies, federal agencies, state agencies, local industries, and other non-DOE entities directly communicated with in this PEIS? Are they referenced in this document?		15-6
7.	Appendix E; Page E-72; Sect. E.3.12; Bullet 2	Text states: "The impacts would be negligible." What methodology and analysis deem these impacts to be "negligible?" Where is a cumulative impacts analysis performed to make this decision.?		15-7

COMMENTOR NO. 15: JACOBS ENGINEERING GROUP, INC. (CONT'D.)
PADUCAH, KENTUCKY

JACOBS ENGINEERING GROUP INC.
Paducah Site

Page 4 of 5

DOCUMENT REVIEW RECORD

Document Title: *Proposed Remedial Action Plan for Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Date: February 13, 1998

Cmnt No.	Page and Location [Revised Location]	Comments	Comment Disposition	
8.	Appendix F; Page F-72; Sect. F.3.10; Para. 1; Last sent.	Text states: "These impacts, although considered, were not analyzed in detail for one or more of the following reasons: ..." How can the "The impacts would be negligible" be an accurate statement if the impacts were not analyzed in detail? Were these impacts analyzed for cumulative impacts? If so, where? Also consider the rationale for the 1st and 2nd bullets.		15-8
9.	Appendix G, H, I; Page G-63, H-34, I-72; Sect. G.3.10, H.3.10, I.3.10; Para. 1; Last Sent.	Text states: See number 8 above. Same comment here.		
10.	Appendix J; Page J-39; Sect. J.3.8; Para. 1; Last sent.	Text states: See number 7 above. No cumulative impacts analysis was seen for these determinations. These actions should be analyzed in this document not in "connected actions" via a later NEPA document.		15-7
11.	Appendix J; Page J-39; Sect. J.3.8; Para. 1; Last sent.	Text states: see number 8 above. No cumulative impacts analyses were seen for these determinations. These actions should be analyzed in this document not in a later NEPA document where "connected actions" are proposed for analysis ("as appropriate"). How is the public going to connect effectively these actions back to this PEIS when the identification and technology analyses for siting, design, and construction are going to be performed in distinctly separate NEPA documents that will be generated at some undefined future dates?		15-8
12.	General	How were the magnitude and significance of cumulative effects determined for the proposed action? What methodology was used to make this determination? Will it be included in an appendix for public review and or comments? What other methods were used to analyze cumulative effects?		15-9
13.	General	Do the cumulative effects of any of the alternatives and the proposed plan exceed the carrying capacity of any resources, ecosystems, or human communities?		15-10

COMMENTOR NO. 15: JACOBS ENGINEERING GROUP, INC. (CONT'D.)
PADUCAH, KENTUCKY

JACOBS ENGINEERING GROUP INC.
Paducah Site

Page 5 of 5

DOCUMENT REVIEW RECORD

Document Title: *Proposed Remedial Action Plan for Solid Waste Management Unit 91 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Date: February 13, 1998

Cmnt No.	Page and Location [Revised Location]	Comments	Comment Disposition	
14.	General	Throughout the PEIS, at the Paducah site, Bayou Creek is referenced as "Big Bayou Creek." This is in error, as the 1978 USGS topographic map for Heath, KY, shows the creek as Bayou Creek not Big Bayou Creek.		15-11
15.	General	Is there any correlation between this PEIS and the "Department of the Navy Final Environmental Impact Statement for a Container System for the Management of Naval Spent Nuclear Fuel," DOE/EIS-0251, Nov., 1996, specifically with concern to interim consolidated storage of spent nuclear material at some location such as Yucca Mountain or another site?		15-12
16.	General	The preferred alternative is not one of the alternatives described and compared in the body of this PEIS but is a combination of alternatives 4 and 5. Why wasn't there another alternative (say # 7) that described and compared the use of the entire UF_6 inventory as the preferred alternative? It seems a little difficult to the reader to see that the preferred alternative isn't one of the decribed and compared alternatives in the body of the PEIS. In combining alternatives 4 and 5, were additive, countervailing, and synergistic effects evaluated? If so, where is this covered in the PEIS?		15-13
17.	Pages 5-109, 5-111, 5-113; Tables 5.12, 5.13, and 5.14.	Tables are titled: "Maximum Cumulative Impacts of Depleted UF_6 Activities, Existing Operations, and Other Reasonably Foreseeable Future Actions at the ..." The reader does not agree that these tables should be titled "Maximum Cumulative Impacts ..." because cumulative impacts have not been analyzed in detail and appear to be based on a limited cumulative impacts methodology and evaluation. In addition, the "Impact Categories" are incomplete and do not include other potential impact areas.		15-14
18.	General	Has this action been correlated with the Vortec Vitrification proposed action for the Paducah Site?		15-15

COMMENTOR NO. 16: ANONYMOUS
PADUCAH, KENTUCKY

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

USE CYLINDER DROP TEST RESULTS, CRASH TESTS
AND MAKE IT PUBLIC TO REASSURE THE PUBLIC.
PUT IT IN THE PEIS. DO PR + CAPITALIZE ON IT.
WE'VE DROPPED FULL CYLINDERS AT PADUCAH FROM THE PAH CRANE USE,
PUT ON SECOND SKIN FOR BREACHES - SEND TO PADUCAH AND
FEED OUT.

⇒ DATA TO SHOW NOTHING BAD WILL HAPPEN

16-1

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name PADUCAH CYLINDER HANDLER (optional)
Organization _____
Address _____ (optional)
City _____ State ____ Zip ____
Phone number _____ (optional)
E-mail address _____ (optional)

❑ Please add my name to the Depleted UF_6 mailing list.
❑ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF_6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 • 301/903-4781

COMMENTOR NO. 17: ROBISON, WILLIAM A. COOKEVILLE, TENNESSEE

Mail this form

Comment Form

Depleted Uranium Hexafluoride Management Program

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*.

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
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- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

We have no comments at this time, but will remain involved in the public scoping process 17-1

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name William A. Robison (optional)
Organization U.S. Fish & Wildlife Service
Address 446 Neal Street (optional)
City Cookeville State TN Zip 38501
Phone number 931-528-6481 (optional)
E-mail address _____ (optional)

■ Please add my name to the Depleted UF_6 mailing list.
❑ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF_6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 •301/903-4781

COMMENTOR NO. 18: JANASKIE, MARK OAK RIDGE, TENNESSEE

Question/Information Request Card

If you have questions that were not addressed or need additional information, please fill out this form and bring it to the registration table. DOE will address your concern to extent possible.

Name: MARK JANASKIE
Address: 151 LAFAYETTE DRIVE, SUITE 210 | OAK RIDGE 37830
Phone: 482-0400 Fax: 482-7690
E-mail: mjanaskie@DPRA.com

DEPLETED

Question/Request: Is there any consideration by DOE to measure the corrosion rate, and if it turns out that the corrosion rate is slow or benign, is there a chance that DOE will do no coating and simply wait until the date for beginning conversion (2006+)? If the corrosion rate is slow, could DOE consider the risk to cylinders low, and thus simply wait until conversion begins. 18-1

Is this one of DOE's current options?

COMMENTOR NO. 19: PARROTT, ROBERT C.
OAK RIDGE, TENNESSEE

Question/Information Request Card

If you have questions that were not addressed or need additional information, please fill out this form and bring it to the registration table. DOE will address your concern to extent possible.

Name: Robert C. Parrott
Address: 151 Lafayette Drive, Suite 210
Phone: (423) 482-0400 Fax: (423) 482-7690
E-mail: cparrott@dpra.com

DEPLETED

Question/Request: 1) What does DOE plan to do with the cylinders after conversion occurs? Dispose of as waste or decon + sell as scrap or re-use? 2) Does DOE have a credible technology to convert the DUF6? Is it realistic that DOE can convert the material by 2028? 3) The current painting program seems inadequate to control corrosion. Does DOE plan to increase the rate of coating? 4) How will DOE decide whether to transport cylinders in overpacks or transfer the contents to new cylinders?

19-1 19-2 19-3 19-4

COMMENTOR NO. 20: RADCLIFFE, DONALD W.
ADDRESS UNKNOWN

TO: depleted UF6 at SAIC_BM2
Subject: Unable to comment on DUF6

When I tried to send a commet through the e-mail link on the website, AOL could not deliver to that address. My comment on the PEIS is:

The cost of enrichment services is much lower and thus the viability of refeeding the DUF6 at higher assays is much improved at some locations outside the U.S. The PEIS should address the issues of overseas shipping and disposal. **20-1**

Donald W. Radcliffe
Nuclear Fuel Consultant

COMMENTOR NO. 21: UNITED STATES DEPARTMENT OF THE INTERIOR
WASHINGTON, D.C.

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, D.C. 20240

In Reply Refer to:
ER 97/732

MAR 5 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Bradley:

The Department of the Interior has reviewed the draft " Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride" and offers the following comments:

The Paducah site's proximity to the Reelfoot Rift and New Madrid fault zones would seem to indicate that an earthquake caused accident could be considerably greater at Paducah than at either the Portsmouth site or the Oak Ridge site. This area has experienced seismic activity within the last two to three months. This should be factored into the analysis. **21-1**

S.1.3 Under Proposed action-Contaminants leaking into groundwater may not be detected for several hundred years. The rate of movement of contaminants in groundwater is variable. Because of the long period of time during which the radiation would still be potentially harmful, monitoring of ground-water contamination should continue as long as a risk exists and should cover a large enough area to capture the full geographic extent of possible contamination. The McNairy-Nacatoch aquifer is a very important source of drinking and domestic water for a number of towns in Missouri and Arkansas. Monitoring should be extensive enough to capture any incidence of contamination in these important water sources following a contamination event. **21-2**

S.4.5-It is important to note that the Paducah site should be considered a "wet site." A disposal facility failure in this wet environment would impact the ground-water system with uranium concentrations in groundwater greater than 20 mg/L within 1,000 years after the failure. **21-3**

The Paducah site is also vulnerable to changes in the biological and chemical composition of surface water caused by ground-water discharges into surface water streams. If contamination from such a discharge were to occur, it could affect the ecological stability of the surface water environment. **21-4**

COMMENTOR NO. 21: UNITED STATES DEPARTMENT OF THE INTERIOR (CONT'D.)
WASHINGTON, D.C.

Page 2

There is not sufficient information presented in the PEIS to permit an analysis or assessment of the validity of the models; therefore, we cannot confirm that the worst-case accident or other scenarios are reasonable simulations. **21-5**

Most of the strategies for disposing of the inventory of uranium would require construction of processing plants to convert UF6 to other chemical forms, however, locations of these plants are not identified. The use of generic data for the proposed plant seems to be a weak link in the analysis because of uncertainty about site location and lack of specific data. Therefore, we cannot confirm the validity of the potential environmental impacts that might be caused by this conversion process. **21-6**

The units for measuring contaminant concentrations are reported differently in different parts of the document (e.g., mg/g, ug/mg, etc.). The same is true of hydraulic conductivity (cm/s, ft/d). Consistent units of measure should be used throughout the PEIS. **21-7**

On page 3-28, the assertion that the high thallium concentrations may be caused by a problem in the laboratory analysis should be confirmed or denied, and explained if levels are confirmed to be as high as suggested. **21-8**

Sincerely,

Willie R. Taylor
Director, Office of Environmental Policy and Compliance

COMMENTOR NO. 22: LAWRENCE LIVERMORE NATIONAL LABORATORY
LIVERMORE, CALIFORNIA

Lawrence Livermore National Laboratory

March 3, 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Bradley,

Lawrence Livermore National Laboratory has no substantive comments to make on the content of the December 1997 Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the long-term Management and use of Depleted Uranium Hexafluoride. We wish to receive a copy of the Final PEIS when available. **22-1**

Should you have any questions, please direct them to Ken Zahn (L-627), phone 510-422-2140 or Internet address: zahn1@llnl.gov.

Sincerely,

Kenneth C. Zahn, Group Leader
Environmental Evaluations Group
Environmental Protection Department

cc:	EEG file	L-627
	Zahn., K.,	L-627
	Galles, H.,	L-626
	Jackson, C.S.,	L-633

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COMMENTOR NO. 23: ECO-PAK SPECIALTY PACKAGING, DIVISION OF CBC
ELIZABETHTON, TENNESSEE

ESF Eco-Pak Specialty Packaging Division of CBC
Intermediate Bulk Containers for Chemicals & Liquids
UF_6 and UO_2 Packaging

125 Jodent Way, Suite A
Elizabethton, TN 37643 USA
Tel: 423-543-4211 • 800-221-2465 • Fax: 423-543-6007
E-mail: info@ecopak.com

February 25, 1998

Mr. Charles E. (Ched) Bradley
Program Manager, Facilities Office, ONEST
19901 Germantown Rd.
Germantown, MD 20874

Dear Mr. Bradley:

It was a pleasure to meet you, last night, at the DOE public meeting in Oak Ridge. Heather and I both feel that the preferred program to convert the stockpiled UF6 to uranium oxide and uranium metal for future use is the most worthwhile alternative.

Eco-Pak Specialty Packaging is very interested in assisting in the transport of this material to the future conversion facilities. I am enclosing a brochure on both Eco-Pak Specialty Packaging (ESP) and our parent company, The Columbiana Boiler Company (CBC).

ESP is a division of The Columbiana Boiler Company (CBC) and part of the Columbiana network of companies, which encompasses more than 100 employees and 200,000 square feet of manufacturing area. ESP and CBC offer the knowledge and manufacturing experience of both the UF6 cylinders (30B & 48" series) and the UF6 cylinder overpacks. Additionally, ESP has experience in packaging for the transportation of uranium oxide materials, plutonium products, and waste products. ESP has a comprehensive quality assurance program in place, which is approved by the U.S. Nuclear Regulatory Commission under Quality Assurance Program Approval for Radioactive Material Packages No. 0179, Revision 6. NCI has on staff a core group of project engineers with a wide range of experience, a strong management team, regulation specialists, a certified core of welders, AWS Certified Welding Inspectors also certified in accordance with ASNT-TC-1A for nondestructive inspection, and excellent production personnel. **23-1**

I hope some of this information helps in the decision making for this project. I look forward to working and meeting with you, again.

If you have any questions about our company or need any further information regarding our capabilities, please contact myself or Heather Little at **(800) 221-2465**.

Best regards,

William M. Arnold
President

WMA/hl
Enclosure

COMMENTOR NO. 24: SWORDS TO PLOWSHARES SAN FRANCISCO, CALIFORNIA

Swords To Plowshares
a veterans' rights organization

5 Market Street, 3rd Floor
an Francisco, CA 94103

Telephone: (415) 247-8777
Fax: (415) 227-0848

March 11, 1998

Charles E. Bradley, Jr.
US Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Enclosed is a copy of the Depleted Uranium Case Narrative about the health and environmental consequences of depleted uranium munitions. I hope that you will carefully review the information presented here as part of your effort to determine the fate of uranium hexaflouride stockpiles.

24-1

Depleted uranium should be stored in safe containers away from humans, water supplies, and the food chain. The use of depleted uranium in ammunition is an unwise use for chemically toxic and radioactive waste.

If I can be of further assistance, please do not hesitate to contact me.

Respectfully,

Dan Fahey

COMMENTOR NO. 24: SWORDS TO PLOWSHARES (CONT'D.) SAN FRANCISCO, CALIFORNIA

Swords To Plowshares
a veterans' rights organization

995 Market Street, 3rd Floor
San Francisco, CA 94103

Telephone: (415) 247-8777
Fax: (415) 227-0848

DEPLETED URANIUM CASE NARRATIVE
QUOTES SHEET

I. Pre-Desert Storm Reports:

1974: "In combat situations involving the widespread use of DU munitions, the potential for inhalation, ingestion, or implantation of DU compounds may be locally significant."
Medical and Environmental Evaluation of Depleted Uranium; Ad Hoc Working Group on Depleted Uranium of the Joint Technical Coordinating Group for Munitions Effectiveness; April, 1974; p. ix.

1974: "The use of DU in certain RDT&E [Research, Development, Training and Evaluation] **and combat activities results in the redistribution of uranium in the environment, thereby providing a potential for adverse effects. Adherence to safety procedures and use of protective clothing minimize the potential for human exposure during RDT&E activities."**
Medical and Environmental Evaluation of Depleted Uranium; April, 1974; p. viii.

July, 1990: "Aerosol DU exposures to soldiers on the battlefield could be significant with potential radiological and toxicological effects."
Kinetic Energy Penetrator Environmental and Health Considerations; Science Applications International Corporation (SAIC); July 1990; Vol. 1, 4-5.

July, 1990: "Under combat conditions, the MEI's [most exposed individuals] **are probably the ground troops that re-enter a battlefield following the exchange of armor-piercing munitions, either on foot or motorized transports."**
Kinetic Energy Penetrator Environmental and Health Considerations; SAIC; July 1990; Vol. 2, 3-4.

July, 1990: "We are simply highlighting the potential for levels of [DU] exposure to military personnel during combat that would be unacceptable during peacetime operations."
Kinetic Energy Penetrator Environmental and Health Considerations; SAIC; July 1990; Vol. 1, 4-5.

July, 1990: "Following combat, however, the condition of the battlefield, and the long-term health risks to natives and combat veterans may become issues in the acceptability of the continued use of DU kinetic energy penetrators for military applications."
Kinetic Energy Penetrator Environmental and Health Considerations; SAIC; July 1990; Vol. 2, 3-4.

July, 1990: "Depleted uranium: low level alpha radiation emitter which is linked to cancer when exposures are internal, [and] chemical toxicity causing kidney damage."
Kinetic Energy Penetrator Environmental and Health Considerations; SAIC; July 1990; Vol. 1, 2-2.

July, 1990: "Assuming US regulatory standards and health physics practices are followed, it is likely that some form of remedial action will be required in a DU post-combat environment."
Kinetic Energy Penetrator Environmental and Health Considerations; SAIC; July 1990; Vol. 1, 4-6.

October, 1990: "Bioassay procedures will be performed when radioactive materials are used in such a manner that they could be inhaled, ingested, or absorbed into the body."
Preventative Medicine; US Army Regulation 40-5; October 15, 1990; Chapter 9, 9-6 a(2).

COMMENTOR NO. 24: SWORDS TO PLOWSHARES (CONT'D.)
SAN FRANCISCO, CALIFORNIA

September, 1990: "If ingestion or inhalation of radioactive materials is suspected, bioassays should be performed."
Guidelines for Safe Response to Handling, Storage, and Transportation Accidents Involving Army Tank Munitions and Armor Which Contain Depleted Uranium; TB 9-1300-278; Headquarters, Department of the Army; September, 1990; p. 7-3.

II. Post-Desert Storm Reports:

March, 1991: "There has been and continues to be a concern regarding the impact of dU on the environment. Therefore, if no one makes a case for the effectiveness of dU on the battlefield, dU rounds may become politically unacceptable and thus, be deleted from the arsenal . . . I believe we should keep this sensitive issue at mind when after action reports are written."
"The Effectiveness of Depleted Uranium Penetrators;" Los Alamos National Laboratory memorandum; Lt. Col. M.V. Ziehmn; March 1, 1991.

March, 1991: "As Explosive Ordnance Disposal (EOD), ground combat units, and the civil populations of Saudi Arabia, Kuwait, and Iraq come increasingly into contact with DU ordnance, we must prepare to deal with the potential problems. Toxic war souvenirs, political furor, and post conflict clean-up (host nation agreement) are only some of the issues that must be addressed."
"Depleted Uranium (DU) Ammunition;" Lt. Col. Gregory Lyle; Defense Nuclear Agency; March, 1991.

1995: "When DU is indicted as a causative agent for Desert Storm illness, the Army must have sufficient data to separate fiction from reality. Without forethought and data, the financial implications of long-term disability payments and health-care costs would be excessive."
Health and Environmental Consequences of Depleted Uranium Use in the US Army: Technical Report; US Army Environmental Policy Institute (AEPI); June, 1995; p. 4.

1996: "US service personnel also could have been exposed to DU if they inhaled or ingested DU dust particles during incidental contact with vehicles destroyed by DU munitions, or if they lived or worked in areas contaminated with DU dust from accidental munitions fires. Thus, unnecessary exposure of many individuals could have occurred."
Presidential Advisory Committee on Gulf War Veterans' Illnesses Final Report; December, 1996; p. 99.

1993: "Army officials believe that DU protective methods can be ignored during battle and other life-threatening situations because DU-related health risks are greatly outweighed by the risks of combat."
Operation Desert Storm: Army Not Adequately Prepared to Deal With Depleted Uranium Contamination; US General Accounting Office; GAO/NSIAD-93-90; January, 1993; p. 4.

1995: "Combat in Desert Storm has shown us that all soldiers anytime during battle may come across depleted uranium and depleted uranium contamination."
Development of Depleted Uranium Support Packages: Tier I - General Audience; US Army Chemical School; October, 1995; p. 25.

1995: "The person most likely to be contaminated is breathing without protection when DU munitions hit and penetrate his AHA [DU armored] M1 tank and the DU aerosolizes into the tank turret. He will inhale large amounts of DU dust. Next is the person in an AHA M1 tank hit and penetrated by non-DU munitions. The DU in the armor would aerosolize into the turret. Other persons include crew members in Bradleys struck by DU ammunition. Last are individuals moving

COMMENTOR NO. 24: SWORDS TO PLOWSHARES (CONT'D.)
SAN FRANCISCO, CALIFORNIA

Statement of Jerry Wheat
Gulf War Veteran
4/7 Cav, 3rd Armored Division
March 2, 1998

My name is Jerry Wheat, and I served in the Army from 1987 until 1991 as a cavalry scout. During the Gulf War, I was assigned to the 3rd Armored Division in Germany and was sent to the Gulf on December 24, 1990. We were deployed near the Iraqi border, where we practiced manuvers before the invasion in February 1991. I left the Gulf in March 1991.

Our unit was engaged in heavy fighting on February 26, 1991. I was injured in a friendly fire incident involing depleted uranium ammunition. Our Bradley Fighting Vehicle was struck twice by DU rounds fired by US tanks, and I was awarded a Purple Heart for my shrapnel wounds.

In October 1991, I became ill. I began having abdominal pains that would drop me to the floor, and I could barely eat. This went on for several weeks even though I was seeing a doctor at an Air Force hospital in Albuquerque, NM. I left the military shortly after falling ill, and I could no longer seek medical care from the military. I contemplated suicide because there were no answers and there was no treatment. At that time, I was not informed nor was I aware of the fact I could go to the Department of Veterans Affairs for medical care. The pain is still with me today.

Later on, I visited the VA in Albuquerque, and I was told that the illnesses are not real, but that it is psychological -- that it is in my head. After seven years, the VA won't say if my physical ailments are related to DU exposure.

In March 1992, my father, an industrial hygenist technician at Los Alamos Laboratory, called me and informed me that the shrapnel taken from my gear and skin were radioactive. This was a tremendous surprise to me, since the Army never bothered to tell me I was hit with radioactive and toxic ammunition.

I am now part of a VA medical review following the health of veterans exposed to DU. This program only follows a handful of those with known heavy doses of DU exposure. By 1993, I had lost 60 pounds, and the VA has yet to explain this to me.

I am speaking out today because so many people are affected by Gulf War illnesses. Our government should stop using depleted uranium. If it won't do that, then the least it can do is provide training and health care for those exposed to the toxic waste.

Remember, this sad legacy of government mistakes is not new. About 50 years ago, veterans were used as human test subjects for atomic bomb blasts. Then the government tested LSD drugs on others. Then there was the use of Agent Orange more than 30 years ago.

The government should conduct more research into the health effects of DU. The government should admit that many, many more were exposed to DU dust and begin to provide health care as soon as possible -- before it is too late. Thank you.

COMMENTOR NO. 24: SWORDS TO PLOWSHARES (CONT'D.)
SAN FRANCISCO, CALIFORNIA

Swords to Plowshares, Inc.
National Gulf War Resource Center, Inc.
Military Toxics Project, Inc.

Case Narrative

Depleted Uranium (DU) Exposures

Case Narratives are reports of what we know today about specific events that took place during the Persian Gulf War. This particular case narrative focuses on exposures to depleted uranium (DU). This is an interim report, not a final report. We hope that you will read this and contact us with any new information that would help us better understand the events reported here. With your help, we will be able to report more accurately on depleted uranium exposures during the Persian Gulf War. Please contact our offices to report any new information by calling:

(202) 628-2700, ext. 162
National Gulf War Resource Center, Inc.

(207) 783-5091
Military Toxics Project

(415) 247-8777
Swords to Plowshares

Last Update:
March 2, 1998

Author:
Dan Fahey

COMMENTOR NO. 25: QUAPP, WILLIAM J., P.E.
IDAHO FALLS, IDAHO

Comments on the
DOE NE PEIS on the Management of
Depleted Uranium Hexafluoride

Prepared by: William J. Quapp, PE
Starmet Corporation,
2300 No. Yellowstone Hwy
Idaho Falls, ID 83401

Phone: 208-535-9001
Fax: 208-535-9070
Email: wjq@srv.net

March 10, 1998

1. INTRODUCTION AND BACKGROUND

Good afternoon, my name is William Quapp, from Starmet Corporation. I have been actively involved in evaluating the management issues associated with depleted uranium hexafluoride since May 1993. At that time and until June 1996, I was employed at the Idaho National Engineering Laboratory. My investigations were performed for DOE Environmental Management Program (EM50). Over these three years, we identified various management options and costs of their deployment. One of the major things we learned is that the management of the depleted uranium inventory must be considered as a system in context with other DOE materials and waste management responsibilities. While the depleted uranium hexafluoride can be processed and useful fluorine byproducts extracted for the recycle value, the residual uranium material – oxide or metal – must be managed as a radioactive material. The fluorine product value will not pay for the total conversion and byproduct management costs. Consequently, DOE must either plan on disposal of the residual uranium materials or identify products that can consume the material and be manufactured at reasonable costs. Additionally, there must be customers for those products. The alternative to products and customers is to manage the depleted uranium as waste. **25-1**

The INEL program developed and patented one technology – *DUCRETE Shielding: A Depleted Uranium Concrete* -- which has been considered in the DOE PEIS as a potential use for depleted uranium. However, as will be pointed out later, because of the radioactive nature of depleted uranium, certain policies with respect to eventual disposal must be put in place to remove obstacles and encourage the use of depleted uranium in products. **25-2**

As has been shown in studies supported by DOE EM, the current quantity of depleted uranium reasonably matches the required quantity if some of the storage applications were to be implemented. No other economic use has been identified that uses large quantities of material.

COMMENTOR NO. 25: QUAPP, WILLIAM J., P.E. (CONT'D.)
IDAHO FALLS, IDAHO

My remarks today will provide a summary of the INEL findings and provide my recommendations for DOE policies and actions needed to support the depleted uranium recycle applications envisioned in the PEIS for the preferred alternative.

2. DISPOSAL AS WASTE

The INEL studies addressed this issue in a parametric sense using published costs of conversion of UF_6 to oxide and the then current cost of disposal at the Nevada Test Site and Hanford. The studies showed that the potential cost range was somewhere between $3 to $11 billion assuming that either the Nevada Test Site or Hanford could accept the material and dispose of it in shallow land burial. Parameters considered included 1.) disposal as a compacted oxide and as stabilized oxide, 2.) disposal site locations and costs, and 3.) disposal as LLW versus Mixed LLW (RCRA controlled material). *25-3*

3. RECYCLE USES

We evaluated recycle uses with the recognition that the depleted uranium is a radioactive material and must be controlled, used, and ultimately disposed of in appropriate nuclear waste repositories. We did not consider uses that would allow unrestricted use and disposal. *25-4*

After evaluating numerous concepts (nuclear shielding, flywheels, drill rods, blast shielding, etc.), we concluded nuclear shielding was the only viable use for depleted uranium since it was a controlled nuclear material and will be slightly radioactive forever. Additionally, because of the lower cost of competitive materials, depleted uranium was not an economic alternative for most other applications. Depleted uranium metal makes economic sense when the benefit of its very high density enables a solution that is otherwise not possible with traditional materials (steel, lead, concrete, etc.).

Depleted uranium has been used as metallic shielding in the past for various shipping casks and as shielding for radiation sources. In these applications, depleted uranium was selected because of its higher efficiency for gamma attenuation would allow cask weight limitations and/or size constraints to be met.

We found that one of the biggest impediments to the use of depleted uranium as metal in storage cask shielding applications is the high cost of converting from UF_6 to uranium metal. In a survey performed for DOE by Technics Corporation, the cost was identified to be about $11.70 per kg-U ($5.30 per lb-U) for conversion of UF_6 to metal and casting into a shape. Any forming or machining was additional and was priced at $4.40 to $22 per kg-U. Some cost reductions could be forecast through larger conversion facilities but these would not be expected to be sufficient to dramatically reduce the costs below those cited. Consequently, since casks could be made with conventional materials at lower total cost, we believed that there was no economic application for depleted uranium metal in storage casks. *25-5*

This economic reality spawned the invention of DUCRETE Concrete as a potentially economic alternative for using depleted uranium and avoiding the near term investment in disposal. This concept, while not directly cost competitive with conventional concrete, is much cheaper than

COMMENTOR NO. 25: QUAPP, WILLIAM J., P.E. (CONT'D.)
IDAHO FALLS, IDAHO

using depleted uranium metal and has some performance values that can make it economically competitive to traditional materials on a life cycle cost basis. And, by recycling the material, DOE can avoid declaring the material waste.

4. DUCRETE SPENT FUEL AND HIGH-LEVEL WASTE STORAGE CASKS

1.) DUCRETE Concrete is a technically viable material for spent fuel and high-level waste dry storage casks. Smaller, lighter weight, and more versatile casks can be designed and fabricated. DUCRETE casks can be factory fabricated and shipped to the user facility and re-shipped to the interim storage site or the geologic repository as required.
2.) DUCRETE Storage casks can be developed and deployed at DOE sites, commercial utility sites, the DOE Interim Spent Fuel Storage Site, and for shielding in Yucca Mountain. However, there is no industry incentive to independently finance DUCRETE cask demonstrations. Consequently, DOE must support such demonstration.
3.) DUCRETE Casks are competitive with traditional concrete **IF** DOE pays for conversion of the UF_6 into the depleted uranium aggregate (UF_6 to UO_x to aggregate). DUCRETE concrete is not a competitive cask material if the cost for conversion from UF_6 to aggregate must be born by the cask fabricator. *25-5 (Con't.)*
4.) DUCRETE Casks will be acceptable to utilities and other users **IF** DOE agrees to accept them at end of life in a DOE disposal facility such as the NTS or the Spent Fuel Geologic Repository. Without a predefined disposal option, no commercial utility will accept ownership.
5.) DUCRETE concrete is a stable chemical form of material that meets the disposal criteria of the Nevada Test Site as-is. No further processing would be required for disposal.
6.) When used as shielding in casks or other radioactive material containers, DUCRETE concrete is managed by organizations already licensed to hold nuclear materials. Thus, the institutional control required for handling of depleted uranium is in place.

4. TIMELY ACTIONS REQUIRED

Driven by the need for spent fuel storage in the country, many fuel storage actions are underway by both DOE OCRWM and utility organizations. Since a cask demonstration and licensing program could take up to 4 years, if DOE NE is to be successful in its goal to recycle the depleted uranium into nuclear storage products, prompt funding of demonstration cask projects need to be undertaken. If prompt initiation of such programs is not undertaken, the window of opportunity for the deployment of depleted uranium in spent fuel storage casks will have passed. To take advantages of the unique characteristics of DUCRETE cask systems, the cask design must be compatible with other transportation systems being developed. This necessitates early integration of cask design with other parts of the transportation systems. *25-6*

5. POLICIES THAT DOE SHOULD ESTABLISH TO ENCOURAGE DEPLETED URANIUM RECYCLING

1. Any product manufactured from depleted uranium after the PEIS ROD should be accepted at the NTS or other DOE site for disposal, provided that, *25-7*

COMMENTOR NO. 25: QUAPP, WILLIAM J., P.E. (CONT'D.)
IDAHO FALLS, IDAHO

a) All depleted uranium products submitted to DOE for future disposal be in a chemical and physical which form meets the current Waste Acceptance Criteria at that DOE disposal site, or,
b) DOE shall retain title to the depleted uranium material and, at end of product life, DOE will accept the product for disposal at the NTS provided that the depleted uranium product meets the NTS Waste Acceptance Criteria. *25-7 (Con't.)*

1. The Nuclear Waste Policy Act should be modified to allow disposal of depleted uranium casks or other depleted uranium materials in empty drift space between or other locations within the geologic repository. Presently, the Act restricts disposal of all materials other than spent fuel or high level waste. *25-8*
2. Empty depleted uranium storage casks in sound physical condition should be accepted at the NTS for re-use and at no cost to the owner. DUCRETE spent fuel or high-level waste casks would be very suitable as high integrity containers for the subsequent disposal of various Greater-than-Class C wastes from reactor decommissioning. DOE has responsibility for receiving such future wastes. *25-9*

6. OTHER DOE ACTIONS THAT WILL FACILITATE THE RECYCLE OF DEPLETED URANIUM

1. DOE should stimulate the demonstration of low cost UF_6 conversion technologies to lower the cost of management. Low cost processes to convert the UF_6 to metal or to an oxide are needed to reduce the management cost to DOE and to support any recycle objective. *25-10*
2. DOE should support the development and licensing of DUCRETE storage casks and mandate their use on DOE storage projects where the total system life cycle cost can be shown to be advantageous to DOE. *25-11*
3. DOE can consider the provision of DUCRETE storage casks to utilities for interim storage of spent fuel as partial compensation for being unable to receive spent fuel as required by law. *25-12*
4. DOE should objectively evaluate the use of DUCRETE shielded storage casks for shielding the spent fuel and high level waste packages in the geologic repository as an alternative to operating the repository as a remote handled facility for the 125 year period during emplacement and post-closure monitoring. *25-13*

7. CONCLUSIONS

Fifty years of nuclear activities in the US have left a large inventory of material with both unique and undesirable characteristics. To minimize the future cost of management in an environmentally and economically responsible manner, a system solution is needed to assure that the beneficial attributes of depleted uranium are recognized and used while the negative impacts of being a nuclear material are minimized.

During the studies I managed for the DOE, we defined such a system solution where DUCRETE casks were used for spent fuel storage at reactor sites, at the interim storage facility, and for disposal containers in the geologic repository. That concept still appears to me to be the most environmentally responsible solution achievable at the least cost to the US taxpayers. *25-14*

COMMENTOR NO. 26: DIETZ, LEONARD A.
NISKAYUNA, NEW YORK

Leonard A. Dietz
1124 Mohegan Road
Niskayuna, NY 12309-1315

March 12, 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Subject: Comments requested on "Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride"

Dear Mr. Bradley:

Remediation of the depleted uranium (DU) storage problem is an important and urgent task of Herculean proportions. My choice of the six options presented is No. 2: **Long-Term Storage as UF_6**—storage of UF_6 cylinders in yards, buildings, or a mine at a consolidated site. This choice has the least potential to pollute the environment with more DU. I suggest that each cylinder of DU hexafluoride should be placed in a permanent overcontainer filled with one atmosphere pressure of an inert gas such as argon to retard corrosion by preventing water vapor and oxygen from entering the containers. The overcontainers should be sealed hermetically and designed to last for 100 years or more. *26-1*

I believe that at this time we as a nation do not possess sufficient wisdom or foresight needed to decide on the final disposition of this enormous stockpile of waste uranium. It would be prudent to wait a few decades more before deciding on a final course of action.

Under no circumstance should DU be allowed in commercially-manufactured consumer goods or be made available to the general public as has been hinted at in a New York Times article by Mathew Wald.[1] He mentions industrial use of DU flywheels to store energy and use as a substitute for lead weights. Elsewhere it has been suggested that DU should be used as ballast in the keels of sailboats. Imagine a long-forgotten sailboat sunk in a storm and unretrievable, its hulk polluting a deep freshwater lake with uranium that slowly becomes soluble and pollutes the water. I became even more convinced that DU should be banned from commercial use when I saw an advertisement for a new driver golf club that contains a sphere of DU metal in its head so that a golf ball can be driven farther. These suggested commercial uses of DU are irresponsible and reckless, and will be dangerous to public health if they are implemented. The average person knows nothing about the technical aspects of uranium or radioactivity and is totally unprepared to deal with this radioactive and pyrophoric material that is highly toxic both chemically and radiologically.[2] Uranium in any chemical form presents significant dangers to health and safety, if it is not handled with scrupulous care. *26-2*

Beginning on the next page, detailed reasons are given why I chose the second alternative.

I would appreciate it very much if you would please add my name to the Depleted UF_6 mailing list. Thank you.

Sincerely,

Leonard A. Dietz

[1] M. L. Wald, "Danger From Uranium Waste Grows as Government Considers Its Fate," NY Times, March 25, 1997.
[2] *Handbook of Chemistry and Physics*, The Chemical Rubber Co., 75th ed., 1994-95, Boca Raton, FL 33431, p. 4-32.

COMMENTOR NO. 26: DIETZ, LEONARD A. (CONT'D.) NISKAYUNA, NEW YORK

Detailed Reasons for Choosing the Second Alternative

Design of the DU Processing Plant and its Containment Efficiency

The processing of DU hexafluoride into uranium oxide or uranium metal requires extensive chemical processing, melting and casting operations. The pyrophoric nature of uranium makes it inevitable that significant quantities of uranium oxide aerosol particles will be formed. There does not have to be an accident at a DU processing plant for the public to be exposed to dangerous concentrations of aerosol micrometer particles of uranium oxide. Exposure can occur from DU aerosol particles released into the atmosphere during normal operations. To illustrate this, we assume that a well-designed and super-efficient processing plant can be built that would contain 99.99999% of all the uranium it processes. In such a plant only 1-gram in 10-million grams of DU would escape into the environment. We examine how this relates to the large amount of DU proposed to be processed from the years 2009 through 2028 and then compare it with an actual experience in New York State.

Using the data given on page S-2, Vol. I, The depleted UF_6 cylinders currently managed by DOE plus the cylinders produced by the United States Enrichment Corporation total approximately 54,422. They contain about 600,000 metric tons of DU hexafluoride. Continued operation of the Portsmouth and Paducah diffusion plants could double this amount by the year 2028. Therefore, the DU hexafluoride that must be processed each year for 20 years beginning in 2009 is approximately 60,000 metric tons, of which two thirds is the element uranium. Thus, it appears that up to 40,000 metric tons of DU will be processed per year.

Containment of DU within the processing facility or facilities will be a major problem, even with the very best technology available. For example, if as postulated, 99.99999% of the DU can be contained successfully, then in 40,000 metric tons of DU processed each year, 4,000-grams will escape at an average rate of 333-grams per month. **26-3**

The New York State Experience with a DU Processing Plant

The estimated rate of 333-grams of DU escaping into the atmosphere per month must be compared with the New York State experience with National Lead Industries, a former DU processing plant near Albany, NY. At NL Industries DU was processed into DU metal penetrators for 30-mm cannon rounds and into airplane counterweights made of DU. In February 1980, a court order by NY State citing public health reasons shut down NL Industries for exceeding a NY State Department of Environmental Conservation monthly radioactivity limit of 150 microcuries (387-grams of DU) for airborne emissions. Recently the highly contaminated plant was razed and a large quantity of radioactively contaminated structural material and soil has been prepared for shipment to a disposal site.

The NL Industries plant caused massive contamination to the residential area and commercial properties outside the perimeter of the plant. In 1984, 1985 and 1988 a total of 950 cubic meters of radioactively contaminated soil were removed by DOE from 53 of 56 vicinity properties.[3] My hypothetical super-efficient plant would release 333-grams (129 microcuries) of DU airborne particles per month into the environment. This amount of DU is not significantly different from the 150 microcuries per month limit set by New York State. It is highly unlikely that a release rate of 150 microcuries of DU per month into the atmosphere will ever again be allowed by a local government or by citizens affected by the fallout. The containment efficiency of a DU processing plant would have to

[3]DOE Report No. DOE/OR/21950-888, "Engineering Evaluation/Cost Analysis (EE/CA) for the Colonie Interim Storage Site (CISS) Buildings," June 1993, p. ES-1.

COMMENTOR NO. 26: DIETZ, LEONARD A. (CONT'D.) NISKAYUNA, NEW YORK

be at least 10 times better than I have assumed, allowing less than 1-gram of DU in 100-million grams (100 metric tons) of DU to escape into the environment. This extremely high requirement may be impossible to meet. The control and containment of DU emissions inside the plant would have to be even more stringent. When processing such huge quantities of DU it will be extremely difficult if not impossible to keep workers inside the plant from becoming contaminated with it. **26-3 (Con't.)**

Transport of DU Particles in the Atmosphere

Another serious issue is what happens to the uranium particles that escape into the atmosphere and become dispersed far and wide by wind action. In the fall of 1979 I worked at the Knolls Atomic Power Laboratory in Schenectady, NY. The laboratory was operated by the General Electric Company for the Department of Energy. While troubleshooting a problem for the radiological group, my colleagues and I accidentally discovered DU aerosols collected in environmental air filters exposed at the Knolls site. The source of the uranium contamination was the NL Industries plant in Colonie, 10 miles east of the Knolls site, outside Albany, NY. We also discovered DU in air filters exposed at the Kesselring site in West Milton, NY, where crews for the nuclear Navy are trained, 26 miles NW of the NL plant. This is by no means the maximum fallout distance for uranium aerosols. A radius of 26 miles encompassed an area of more than 2,000 square miles around Albany where this fallout occurred. In January, 1980 I wrote and issued an internal technical report that documents our mass spectrometer measurements.[4] Airborne uranium aerosol particles act like dust and can go everywhere that dust goes. The scientific explanation of how micrometer-size uranium particles can easily travel such large distances when airborne is given in a survey paper that is available on the Internet.[5] **26-4**

Use of DU Metal in Large Commercial and Military Airplanes

The use of DU metal counterweights in commercial and military airplanes should be banned. Until about 1980 each Boeing 747 passenger jet contained 1,500 kilograms of DU metal counterweights used for dynamic flight control.[6] In a crash and ensuing intense fire DU metal will begin to oxidize rapidly and sustain slow combustion when it is heated in air at a temperature of 500° C.[6] This can cause DU oxide particles to be formed that can become airborne and poison large numbers of people and their surroundings.[7] This scenario has already happened. In 1977 two Boeing 747s crashed into each other and burned on a runway at Tenerife, Canary Is. In 1988 a Boeing 747, Pan Am Flight 103, crashed and burned at Lockerbie, Scotland. And in 1992 an El Al Isralei Boeing 747 crashed into an apartment building and burned in Amsterdam, Holland. **26-5**

Fire and safety personnel exposed to the combustion products of DU are at risk. How many fire and safety emergency crews at airports or in cities have been trained and provided with equipment that will protect them from uranium particles that have been generated in intense fires?

[4]L. A. Dietz, CHEM-434-LAD, "Investigation of Excess Alpha Activity Observed in Recent Air Filter Collections and Other Environmental Samples," Jan. 24, 1980; unclassified technical report, Knolls Atomic Power Laboratory, Schenectady, NY 12301; obtained under the Freedom of Information Act. Copies available from L. A. Dietz. If desired, a certified copy should be available from Schenectady Naval Reactors.

[5]L. A. Dietz, "How Gulf War Veterans and Others became Contaminated by Depleted Uranium," available on the world-wide web at the WISE Uranium Project home page: <http://www.nl/~wise/uranium/>.

[6]Lowenstein, P., "Industrial Uses of Depleted Uranium," photocopy in *Uranium Battlefields Home & Abroad: Depleted Uranium Use by the U.S. Department of Defense*, Bukowski, G. and Lopez, D. A., March, 1993, p. 136.

[7]Parker, R. L., "Fear of flying," *Nature*, Vol. 336 22/29 Dec. 1988, p. 719.

COMMENTOR NO. 27: DUPONT NAFION® PRODUCTS FAYETTEVILLE, NORTH CAROLINA

DuPont Nafion® Products
P.O. Drawer Z
Fayetteville, NC 28302
Tel (910) 678-1336
Fax (910) 678-1261

DuPont Nafion® Products

March 17, 1998

Mr. Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program Office of Facilities
Office of Nuclear Energy, Science and Technology
Department of Energy
Germantown, MD 20874-1290

Dear Mr. Bradley,

We are interested in the Depleted Uranium Hexafluoride Management Program and the safe disposal of this material. Our major interest is in the utilization of the fluorine contained in the depleted uranium hexafluoride.

A number of proposals for the chemical conversion of the UF_6 have been made. At present, the conversion of UF_6 into elemental fluorine and uranium metal proposed by BNFL Inc. appears to be the most promising scheme. The preparation of high value fluorine (F_2) makes the most economic sense. We have had and continue to have discussions with BNFL Inc. about this process and our uses for the fluorine product. Although we do not anticipate any interest in the uranium coproduct this may also be its most desirable form for ultimate use or disposal by others. 27-1

We will continue our discussions and contacts with BNFL Inc. and the Department of Energy. Please do not hesitate to contact us if we be of any help to you in your work on the Depleted Uranium Hexafluoride Management Program.

Sincerely yours,

Paul R. Resnick

Paul R. Resnick
DuPont Fellow
(910) 678-1607 (910) 678-1496 FAX

Robert A. Boyajian
Senior Engineering Associate
(609) 540-3649 (609) 540-3078 FAX

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COMMENTOR NO. 28: STATE OF TENNESSEE, DEPARTMENT OF ENVIRONMENT AND CONSERVATION OAK RIDGE, TENNESSEE

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

March 18, 1998

Charles E. Bradley, Jr.
Office of Facilities (NE-40)
US Department of Energy
19901 Germantown Road
Germantown MD 20874

Dear Mr. Bradley

Programmatic Environmental Impact Statement For Alternative Strategies For The Long-Term Management And Use Of Depleted Uranium Hexafluoride

The Tennessee Department of Environment and Conservation, DOE Oversight Division (TDEC/DOE-O) would like to request an extension on the comment period for the "Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride." This is an important issue for the State of Tennessee, and we would like additional time to complete a thorough review of this document. An extension of the comment period to May 7, 1998, will be sufficient. Please let us know if this is acceptable. 28-1

If you have any questions, please contact Rebeeca Charles at (423) 481-3032 or me at (423) 481-0995.

Sincerely

John Owsley

John Owsley
Assistant Director

jao496.99

COMMENTOR NO. 29: UNITED STATES SENATE, MOSELEY-BRAUN, CAROL; DURBIN, RICHARD & POSHARD, GLENN WASHINGTON, D.C.

CAROL MOSELEY-BRAUN
ILLINOIS

COMMITTEES:
BANKING, HOUSING, AND URBAN AFFAIRS
FINANCE
SPECIAL AGING

United States Senate
WASHINGTON, DC 20510-1303

March 19, 1998

The Honorable Frederico Pena
Secretary
The United States Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

Dear Secretary Pena:

We are writing to express our interest in the important work underway at the Department of Energy (DoE) to evaluate strategies for the long-term management and use of depleted uranium hexafluoride. As you know, there are over 1 billion pounds of this uranium enrichment by-product stored at the enrichment plants in Ohio and Kentucky, as well as in Oak Ridge, Tennessee. We are aware that the Department is currently soliciting public comments on a Draft Programmatic Environmental Impact Statement on various uranium hexafluoride management strategies. We commend you for moving to address this health, safety and environmental issue for the employees and neighbors of these facilities. *29-1*

One of the options under the consideration by DoE is a technology which can convert uranium hexafluoride to a safe and stable form of uranium suitable for long-term storage, retrievable disposal, or further use. This process is essentially the reverse of the uranium conversion process performed by AlliedSignal in Metropolis, Illinois. The technology, which is being tested through a joint DoE - industry partnership in Metropolis, offers two key benefits.

First, it converts the uranium to a solid, or oxide state, making it safer to store and available for possible future use. Secondly, it captures the Hydrogen Fluoride contained in the uranium hexafluoride which can then be recycled for use in the ongoing uranium conversion process, and for other manufacturing processes such as the production of non-ozone depleting refrigerants. The benefit to DoE and the country is that the danger posed by the existing uranium hexafluoride containers can be removed and the government can be compensated for the value of the captured Hydrogen fluoride. *29-2*

We realize that DoE will not make a final decision on a uranium hexafluoride management strategy until early next year. Our hope is that the time between now and then can be used productively to fully demonstrate this technology so its full costs and benefits can be determined. In order for this to happen, DoE funding needs to continue through fiscal year 1999. We hope that sufficient funding for the current fiscal year is available within the Department's FY 1998 appropriation. Please inform us of the current and future funding plans for this

COMMENTOR NO. 29: UNITED STATES SENATE, MOSELEY-BRAUN, CAROL; DURBIN, RICHARD & POSHARD, GLENN (CONT'D.) WASHINGTON, D.C.

important environmental management program.

We thank you for your time and attention to this matter.

Sincerely,

Carol Moseley-Braun
U.S. Senator

Richard Durbin
U.S. Senator

Glenn Poshard
Member of Congress

COMMENTOR NO. 30: UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN
URBANA, ILLINOIS

UNIVERSITY OF ILLINOIS
AT URBANA-CHAMPAIGN

Department of Chemical Engineering
114 Roger Adams Laboratory, Box C-3
600 South Mathews Avenue
Urbana, Illinois 61801
USA

March 23, 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U. S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Charles:

I am interested to see that things are moving ahead much as you told us they would, when we were preparing our National Research Council Report, "Affordable Clean Up". [Dr. Fred Schneider and I wrote the chapter on "Disposition of the UF_6".

At the time we saw little to suggest that conversion to metal made any sense, but I see that mentioned as one of DOE's ambitions. I wonder if you are really serious about that.

In your PEIS (Summary version, page S-44) you indicated that DOE is "committed to continuing its support for the development of applications for depleted uranium products and, for as long as is necessary, to continue the safe management of its depleted UF_6 cylinder inventory". Now that position bothers me! We have had this material in storage for 50 years and have been studying options for using the stuff for a large number of those years. Continued storage and study is just a way of avoiding a decision in my opinion. Only DOE would consider such an option! **30-1**

I read where the money allotted to DOE clean-up activities is well below that required for expeditious clean-up. But the UF_6 ought to be on the list somewhere, not just relegated perpetually to the future.

Sincerely,

Walter G. May

W. G. May
Professor of
Chemical Engineering

WGM:djj

Phone (217) 333-3640 • Fax (217) 333-5052

COMMENTOR NO. 31: FRIENDS OF OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

Friends of Oak Ridge National Laboratory

1052 West Outer Drive
Oak Ridge TN 37830

2 April 1998

Mr. Charles E. Bradley, Jr
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874

Subject: Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride. Summary, DOE/EIS-0269, December 1997.

The Friends of Oak Ridge National Laboratory, an organization of retired and present employees and of others interested in the welfare of the Laboratory and the community, wishes to comment on the referenced PEIS.

Roughly 46,000 cylinders containing depleted UF_6 (not counting 8000 under management of the United State Enrichment Corporatiion) are stored at the three gaseous diffusion sites, about 4,700 of them in Oak Ridge. Each is partially filled with 10 to 14 tons, solid at ambient temperature, for a total in the neighborhood of 500,000 tons. DOE plans between 2009 and 2028 to convert the material to HF and a solid form of uranium, likely U_3O_8. There is an established market for HF, and the hope is to find beneficial uses for the uranium. Barring the breeding of nuclear fuel, not likely in the next few decades, prospects for use of a substantial fraction of it are dim. **31-1**

There does not seem to be agreement in estimates of the costs of conversion, except that they will be large. If we assume for discussion, $3 a pound, net of HF value, a total of about $3 billion would be be required. Quoted current costs for management of the inventory range from fifteen to thirty million/year. If there were no significant risks involved and if the maintenance costs were to track inflation, there would be no particular urgency for getting on with conversion, because interest on the conversion investment would easily exceed present annual outlays. We have serious doubts about both premises. **31-2**

COMMENTOR NO. 31: FRIENDS OF OAK RIDGE NATIONAL LABORATORY (CONT'D.)
OAK RIDGE, TENNESSEE

The cylinders are constructed of carbon steel, of nominal thickness 0.312 inches (older ones were of twice this thickness). Although internal corrosion from UF_6 appears small, so long as integrity of containment is maintained, there is abundant evidence of general external corrosion from exposure to the elements, particularly of those in Oak Ridge, which tend to be older. Of more concern, there is pitting and crevice corrosion. Seven of the cylinders are known to have developed cracks, five involving handling, but two from corrosion alone. In these cases, atmospheric moisture has hydrolyzed the uranium hexafluoride to UO_2F_2, which has acted as a seal. The HF produced has dissipated harmlessly, and the contamination of water with soluble uranium compounds has not yet caused serious embarrassment. The benign effects of these failures seem to have lulled policy makers about untoward events during the thirty years projected before completion of conversion to a form safe for indefinite storage. *31-3*

However, even if events having serious consequences are discounted, steep rises in the annual costs of custodial care and in the eventual costs of conversion seem inevitable. As corrosion worsens, there will be increasing numbers of breaches requiring patches. The weakening of the cylinders will increase the costs and dangers of handling them in periodic painting or in removing the contents for conversion. If all are to be converted at a single site, more and more will have walls that do not meet the minimum 0.25-inch walls DOE specifies for safe transportation by highway or rail. *31-4*

Confidence that there is small risk of more damaging events may be misplaced. The cylinders support about 250,000 pounds force from the atmosphere (25000 in^2 times 10 psi differential). In addition to this evenly distributed stress is that from resting on the surface and, for the bottom layer, from those stacked on top. Many of the cylinders are forty years old. The program to clean and paint the outer surfaces lags deterioration. *31-5*

There are a number of conceivable scenarios for catastrophic failures of containment, beyond what uranyl fluoride could seal, from an earthquake or transportation accidents, for example. Over the interval before planned conversion, with the number involved, stacked as they are, collapse in place of some is hard to exclude. If such an event occurred in a wet situation, a dangerous plume of HF could be produced. In Table S.2 on page S-17 of the referenced summary, it is estimated that such a failure might occur in 1 to 10 years under dry conditions; on the next page, the frequency of a more serious accident, involving three cylinders apparently being transported, is given as 1 in 100,000 years under wet conditions. Chemical exposure from the latter is projected to have adverse effects on 1900 of the public, and on 1000 non-involved workers (of which 300 would suffer irreversible effects). With the climate here and the difficulty of reaching cylinders in the middle of storage areas, the 1 to 10 year single-cylinder failure might well occur under wet *31-6*

COMMENTOR NO. 31: FRIENDS OF OAK RIDGE NATIONAL LABORATORY (CONT'D.)
OAK RIDGE, TENNESSEE

conditions, perhaps with less, but still unacceptable, effects.

There seems to be general agreement that conversion is eventually necessary. We advocate acceleration. We recommend that conversion begin in Oak Ridge as the pilot. The cylinders here are in the worst condition and are likely most risky to transport. We believe that work should not be delayed until a market for the uranium develops, a long shot at best. We encourage research to lower costs of conversion, but not at the expense of timely action. In the meantime a major overhaul of the cylinder storage situation at Oak Ridge should be a high priority. *31-7*

As we understand it, the cylinders are not considered waste, and as a result conversion is not on the table when remediation priorities are set. If funding for conversion is not available in the appropriate category, we believe DOE should rise above administrative barriers and assess the possible problems from the cylinders in comparison with the risks from delays of other remediation projects. *31-8*

Respectfully,

William Fulkerson, President

COMMENTOR NO. 32: PUBLIC HEARINGS PADUCAH, KENTUCKY

UNITED STATES DEPARTMENT OF ENERGY

PUBLIC HEARING REGARDING

DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

HEARING DATE: February 19, 1998

TIME: 7:00 p.m.

****
A&A COURT REPORTING
****
Anita Gale, CSR
240 Colonial Drive
Paducah, Kentucky 42001
(502) 554-9349 (800) 253-7866

COMMENTOR NO. 33: PUBLIC HEARINGS OAK RIDGE, TENNESSEE

TRANSCRIPT OF THE

DEPARTMENT OF ENERGY'S PUBLIC HEARING

ON THE DRAFT

PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

DARRYL ARMSTRONG FACILITATOR

FEBRUARY 24, 1998
5:00 to 9:00 p.m.
RAMADA INN AND SUITES
OAK RIDGE, TENNESSEE

****
ARIANNE KYSER, RPR
MILLER & MILLER COURT REPORTERS
12804 UNION ROAD, KNOXVILLE TN 37922
1-423-675-1471 * 1-800-532-5950

COMMENTOR NO. 34: PUBLIC HEARINGS PORTSMOUTH, OHIO

1
2
3
4 UNITED STATES DEPARTMENT OF ENERGY
5 ---
6 In re: :
7 Public Hearing. :
8 ---
9 Riffe Vocational School
Piketon, Ohio
10 February 26, 1998
5:00 p.m.
11 ---
12 BEFORE:
13 Darryl Armstrong, Facilitator.
14 Also present:
15 Charles Bradley and Thomas Marshall, Cylinder Management
16 Program;
17 Halil Avci and Marsha Goldberg, Argonne National
Laboratory;
18 Gene Gillespie, Plant Manager.
19 ---
20
21
22
23 JENNIFER L. RENO REPORTING
24 P.O. BOX 594
WAVERLY, OHIO
25 (614) 947-9001

COMMENTOR NO. 35: PUBLIC HEARINGS WASHINGTON, D.C.

1

UNITED STATES OF AMERICA

DEPARTMENT OF ENERGY

PUBLIC HEARING ON THE DRAFT
PROGRAMMATIC ENVIRONMENTAL IMPACT
STATEMENT FOR ALTERNATIVE STRATEGIES
FOR THE LONG TERM MANAGEMENT AND
USE OF DEPLETED URANIUM HEXAFLUORIDE

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TUESDAY
MARCH 10, 1998

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WASHINGTON, D.C.

The public hearing was held in Room 1E-245 of the U.S. Department of Energy Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C., at 1:00 p.m., Darryl Armstrong, facilitator, presiding.

PRESENT:

Darryl Armstrong
Charles Bradley, Jr.
Andrew Lukimer
Annie Makhijani
William Quapp
Gene Hollman

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COMMENTOR NO. 36: STATE OF ILLINOIS, DEPARTMENT OF NUCLEAR SAFETY SPRINGFIELD, ILLINOIS

STATE OF ILLINOIS
DEPARTMENT OF NUCLEAR SAFETY
1035 OUTER PARK DRIVE
SPRINGFIELD, ILLINOIS 62704
217-785-9900
217-782-6133 (TDD)

Jim Edgar
Governor

Thomas W. Ortoiger
Director

April 1, 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Bradley:

The Illinois Department of Nuclear Safety (IDNS) hereby submits its comments on the Department of Energy (DOE) Preliminary Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (UF_6). IDNS applauds DOE's early recognition of Illinois' unique situation relative to this issue and appreciates the opportunity to comment on the Draft. IDNS considers itself a stakeholder in this process for two reasons. Clearly, IDNS is interested in any environmental impacts from changes in the mission of the Paducah Gaseous Diffusion Plant (PGDP) facility because of its proximity to Illinois. However, IDNS is also interested for a reason not reflected in the PEIS; the close proximity to the subject facility of the Allied-Signal Metropolis Works in Illinois. **36-1**

Fundamentally, IDNS supports the general strategy of converting UF_6 to more chemically stable forms such as U_3O_8 as soon as possible. We agree that DOE needs a longer-term plan for management of UF_6 that goes beyond inspections and repairs of leaking cylinders in storage yards. We also agree with the general strategy of trying to find markets for the by-products of the conversion process, although we have some concerns about radioactive contaminants in these by-products which we will discuss below. **36-2**

The major shortcoming of the PEIS in our view, however, is its failure to recognize that the Allied-Signal Metropolis Works does exist and that there is a reasonably high probability that it will have an important role to play in DOE's UF_6 management strategy. DOE must recognize that given Allied-Signal's **36-3**

recyclable

COMMENTOR NO. 36: STATE OF ILLINOIS, DEPARTMENT OF NUCLEAR SAFETY (CONT'D.) SPRINGFIELD, ILLINOIS

experience in the conversion business and the existing infrastructure at Metropolis, the Metropolis Works may be the only facility in the United States capable of handling the UF_6 to oxide conversion at a reasonable cost. **36-3 (Con't.)**

IDNS understands that given the method that DOE generally employs to develop a PEIS, siting issues are not addressed until the second phase of the NEPA approach. However, we feel that the decision to recognize or ignore Allied-Signal, even at this early stage, has significant impact on evaluating the risks and benefits of DOE's management options. **36-4**

Page 2-5 - This section describes the option of long-term storage as depleted UF_6. This option is the least desirable from IDNS' point of view. Associated with this option would be all the risks of transportation with none of the benefits of conversion to oxide. We suggest that this option be given no further serious consideration. **36-5**

Section 3.1.7 - The description of the affected environment surrounding the PGDP fails to recognize the presence of the Allied-Signal Metropolis Works as another major uranium processing facility in the immediate vicinity. Allied-Signal's effluent releases and impacts on the environment are thereby not considered in this review. **36-6**

Page 3-14 - The region of influence includes Massac County, Illinois (not Massaic). **36-7**

Page 3.4 - Check the map scale. 3000 km is not roughly equivalent to 2 miles. **36-8**

Table F.2 - If Allied Signal were considered as a site for a conversion facility, most of the health risks and potential benefits would need to be evaluated. Risks and benefits from construction activities would be particularly impacted. While on one hand, ecological and land use impacts would be smaller, economic benefits from increased employment would also be smaller. **36-9**

Page F-11 - Anhydrous HF may have been a valuable product at one time, however, given the glut of UF_6 on the market, one questions the value of a product whose primary use is the production of more UF_6 from ore. **36-10**

Page F-12 - IDNS is concerned about the depleted uranium content of the anhydrous HF that could be produced by a conversion process. IDNS would be interested in any uncertainties associated with the 1 ppm figure quoted. In any **36-11**

COMMENTOR NO. 36: STATE OF ILLINOIS, DEPARTMENT OF NUCLEAR SAFETY (CONT'D.) SPRINGFIELD, ILLINOIS

Charles E. Bradley, Jr.
Page 3
April 1, 1998

case, we do not believe it is certain that the material will have commercial value if it is known to be contaminated at any level.

Table F.25 - We assume that the source of the figures in this table are from (LLNL 1997) which is an estimate based on theoretical considerations. We suggest that actual historical low-level radioactive waste generation figures from Allied-Signal would be more useful. *36-12*

Page J-7 - The failure to consider existing facilities has led to inconsistencies in making assumptions. In Appendix J, the analysis of transportation risks is based on the assumption that the distance between the storage and conversion facilities is 1000 km. However, in Appendix F, it assumed that the facilities are co-located. *36-13*

Questions on our comments should be addressed to Richard Allen, Manager, Office of Environmental Safety at 217-782-1322.

Sincerely,

Thomas W. Ortciger
Director

TWO:tlk

COMMENTOR NO. 37: NURMELA, LILLIAN OAKLAND, CALIFORNIA

Lillian Nurmela, 145 Monte Cresta Ave., #201; Oakland, CA 94611 (510) 652-5766

April 4, 1998

Mr. Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Re: Disposition of Depleted Uranium

The only responsible course for the Department of Energy to follow regarding the huge DU inventory is to establish safe, long-term storage of this material, which remains radioactive for what amounts to eternity. *37-1*

DU should definitely NOT be used for military purposes. We must not be responsible for blanketing battlefield areas with this long-lived radioactive material. *37-2*

Sincerely yours,

Lillian Nurmela

Lillian Nurmela

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY
OAK RIDGE, TENNESSEE

OAK RIDGE NATIONAL LABORATORY
MANAGED BY LOCKHEED MARTIN ENERGY RESEARCH CORPORATION
FOR THE U.S. DEPARTMENT OF ENERGY

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April 3, 1998

Mr. Charles E. Bradley, Jr.
Office of Nuclear Energy, Science and Technology
Office of Facilities, NE-40
Department of Energy
19901 Germantown Road
Germantown, Maryland 20874-1290

Dear Mr. Bradley:

Comments on the *Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride*

I am enclosing comments and observations generated by my staff pertaining to a review of the subject document. Please contact Gordon E. Michaels (423) 574-4187 or David L. Moses at (423) 574-6103 if you have questions concerning these comments.

Sincerely,

R. G. Gilliland
Associate Director for
Energy and Engineering Sciences

Enclosure

RGG:jlp

c/enc: H. E. Clark, DOE-ORO
A. G. Croff
C. W. Forsberg
E. C. Fox
S. R. Greene
M. J. Haire
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G. E. Michaels
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D. L. Williams

ornl - *Bringing Science to Life*

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY (CONT'D.)
OAK RIDGE, TENNESSEE

1. **Retain adequate depleted UF_6 to support the Surplus Plutonium Disposition Program under the "No action alternative" long-term management strategy for depleted UF_6.**

One of the options for dispositioning the surplus weapons-grade plutonium is for use as mixed-oxide (MOX) fuel in light water reactors. A small portion, less than 0.3% of the available supply of the depleted UF_6 (ORNL/TM-13417 Rev. 1), should be set aside and reserved for use in the Surplus Plutonium Disposition Program. The required UF_6 to be removed from inventory is approximately 1400 MT as indicated in ORNL/TM-13466, Rev. 1, which is a Data Report to be released concurrently with the Surplus Plutonium Disposition Environmental Impact Statement.

The depleted UF_6 should be stored at the Portsmouth site since that is the only facility with operating transfer autoclaves for emptying the depleted UF_6 from the 12.7 MT (14 ton) storage cylinders into 2.28 MT (2.5 ton) feed cylinders. The smaller cylinders are required for transporting the depleted UF_6 by truck to commercial conversion facilities where the depleted UF_6 will be converted to uranium oxide and subsequently blended with oxide derived from surplus plutonium to make MOX fuel at a proposed government-owned fuel fabrication facility. The UF_6 cylinders will be selected based on a depleted uranium assay specified by the consortium selected to provide MOX fuel fabrication and reactor irradiation services. The feed requirement for the depleted uranium expected to be required by the Surplus Plutonium Disposition Program is approximately 0.25 wt % as indicated in ORNL/TM-13466, Rev. 1. **38-1**

The PEIS (Section S.5.1 and Section 1.6) acknowledges that other DOE programs, such as the Surplus Plutonium Disposition Program, have requirements for small amounts of depleted UF_6. It is stated that this small fractional requirement of the UF_6 inventory would not affect the selection of a long-term management strategy in the Record of Decision (ROD) to be issued following the publication of the final version of the PEIS. However, the comments under Item 1 above are relevant in that specific cylinders of excess depleted UF_6 should not be considered surplus to all government programs and will be requested to be stored at Portsmouth for potential use in the disposition of surplus plutonium.

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY (CONT'D.) OAK RIDGE, TENNESSEE

2. **Consider the benefit of using the depleted uranium in geological disposal sites such as Yucca Mountain and the Waste Isolation Pilot Plant (WIPP) under the "Use as Uranium Oxide" long-term management strategy for depleted UF_6.**

Depleted uranium can be used to improve the performance of the repository for disposal of spent nuclear fuel (SNF). Depleted uranium reduces the radionuclide release rate from a SNF waste package and minimizes the potential for long-term nuclear criticality. In this context, the U.S. Nuclear Waste Technical Advisory Panel—the Congressionally-mandated scientific review panel for the DOE Yucca Mountain project— stated (U.S. Nuclear Waste Technical Review Board, *Report To The Congress And The Secretary of Energy: 1995 Findings and Recommendations*, Arlington, Virginia, April 1996):

"The Board suggests that DOE consider increasing the criticality control robustness of the EBS (Engineered Barrier System)... In particular, the use of depleted uranium in filler, invert, or backfill material, or in all three, is a concept the program has not yet explored adequately. Conceivably, increasing the criticality control robustness of the EBS could turn a potentially intractable analysis of external criticality into a comparatively easy one." **38-2**

The recommendations of nationally recognized, congressionally-mandated scientific review boards on uses of depleted uranium should be explicitly considered in the PEIS. It is also noted that the Spanish repository program is investigating the use of depleted uranium to improve repository performance. This use of depleted uranium is receiving attention worldwide.

Additional information on this option can be found on pages 8-9 of the paper "Beneficial Uses Of Depleted Uranium," authored by Colette Brown of DOE and Allen Croff and M. Jonathan Haire of ORNL. The paper was prepared for the Beneficial Re-Use '97 Conference held in Knoxville, Tennessee, on August 5-7, 1997.

3. **Expand the discussion in the PEIS of potential "Use Options" of the depleted UF_6, either as Uranium Oxide or Uranium Metal,**

The primary use of the depleted UF_6 discussed in the PEIS, either as uranium oxide used to make high density concrete (Section 2.2.4) or as uranium metal (Section 2.2.5), is as **38-3**

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY (CONT'D.) OAK RIDGE, TENNESSEE

shielding for spent nuclear fuel or high-level waste (HLW) storage containers. The detailed discussion should be expanded to include other options which could potentially use substantial amounts of the depleted UF_6, such as its use in industrial counterweights for forklift trucks. Another potential option would be the use of the depleted UF_6 in the manufacture of casks for low-level wastes (LLW), as recently proposed in a Technical Development Initiative for Fernald. The discussion of each "use option," including the use of the depleted UF_6 as shielding, should address the economic and technical viability of each option since these issues have been challenged in the public hearings for this PEIS held in Paducah and Oak Ridge. Additional information on these options can be found in the paper "Beneficial Uses of Depleted Uranium," referenced in Item 2. **38-3 (Con't.)**

4. **Account for the end of life disposal requirement for any application under the "Use Options" for long-term management strategy for depleted UF_6.**

DOE is considering using depleted uranium in the manufacture of casks for spent nuclear fuel or high-level waste (HLW) storage containers. One application is to covert the depleted UF_6 to an oxide which in turn would be used as the aggregate to make depleted-uranium-concrete. The high density of the uranium allows the same shielding effectiveness with approximately half the thickness of conventional concrete. This concrete would then be used to manufacture oxide-shielded casks.

Another option would be to chemically-convert the depleted UF_6 to uranium metal which could be enclosed between the stainless steel shells making up the body of the casks. The uranium metal would be the primary shielding material in the casks which could be reduced in thickness relative to casks using only steel as the shielding material. The PEIS (pages 2-14 and 2-15) states that no assumptions were made regarding the fate of depleted-uranium-concrete casts or the uranium metal casks following use. However, the disposal requirements for depleted uranium at end of life have a major impact on "use options." When the depleted uranium is used for an application such as shielding, at the end-of-life it must be converted into an acceptable waste form. The end-of-life costs to convert depleted uranium into an acceptable form may far exceed manufacturing costs. The consequence of this requirement should be evaluated in the PEIS. **38-4**

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY (CONT'D.) OAK RIDGE, TENNESSEE

5. **Consider disposal of the depleted uranium at the Yucca Mountain repository for spent nuclear fuel and high-level waste under the "Disposal Alternative" long-term management strategy for depleted UF_6.**

The draft PEIS (Section 2.2.6) lists three options under the "Disposal Alternative": shallow-land earthen structures, below ground vaults, and mine disposal. At least two of these three options, shallow-land earthen structures and below ground vaults, do not meet regulatory requirements for protection of public health and safety according to the detailed analysis in Appendix I of the draft PEIS. The detailed analysis within the draft PEIS on page I-23 states:

"The maximum dose to an individual, assumed to live at the edge of the disposal site and use the contaminated water, was estimated to be about 110 mrem/yr, which would exceed the 25 mrem/yr limit specified in 10 Code of Federal Regulations Part 61. Possible exposures (on the order of 10 rem/yr) could occur for shallow earthen structures and vaults if the cover material were to erode and expose the uranium material..."

38-5

The detailed technical analysis within the draft PEIS Appendix I is consistent with the U.S. Nuclear Regulatory Commission (NRC) analysis that near surface disposal of large quantities of depleted uranium is not acceptable (J. W. N. Hickey, *Letter from J. Hickey, Chief Fuel Cycle Safety Branch, U.S. Nuclear Regulatory Commission To Louisiana Energy Services, L.P.*, Docket No 70-3070, U.S. Nuclear Regulatory Commission, Washington D.C., September 22, 1992). It is also consistent with DOE performance assessments for near-surface disposal at specific sites (Martin Marietta Energy Systems, Inc.; EG&G Idaho, Inc.; and Westinghouse Savannah River Co., *Radiological Performance Assessment for the E-Area Vaults Disposal Facility,* WSRC-RP-94-218, Oak Ridge National Laboratory, Grand Junction, CO., 1994). Additional analysis is necessary to determine the viability of mine disposal of the depleted uranium to meet regulatory requirements for protection of public health and safety.

COMMENTOR NO. 38: OAK RIDGE NATIONAL LABORATORY (CONT'D.) OAK RIDGE, TENNESSEE

At the current time, the only facility being planned in the United States that would meet the requirements for disposal of this material is the proposed Yucca Mountain repository for spent nuclear fuel and high-level waste. Because this is the only current option that meets the regulatory requirements for safe disposal of this material, it should be included as a disposal option in the PEIS.

6. **Clarify the "no action alternative" long-term management strategy for depleted UF_6 in the PEIS with the preferred waste form for final disposition of depleted uranium favored by the U.S. NRC.**

The no action alternative as initially announced in the "Notice of Intent" to prepare this PEIS included eventual chemical conversion of the UF_6 to oxide followed by storage. However, after public scoping and internal DOE reviews, it was determined that the no action alternative should consider the continued storage of UF_6 cylinders indefinitely at the three current storage sites, as indicated on page 2-2 of the PEIS. The NRC stated that the preferred waste form for final disposition of depleted uranium is U_3O_8 (J. W. N. Hickey, *Letter from J. Hickey, Chief Fuel Cycle Safety Branch, U.S. Nuclear Regulatory Commission To Louisiana Energy Services, L.P.*, Docket No 70-3070, U.S. Nuclear Regulatory Commission, Washington D.C., September 22, 1992). The NRC, in the referenced license application for the private Louisiana Energy Services enrichment plant, further stated that conversion of the depleted UF_6 to uranium oxides should be done on a specific schedule.

38-6

It is ORNL's recommendation that the two points of view on the storage form of depleted UF_6 be reconciled between the DOE and NRC.

COMMENTOR NO. 39: CITY OF OAK RIDGE, ENVIRONMENTAL QUALITY ADVISORY BOARD OAK RIDGE, TENNESSEE

CITY OF
OAK RIDGE

ENVIRONMENTAL QUALITY ADVISORY BOARD

POST OFFICE BOX 1 • OAK RIDGE, TENNESSEE 37831-0001

April 9, 1998

Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
Office of Disposition Technologies
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Members of the Environmental Quality Advisory Board (EQAB) have reviewed the Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management of Depleted Uranium Hexafluoride (DOE/EIS-0269). The City of Oak Ridge has a strong interest in the future management of the DOE depleted uranium hexafluoride (UF_6) inventory, since about 10% of this inventory is stored at the East Tennessee Technology Park (ETTP, formerly K-25 Site) in Oak Ridge.

As explained in the draft programmatic environmental impact statement (PEIS), the continued storage of depleted hexafluoride in steel cylinders in outdoor storage yards does not pose an imminent threat to workers, public, or the environment. However, continued safe storage requires an ongoing program of surveillance and maintenance, and the job of assuring safe storage will become more difficult as time passes. Furthermore, the continued presence of this material at the ETTP may adversely affect ongoing site reuse initiatives, both by presenting a negative aesthetic image to prospective ETTP tenants and by preventing new uses of the areas occupied by cylinder storage yards. **39-1**

EQAB members support the concept, embodied in most of the alternatives considered in the PEIS, of converting the depleted UF_6 to a more stable form (either uranium oxide or metal) that would be suitable for long-term storage, reuse, or disposal. However, we think the timetable for action that is presented in the PEIS is much too slow. Instead of waiting until 2009 to start converting this material (and finishing the job in about 2028), DOE should act now to start the conversion process as soon as feasible. (There appear to be no technical barriers to starting the conversion process.) The Oak Ridge Gaseous Diffusion Plant operated for about 40 years (1945 to 1985); the federal government owes it to this community not to wait an additional 43 years (1985 to 2028) to deal responsibly with the byproducts of gaseous diffusion. **39-2**

Thank you for the opportunity to review and comment on this document.

Sincerely,
For the Board

Gerald L. Palau

Gerald L. Palau
Chairman

cc: Honorable Mayor and Members, Oak Ridge City Council
Amy S. Fitzgerald, Special Assistant to the City Manager
James Hall, DOE Oak Ridge Operations Office

COMMENTOR NO. 40: DORTCH, JOTILLEY PADUCAH, KENTUCKY

4305 Buckner Lane
Paducah, Ky 42001
7 April 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Mgmt. Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear DOE Representatives:

A PEIS for UF_6 strategies and management must take all available information on the subject into consideration. This PEIS does not cite the following:

1. "Draft Preliminary Report - DOE Independent UF_6 Cylinder Assessment Team"; DOE draft; 25 Mar 1992.
2. "Integrity of Uranium Hexafluoride Cylinders" ONFSB Technical Report; 5 May 1995. **40-1**
3. "Affordable Cleanup? — Opportunities for Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities"; National Research Council; 1996.

Why weren't these studies used as a basis for addressing this problem and its solutions?

The above-ground cylinder storage is risky. There are many styles of containers of varying wall thicknesses. Rust, both visible and under the paint, has weakened many. Improper storage — too close to the ground, too close together to be inspected all around, stacking incompatible styles, damage to cylinders in transport all add to the danger. Leaky or degraded valves and cylinder ID tags missing or unreadable are a problem. **40-2**

How full the cylinders are presents another problem. Many were filled before the current limits were **40-3**

COMMENTOR NO. 40: DORTCH, JOTILLEY (CONT'D.) PADUCAH, KENTUCKY

- 2 -

established.

The geology of the area at PGDP includes high risk earthquake zones. It is not a stabe place to store or reprocess UF_6. It is not a good place to store the produce until a market opens up or a use is discovered". 40-4

A viable long-term solution is to convert the cylinder contents to U_3O_8, a more stable oxide that can be reconverted if the need arises. France does this very thing. 40-5

The problems that have surfaced since we have come off the "production-at-all-cost" mentality do not need bandaids. They need real and permanent solutions based on sound technology and upon sound geologic grounds. 40-6

Sincerely,
jotilley dortch
4205 Buckner Lane
Paducah, Ky 42001

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

BNFL

British Nuclear Fuels plc

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Charles E Bradley, Jnr.,
Program Manager,
Depleted Uranium Hexafluoride Management Program,
Office of Facilities (NE-40),
Department of Energy, Science and Technology,
US Department of Energy.
19901 Germantown Road,
Germantown MD 20874-1290

Direct tel: 01925 834204
Direct fax: 01925 832026

Your ref:
Our ref: peis1.doc

14th April 1998

Dear Ched,

Please find enclosed the BNFL response to the draft PEIS. The response document is an amalgamation of expert opinion within the Company from those with experience of various aspects of depleted hex tails processing, storage and disposition . The responses are presented as general comments or specific to the appendices of the PEIS.

You will note that one of the main concerns that we have is the omission of an option for depleted uranium metal as a medium for long-term storage/disposal. As you are aware the technology BNFL is currently developing to process our own tails has as products, uranium metal and fluorine gas. BNFL's view is that uranium metal is feasible for long-term storage and disposal and could have clear cost and environmental advantages. This has not been adequately recognised or assessed in the report. 41-1

If you have any queries about the BNFL comments, please contact me or Marilyn Meigs at BNFL Inc.

Yours sincerely

A J Lorimer

Assistant Director International Development

cc: Ms M F Meigs
Mr P R Gregson

Registered in England no.1002607
Registered office:
Risley Warrington Cheshire WA3 6AS

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

A Note by BNFL plc

GENERAL COMMENTS

1. BNFL supports the strategy of safe storage as UF_6 pending the development of suitable uses. These uses would be most likely within the nuclear fuel cycle. *41-2*

2. The Engineering Analysis has several significant omissions and inaccuracies which although unlikely to affect the overall environmental impact, could weaken the conclusions of the PEIS and the Cost Analysis. *41-3*

3. The approach taken for the assessment of the environmental impacts arising from the various management options is good and the methodologies are suitably transparent to scrutiny. However, there are a number of general areas where the assessment methodologies could be improved and these are detailed below. *41-4*

4. The methodologies used in the Cost Analysis are considered to be sound. However the report is based on the Engineering Analysis and the comments made for that report will also have cost implications and might alter the conclusions of the Cost Analysis. In particular, the basis for the revenues or credits for the sale of AHF, CaF_2 and radiation shields require robust justification. *41-5*

5. Long-term storage as uranium metal has not been analysed even though it was a feasible recommendation in the Technology Assessment Report and there are significant volume and cost benefits which might make the economics of this route more attractive than U_3O_8 or UO_2. *41-6*

6. Disposal as uranium metal has not been analysed even though it was a feasible recommendation in the Technology Assessment Report and there are significant volume and cost benefits which might make the economics of this route more attractive than U_3O_8 or UO_2. The PEIS shows that reducing the volume of the material disposed significantly reduces the impacts on the environment, suggesting that uranium metal, which has the minimum volume, would minimise the environmental impacts. Although current DOE Orders restrict such disposal, there is no equivalent restriction at the commercial disposal sites. *41-7*

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

7. The environmental impacts of disposing of, or recycling, the products containing uranium metal or oxide at the end of their useful life should be analysed. *41-8*

Detailed comments are presented below.

COMMENTS ON THE ENGINEERING ANALYSIS

General

The Engineering Analysis uses conservative assumptions resulting in excessive rather than realistic costs and tending to preclude meaningful comparison of the options. Examples are: taking 7 years to build a facility, not considering use of several existing facilities in the USA, and the high projected manning levels. *41-3 (Con't.)*

Transportation Module

Cylinder Preparation for Shipment

The suggestions for the Pre-transport Preparations of UF_6 Cylinders appear to be compliant with the recommendations in IAEA Safety Series 6, 7, 8, 37 and 80.

An overcontainer used for a cylinder which does not meet DOT requirements would need to contain any leakage from the cylinder. To achieve this, the overcontainer would need to meet the requirements of a Type A Package, as defined by the IAEA. An overcontainer "slightly bigger than the cylinder" which meets DOT regulations may not achieve this. It would be more prudent to plan for the transfer of the UF_6 to a new cylinder to cater for the instance of an over-pressure and damaged cylinder which could not be transported even in an overcontainer. *41-9*

The engineering required to deal with some of the severely degraded cylinders has been underestimated. It is not reasonable to assume that these cylinders can be placed into overcontainers nor that their contents can be transferred in the manner described. *41-10*

Accidents considered for the Cylinder Preparation Options involving cylinders of solid UF_6 assume releases of UF_6 in dry conditions and HF in wet conditions (rain). Accidents involving UF_6 vapour assume releases of UO_2F_2 and HF. Releases of any physical form of UF_6 result in reaction with water vapour in the air, producing UO_2F_2 and HF vapour. The PEIS therefore has underestimated the impacts of such accidents. *41-11*

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Emptied Cylinder Treatment

The residue remaining after the cylinder has been washed out and the water has evaporated will be UO_2F_2, rather than a "mixture of uranium and fluorine".

The cleaned cylinders could be cleaned further and monitored for free-release, or could be recycled to fabricate other containers for use in the nuclear industry. **41-12**

Conversion Module

The vast majority of process and other buildings use reinforced concrete in their construction. The use of reinforced concrete for the conversion process buildings cannot in itself be considered a safety feature. **41-13**

Control of HF vapour by limiting the temperature of the building will not work. The vapour pressure of HF at 32°F is nearly half an atmosphere so even at this low temperature HF will vaporise quite quickly. Control of vapour in the manner described is analogous to saying that a cup of coffee does not give off water vapour because it is below the boiling point of water. **41-14**

Upgrading the concentrated HF as described in both the U_3O_8 and UO_2 options will produce approximately equal quantities of azeotropic HF, a highly corrosive liquid, and AHF. The azeotropic HF has relatively little value, and no disposal or use route is described. However, the reduction of UF_6 to UF_4 with hydrogen or cracked ammonia to produce metal does indeed produce just anhydrous HF as a by-product. **41-15**

U_3O_8 Option

A dry conversion process could produce dense U_3O_8 **41-16**

UO_2 Option

UO_2 is a metastable oxide which could react with oxygen or air to form U_3O_8, with an increase in volume. **41-17**

1
PEIS1A.DOC

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Sintering in a hydrogenous atmosphere is required to achieve the densities quoted (9 gm/cc). The hazards associated with hydrogen have not been addressed. **41-17 (Con't.)**

Uranium Metal Option

A continuous metallothermic reduction process produces a uranium/iron compound with a lower melting point than that of pure uranium, allowing the operating temperature of the process to be lower. This is necessary to control the magnesium evaporation rate since magnesium has a significant vapour pressure at temperatures well below the melting point of pure uranium. The uranium/iron compound is much less dense than uranium metal and would be a relatively inefficient gamma radiation shielding material. The two metallothermic reduction processes are not therefore equivalent for the production of metal for use and should not be compared. **41-18**

The Unlikely Accident during Conversion to Metal "Uranium metal fire" would be better described as a conventional fire causing some oxidation of the adjacent uranium derbies. The large size of the uranium derbies would prevent them from catching fire. **41-19**

Pressurisation of the metallothermic reduction vessel caused by vaporisation of excessive magnesium has not been considered. This should be a "Likely Accident". **41-20**

The estimated quantity of uranium released to atmosphere from the conversion facility is very small given the throughput of the facility. **41-21**

Use Module

For shielding gamma radiation, it is not only the material's density which makes it an effective shield, but, as in the case of uranium, a high atomic number is also significant. There are alternative dense metals such as tungsten for applications which need solely high density and mass: in such applications, uranium is usually preferred only when particular mechanical properties are required in addition to density.

The number of UO_2 shielded casks and the number of uranium metal shielded casks seem to be derived by dividing the weight of uranium in the tails UF_6 by the weight of uranium in each cask. This number should be compared with the number of casks needed by the US nuclear power program for the storage/disposal of irradiated fuel. **41-22**

Uranium metal is a much more effective gamma shield than UO_2, and so more spent fuel could be loaded into each metal-shielded cask, thereby reducing the transport and final disposal costs of the spent fuel. **41-23**

4

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

The proposed method of fabricating the casks with uranium metal shielding is not practicable and is hazardous. Molten uranium forms low melting point eutectics with Fe, Cr and Ni, therefore the molten uranium will dissolve the steel shells, liberating large quantities of heat and resulting in a major spillage of uranium. There are, however, other, methods available to fabricate casks from depleted uranium that do not have these safety problems **41-24**

No reason is given why solidified ash waste from the facility producing uranium metal shielding components should require disposal in a special cell or mine. **41-25**

The estimated quantity of uranium released to atmosphere from the manufacturing facility is very small given the throughput of the facility. **41-26**

The release from accidental mishandling/drop of drum/billet inside the plant should be more for the oxide case than the metal case since the oxide is at this stage a loose and powdery material and the metal is in massive billet form. **41-27**

The chemical form of a release due to failure of a uranium metal furnace should be U_3O_8 and not UO_2.

One factor which limits the useful market for uranium is its radioactivity which means that at the end of life it cannot be disposed of by the user in a straightforward manner. The Engineering Analysis considers the manufacture and use of the depleted uranium in both oxide and metal forms for the shielding of spent nuclear fuel. However there is only a disposal route defined for the oxide form since uranium metal is not considered suitable for disposal. The environmental impacts of disposing of, or recycling, the products containing uranium metal or oxide at the end of their useful life should be analysed, including impacts from disposal of the shielding with the spent fuel still in it. **41-28**

Long-Term Storage Module

Recommendations from the Technology Assessment Report to store the uranium as metal have not been analysed even though they were considered feasible. Storage of bulk metal does not produce metal flakes so the pyrophoricity issue is not relevant. Corrosion of uranium metal by moisture can produce hydrides in the metal, but these are only a hazard if oxygen (or air) are excluded. The possibility of an explosion if the hydrogen from corrosion is collected in closed containers only arises when the containers are opened and air is admitted. Storage of bulk uranium metal in a building in air, as opposed to closed containers, is entirely practicable and safe. Should the consequent slow corrosion be **41-29**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

unacceptable, it is feasible to consider development and application of a protective coating.

In a response to a comment on the storage of uranium in forms other than oxide, received during the scoping process for the PEIS, it was stated that "the rationale for the selection of these chemical forms for analysis will be presented in the PEIS". The same response questions the suitability of uranium metal, as opposed to uranium oxide, for storage on the grounds of "higher conversion cost, lower stability and uncertainty of the suitability of the metal form for eventual disposal". The Engineering Analysis, Cost Analysis and PEIS fail to justify any of these assertions. No account is taken of the introduction of new technologies which would produce uranium metal at significantly lower cost. **41-30**

Disposal Module

Using 30 gal drums for UO_2 disposal is not an optimum solution. There are no real reasons why 55 gal drums (about 2,000kg weight) cannot be used and handled efficiently. This would reduce the number of drums to be disposed with consequential lower environmental impacts. **41-31**

Recommendations from the Technology Assessment Report to dispose of the uranium as metal have not been analysed even though they were considered feasible. Uranium metal is accepted at commercial disposal sites in the USA, and there are no NRC regulations which would prevent such disposal. The DOE Orders which specifically exclude fluorides and metal from the Nevada Test Site and Hanford should be comprehensively reviewed to identify the adverse consequences/impacts, if any, which lead to the dismissal of U metal as a suitable form for disposal. **41-32**

The U oxides are stated to be the preferred forms for disposal because of their stability and slow dissolution rates in water. Uranium metal is slow to dissolve in water, and therefore should be considered for disposal especially when the much smaller volume of metal is taken into consideration. **41-33**

The reduced volume of the uranium metal would significantly reduce the impacts on the environment as the PEIS shows that most environmental impacts tend to be proportional to volume. The observations that impacts for the denser UO_2 are less than for U_3O_8, and the impacts for ungrouted wasteforms are less than for grouted wasteforms because the volumes are lower (about 50%) should enhance the case for disposal as U metal because metal volumes will be even lower. Disposal as U metal blocks would not involve grouting and would therefore also have lower environmental impacts through the avoidance of the long term effects of grouting. **41-34**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

It is not correct to describe surface oxidation of U metal as "similar" to HF formation from reaction of uranium fluorides with water. The consequences of the two are very different. **41-35**

COMMENTS ON THE PEIS METHODOLOGY

Areas where the Assessment Methodologies could be improved

The treatment of uncertainty in any kind of assessment methodology is a vital issue, especially where generic (non site specific) settings have been used. The uncertainties in the input parameters and assumptions in conceptual models, and their effect on the predicted consequences, need to be determined, usually by a sensitivity analysis technique. Measures can then be taken to reduce the uncertainties.

Uncertainty has been recognised as important in the PEIS but little has been done to analyse the issue. Instead, assumptions have been made with the intention that the various anticipated environmental impacts result in conservative rather than realistic estimates. As it turns out, in most cases (except groundwater contamination in the disposal option) the impacts are still low enough to be acceptable. However, this approach tends to obscure meaningful comparison between the alternatives and is not always appropriate. When a management option and suitable site are chosen, the environmental impacts for that site should be assessed on a realistic basis. **41-4**

One exception to this conservative approach is the assumption that manufacture of shielded containers would bound any impacts associated with other products. In this case, the shielded containers are as large a product as can be reasonably imagined. Smaller products would require more operators per unit weight of uranium processed, and would be less self-shielded, giving much larger total involved worker doses.

Radiation and chemical effects are analysed by considering the maximally exposed individual (MEI) in three groups, "involved workers", "noninvolved workers" and "members of the general public". However, no account seems to have been taken for cumulative exposures between groups (the MEI in the involved worker group could also be the MEI in the general public group if he/she lives near the site). This approach has resulted in some anomalies, such as in the case of the manufacturing facility where the MEI radiation dose and hazard index of a member of the general public are predicted to **41-36**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

be greater than those for a noninvolved worker, under normal operating and certain accident conditions. A preferable approach would be to use a larger number of critical exposed groups, chosen to be mutually exclusive.

The chemical and radiation risk to the MEI for the involved worker group during normal operations has not been quantified. The reason given is that worker activities are uncertain at this stage. However, uncertainties such as this have not stopped the authors from making conservative assumptions in order to quantify environmental impacts in many other areas of the PEIS. The PEIS approach must be consistent. **41-36 (Con't.)**

The impacts to the involved workers of clearing up from the assumed accidents have not been considered. The amount of material released inside the plant which the involved workers would have to clean up is likely to be significantly more than the amounts quoted in the PEIS, which are presumably the amounts released to the environment outside the process buildings. **41-37**

The environmental impacts due to human intervention (deliberate and inadvertent) do not appear to have been addressed. While human intervention is most applicable for the disposal option (post-closure phase), where mining and construction activities could bring material back to the surface, there are also human intervention scenarios plausible for all of the other options. No mention is made of any institutional controls likely to be in place to help prevent such occurrences. Assessment of the risks resulting from human intervention is usually carried out by an expert elicitation process to determine the probability and consequences of various human actions. **41-38**

The environmental impacts due to the disposal of secondary wastes such as MgF_2 from the conversion options have not been fully addressed. The only impact addressed is the extra burden on the capacity of the disposal sites and the environmental impacts due to the construction of new disposal sites to cope with the increase in demand. The post-closure impacts of such sites are not addressed in the PEIS. **41-39**

The prediction of groundwater contamination is highly site specific. Most of the calculations in the PEIS connected with this issue have to make large assumptions over the geochemical and hydrological characteristics of generic sites and the value of environmental impacts calculated in this way is questionable. Only site-specific data should be used when calculating risks from a groundwater pathway. **41-40**

Specific Comments on the Storage Option

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

Cylinder yard doses do not seem consistent with a strict care, maintenance and inspection regime. Portsmouth at 2mSv (196mRem/yr) is most realistic. (probably plausible if a large number of personnel are used, and/or remote inspection equipment or shielding is implemented) **41-41**

Assumption of 0.0041 breaches per cylinder move (Appendix B Section B3) would result in 2 x(28351+13388+4683)X0.0041 = 380 breaches if all containers were moved for painting. This does not seem consistent with number of breaches quoted in Table B1. **41-42**

Comprehensive wall thickness testing at time of refurbishment would aid future decision making. However corrosion rates will be difficult to estimate if initial wall thickness is unknown. **41-43**

Thorough inspection, testing and painting will result in high doses potentially. **41-44**

In the event of aircraft crash on any of the UF_6 storage areas, the environmental impact would be far greater than for any storage option e.g. UO_2. **41-45**

Uranic oxide powders stored in 200 litre drums expose operators to higher dose rates than UF6 cylinders. Thin drums are stored indoors to prevent corrosion but periodic inspection is required. **41-46**

Specific Comments on the Disposal Option

There is no description of the methodology used for estimating post-closure risks for the UF_6 disposal option in the PEIS. **41-47**

The term "indefinite period" needs to be defined in the context of monitoring and maintaining a disposal facility post-closure. Monitoring and maintenance in perpetuity is not a realistic scenario. **41-48**

The impact of post-closure peak doses from uranium daughters at 1,000 years is not sufficiently long since peak doses from uranium daughters occur much later. A more reasonable assumption would be 10^8 years. **41-49**

The PEIS finds that groundwater contamination in the post-closure phase of a disposal site in a wet location could lead to both the radiation dose to the public exceeding **41-50**

COMMENTOR NO. 41: BRITISH NUCLEAR FUELS PLC (CONT'D.)
RISLEY WARRINGTON CHESHIRE, UNITED KINGDOM

regulatory limits and the concentration of uranium causing adverse health effects. These effects are dismissed by stating that the water could be treated or an alternative source used. Given that this is one of the few instances in the PEIS that such limits are exceeded, this is neither a scientific nor a publicly-reassuring stance and does not fit in well with the general environmental impact assessment approach used in the PEIS. This is an example where the PEIS would have benefited from utilising a full treatment of uncertainty/sensitivity analysis to give realistic rather than conservative estimates. **41-50 (Con't.)**

Vaults appear to perform less well than shallow trenches in terms of human health impacts. Does this imply that vaults should be dismissed in favour of shallow earthen structures? Some clarification is needed as to the reasons why "...the concentrations from the vault would be greater than those from shallow earthen structure by a factor of 1.2". **41-51**

BNFL

April 1998

COMMENTOR NO. 42: KARPIN, TIMOTHY L., CHMM
DAVIS, CALIFORNIA

Comments

Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride

The Depleted UF_6 Management Program

To: Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290
Fax: 301-428-0145

From: Timothy L. Karpin, CHMM
2640 Portage Bay Avenue, #19
Davis, California 95616
Phone/Fax: 530-757-6840
E-mail: tkarpin@mother.com

Date: April 20, 1998

General Comments

In summary, I agree with the DOE's position that depleted UF_6 can and should be reprocessed into either a uranium oxide or uranium metal form for use in commercial or industrial settings. The American public, whether they cared to or not, has spent significant funds during the last 50 years on the mining, milling, processing, and enrichment of uranium. It would be economically negligent to reprocess and dispose of depleted UF_6 into a form and location, respectively, that can no longer be of use or benefit to American citizens or industry. Such a process would also be in contrast with America's recognition of the value of recycling valuable raw materials. *42-1*

The Draft PEIS is relatively complete and informative. I do have several specific comments as noted below:

Comments related to Volume II, Appendix E

1. Why not ship all casks in clamshell cases?

   A. No UF_6 transfer facility would be needed, which would reduce potential environmental impact and permitting activities.
   B. The use of clamshell cases could possibly reduce the number and cost of ultra-sonic wall thickness tests.
   C. Clamshell case costs would not go up if a local facility is used to process UF_6 (i.e. it may be more economical to build 2 or 3 facilities near each gaseous diffusion plant.). *42-2*
   D. Public perception would be more favorable toward the DOE if the DOE shows demonstrated caution by using clamshell cases. The DOE's decision tree would be reduced by one layer, and one area of judgment/opinion would be eliminated.
   E. Accident scenarios would decrease with regard to potential environmental and health impacts.

COMMENTOR NO. 42: KARPIN, TIMOTHY L., CHMM (CONT'D.)
DAVIS, CALIFORNIA

Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride

To: Mr. Charles E. Bradley, Jr.
From: Timothy L. Karpin, CHMM
Date: April 20, 1998
Page 2

   F. Consider modifying nearby runways and flying MD-17s in and out with clamshell cases (MD-17s are civilian versions of the new C-17 military transport). Of course, an economic study would be required to validate this concept.
   G. The costs and energy/resource consumption of a transfer facility would be very high in comparison to clamshell case use. *42-2 (Con't.)*
   H. One important issue was not directly discussed. You would need a separate facility or partitioned area at the UF_6 processing facility to decontaminate the clamshell cases (if necessary).

Thank you for allowing me the opportunity to comment on this document. Good luck on the final version.

Sincerely,

Timothy L. Karpin

Timothy L. Karpin, CHMM

COMMENTOR NO. 43: VERSGROVE, TOM
POMONA, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **43-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **43-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **43-3**

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. **43-4**

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **43-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **43-6**

Thank you for considering these comments.

Sincerely,

Tom Versgrove
Box 44
Pomona, Il 62975

COMMENTOR NO. 44: THOMPSON, THOMAS
SIMPSON, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **44-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **44-3**

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Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **44-6**

Thank you for considering these comments.

Sincerely,

Thomas Thompson
Rt 1 Box 278
Simpson, IL
62985

COMMENTOR NO. 45: DONHAM, MARK & HANSON, KRISTI BROOKPORT, ILLINOIS

.harles Bradley
Office of Facilities (NE-40)
US Dept. Of Energy
19901 Germantown Rd.
Germantown, MD 20874 April 5, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted UF6 Draft PEIS.

(1) We are concerned about the failure of DOE to reference or mention the 3 studies and/or reports which specifically address the cylinder problem. These are "Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", from the Oak Ridge Field Office, Mark 25, 1992; "Integrity of Uranium Hexafluoride Cylinders" and "Affordable Cleanup? - Opportunities for Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996. **45-1**

(2) One of the first key issues which must be addressed is the earthquake risk at Paducah from the New Madrid fault/rift zone. Any strategy for dealing with the cylinders has to address this problem, as well over half the cylinders are in Paducah. Most of these cylinders are stored on soils with liquefaction potential. Due to the close stacking of the cylinders, and the configuration of the stacks, breach of cylinders due to puncturing from other cylinders in the event of a seismic event strong enough to move he cylinders is probable. Any punctures in the cylinders would result in .he slow release of hydrogen fluoride and uranium and other radionuclides, which would then accelerate the further corrosion of the cylinders. **45-2**

Because the tens of thousands of cylinders are stacked in a configuration which makes it virtually impossible to access cylinders in the center of the stacks in a timely fashion. These factors are why the seismic risk at Paducah has to be considered in any long term strategy to deal with the cylinders.

(3) In considering the long term seismic risk at Paducah and its effect on cylinder management, the first question to ask is, will any future conversion/storage take place at Paducah. If the answer is yes, and if the plans are to bring cylinders in from Portsmouth and Oak Ridge, then these facilities have to be built to highest earthquake standards available. In addition, transportation risks from Portsmouth and Oak Ridge to Paducah must be considered.

If the answer is yes, but only for the Paducah cylinders, then either three conversion facilities will have to built or the facility will have to be mobile, which means it will have to be transported contaminated or will have to be completely decontaminated. None of these alternatives is looked at in the PEIS. **45-3**

If the answer is no, there will not be conversion/storage at Paducah, then the massive transportation burden to get the 40,000 cylinders at Paducah, some of which it is doubtful could be moved, from Paducah to wherever the onversion/storage would take place. This is not considered properly in the .EIS.

Connected Actions/Cumulative effects

(4) To determine the scope of environmental impact statements, agencies shall consider 3 types of actions, 3 types of alternatives, and 3 types of **45-4**

COMMENTOR NO. 45: DONHAM, MARK & HANSON, KRISTI (CONT'D.) BROOKPORT, ILLINOIS

impacts. They include: (a) Actions (other than unconnected single ctions)
which may be: (1) Connected actions, which means that they are closely related and therefore should be discussed in the same impact statement. Actions are connected if they: (i) Automatically trigger other act ns which
ay require environmental impact statements. (ii) Cannot or will .otproceed
unless other actions are taken previously or simultaneously. (iii) re
interdependent parts of a larger action and depend on the larger action for their justification. (2) Cumulative actions, which when viewed wit other
proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact statement. (3) Similar actions, wh h when
viewed with other reasonably foreseeable or proposed agency actions, have similarities that provide a basis for evaluating their environmental consequences together, such as common timing or geography An agency may wish to analyze these actions in the same impact statement. It should do SO when the best way to assess adequately the combined impacts of similar actions or reasonable alternatives to such actions is to treat them in a single impact statement.

It is clear that the UF6 DPEIS is inadequate in both its scope and its cumulative effects analysis, and that this flaw is serious.

Certain alternatives for dealing with the DUF6 cylinders are provided in the DEIS. Those alternatives include conversion to Uranium oxide, conversion to uranium metal, and long term storage. **45-4 (Con't.)**

In order to convert to either uranium metal or uranium oxide, several unavoidable, connected steps must be undertaken. These include (1) building the facilities which will empty the cylinders and convert the DUF6; (2) the ylinders will have to be moved to the facility; (3) the material will have to be defluorinated; (4) the emptied cylinders will have to be washed and dealt with, and a wastewater treatment plant will need to be built to treat the effluent, which will contain small amounts of transuranics; (5) the hydrogen fluoride will have to be placed into cylinders and stored or disposed, which will require facilities; (6) the empty DUF6 cylinders will have to be dealt with; (7) the converted material will have to be disposed or stored.

If one of the conversion alternatives is chosen as the preferred alternatives, there is no avoiding any of the above steps. These are all clearly "connected actions" as described above. Yet, the DEIS defers analysis of the effects of the conversion process until a future NEPA document. This future NEPA analysis would come at a time when a decision has already been made committing to one of these alternatives. NEPA requires that information be made available to decision makers and the public before decisions are made and actions taken.

In addition, at all of the facilities involved (Paducah, Portsmouth, and Oak Ridge) there are other cleanup activities ongoing, either under the WM or ER programs of DOE. These activities are clearly "proposals" and could have cumulative effects in regard to releases of radionuclides and other hazardous substances. The cumulative effects analysis of this DEIS (and the segmented NEPA analysis of the other cleanup projects ongoing at the sites) needs to be looked at in combination. The DEIS fails to make this important analysis.

Incorporation by Reference

(5) As is true is most DOE NEPA documents, there are sweeping impact ssumptions based upon referenced material, mostly internal DOE information. .EPA requires that agencies which incorporate by reference material in an EIS make that material readily available to the public for review. Yet there is no mention where such referenced material (such as the GENII model) could be reviewed or obtained. This is a serious and blatant flaw in the **45-5**

COMMENTOR NO. 45: DONHAM, MARK & HANSON, KRISTI (CONT'D.) BROOKPORT, ILLINOIS

DEIS.
(6) NEPA does not allow conclusory assertions of no impact to suffice for a hard look. Assumptions in an EIS must be supported by objective or empirical data. By DOE making sweeping, conclusory statements of no impact (for example, of the environmental impact of the release of radiation from the activities associated with DEIS) based upon internal studies, which are not explained or described and which are not readily available to the public, DOE is violating one of the main tenants of NEPA - to inform the public of their proposed actions. **45-6**

Thank you for considering these comments.

Sincerely

Mark Donham
Kristi Hanson
RR # 1, Box 308
Brookport, IL 62910

COMMENTOR NO. 46: BARNWELL, CARLENE GOREVILLE, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **46-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **46-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **46-3**

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. **46-4**

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **46-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **46-6**

Thank you for considering these comments.

Sincerely,

Carlene Barnwell
3485 Goreville Rd.
Goreville, Il.
62939

COMMENTOR NO. 47: WESTERMAN JONES, CAROL & JONES, ANTHONY E. CARBONDALE, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **47-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **47-2**

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Thank you for considering these comments.

Sincerely,
Carol Westerman Jones + Anthony E. Jones
3310 HWY 127
Carbondale, IL
62901

COMMENTOR NO. 48: KLUETER, KARLA CARBONDALE, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **48-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **48-3**

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Thank you for considering these comments.

Sincerely,
Karla Klueter
6829 Sparrows Ln
Carbondale IL
62901

COMMENTOR NO. 49: MOBLEY, E.V.
IDAHO FALLS, IDAHO

File A:\uf-6..wpd UF-6 Comments Rev 1, 03-26-98

I have reviewed DOE/EIS-0269, PEIS for UF-6 Management, 12/97. I have the following comments:

1. I agree with and support the DOE preferred alternative i.e, use rather than disposal of the UF-6. **49-1**

2. Vol. 1, S.5.1, contains an informative summary of possible uses for converted UF-6 in addition to cask shielding, but its location in the document makes it a surprise. I suggest that other possible uses be mentioned in paragraph S.2. **49-2**

3. The radiation effects calculations are based on the linear-no-threshold (LNT) hypothesis (Vol. 1, S.4.3.1.1.2 and Vol.2, C.4.2.2). A number of studies, for example those cited in The Scientist, March 3, 1997 and in Nuclear News, June 1997, indicate the LNT hypothesis is excessively conservative and in some cases is detrimental. I suggest an improved analysis practice that includes evaluating the magnitude of the conservatism instead of merely stating that the result is conservative. Data are available for derivation of best-estimate or most-probable health effects. A more realistic presentation in the UF-6 PEIS would result if there were a comparison of best-estimate and conservative health effects. **49-3**

4. In Volume 2, paragraphs C.4.1.5, C.4.2.2, and C.4.2.3, it appears that four different dose to health effects conversion standards were used. I suggest some additional explanation to avoid the appearance of confusion. **49-4**

E V Mobley

COMMENTOR NO. 50: WHEELER, NORMA S.
MARION, ILLINOIS

Note: As a longtime environmental activist, I'm accustomed to writing my own opinions. My schedule today forces me to use this form letter, but I assure you that I feel very strongly about the issue & hope that the DOE, after decades of irresponsibility, will take realistic steps to control these grave hazards.

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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Thank you for considering these comments.

Sincerely,

Norma S. Wheeler
13250 Griffith Ln
Marion IL
62959-6163

COMMENTOR NO. 51: WHAYNE, SUE; ROBERTS, MARY LEE & RAY, BETTY
CLINTON, KENTUCKY

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **51-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **51-3**

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Thank you for considering these comments.

Sincerely,

Sue Whayne 992 Sh. Rd. 182 Clinton, Ky 42203
Mary Lee Roberts 398 Sh. Rd. 1037 " "
Betty Ray 31 Sh. Rd. " "

COMMENTOR NO. 52: RHODES, CRAIG & BROWN, CHARLENE
BROOKPORT, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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Thank you for considering these comments.

Sincerely,

Craig Rhodes / Charlene Brown

Craig Rhodes & Charlene Brown
3883 Mt. Pleasant Rd.
Brookport, IL 62910

COMMENTOR NO. 53: HOFFMAN, EUGENE
KNOXVILLE, TENNESSEE

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

April 14, 1998

Comments

My comments (4 pages, 9 comments) are given in the attachment. If any of my comments or questions are not clear, I would appreciate being contacted. 53-1

How will comments on the draft PEIS be documented by DOE? What is the status of the sale of the enrichment plants to USEC? Please call me at your convenience. 53-2

Sincerely,
Gene Hoffman

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name EUGENE E. HOFFMAN (optional)
Organization DOE-Retired
Address 10504 Sandpiper Lane (optional)
City Knoxville State TN Zip 37922-5518
Phone number (423) 966-3964 (optional)
E-mail address _____ (optional)
FAX (423) 966-3964
(must call first)

☑ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 • 301/903-4781

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

COMMENTS BY EUGENE E. HOFFMAN (DOE-RETIRED) TO THE U.S. DEPARTMENT OF ENERGY ON THE DRAFT PEIS ON MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE,DOE/EIS-0269, DECEMBER, 1997

1. The DOE "preferred alternative" (see PEIS, pp. S-42, -44) is to "use the entire inventory of material" based on market demand for uranium oxide (UO2), uranium metal and fluorine products. "Safe management of the cylinder inventory would continue until 100% of the inventory had been converted for use." - - - This DOE preferred alternative would be supported by everyone if the DOE assumed use potential had any basis in fact. Every documented evaluation of potential use of the DUF6 by independent investigators, DOE contractors, and commercial firms in the uranium business during the past ten years has concluded that future use of only a small fraction of the 1,200,000,000 plus pounds of the depleted UF6 can be projected. 53-3

In the PEIS, DOE evaluated six alternative management strategies (see page S-6). However, an option to continue storage of a reasonable (small) fraction of the DUF6 (only the best cylinders, under shelter) for future use and begin conversion of the most degraded cylinders to the safe, stable form (U3O8) was not considered. WHY?? 53-4

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Comments by E. E. Hoffman (cont'd) - 2 -

2. The 1100-page draft PEIS did not cite or reference the three independent reports that directly relate to the subject of the PEIS. These are listed below:
   a) *"Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, dated March 25, 1992 (never published).*
   b) *"Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Safety Board Technical Report DNFSB/TECH-4, May 5, 1995.*
   c) *"Affordable Cleanup? - Opportunities For Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996*
      Chapter 7. Disposition of the DUF6

53-5

3. The draft PEIS presents brief and totally inaccurate statements regarding the New Madrid earthquake safety issue, which is of particular importance to the Paducah plant site which has in excess of 28,000 of the DUF6 cylinders. (PEIS reference - page 3 -7)

53-6

4. The French have been converting hundreds of millions of pounds of their depleted UF6 to the safe, stable oxide and stored it in steel containers in metal framed, earthquake resistant buildings since 1977 to avoid the hazards associated with storing UF6.

53-7

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Comments by E. E. Hoffman (cont'd) - 3 -

5. At least 17,475 of the DUF6 cylinders exhibit accelerated corrosion (Reference: DOE/ORO Work Agreement document, dated 10/30/96). The current DOE schedule for cleaning, inspecting, and re-painting of the cylinders will require at least 30 years, especially when the fact is considered that many of the cylinders will have to be re-cleaned and re-painted at least three times during that period. Each handling operation risks rupture. (Reference: Letter, S. J. Pawel to M. S. Taylor, Feb. 10, 1997, ORNL/CST-SP-021097-05, *Update on Development Activities, page 4, "The life of the paint system presently in use is not analytically known, but current estimates suggests that a 12-year life (on average) prior to significant maintenance or re-painting is reasonable".*

53-8

6. The DUF6 safety and accident concerns presented in the Defense Nuclear Facilities Safety Board report (DNFSB/TECH-4, May 5, 1995) are not cited in the draft PEIS.

53-9

7. On February 18, 1998 a USAF B-1 supersonic bomber weighing in excess of 200,000 pounds crashed and burned approximately 40 miles from the Paducah cylinder storage yards. The Barkely Regional Airport is located approximately 2 miles from these storage yards. Has the accident scenario of a large plane crash into the cylinder yards on a rainy day been analyzed? Under such circumstances a number of cylinders would be ruptured and large quanties of hydrofloric acid gas would be generated which could caused additional ruptures and make control of the accident very difficult.

53-10

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

EUGENE E. HOFFMAN

10504 Sandpiper Lane
Knoxville, TN 37922-5518
(423) 966-3964

Education: BS in Metallurgy, University of Notre Dame, 1951
MS in Metallurgy, University of Tennessee, 1959

Work Experience:

(1996) Retired from the U.S. Department of Energy-Oak Ridge Operations (DOE-ORO)

(1981-1996) DOE-ORO) ORO Manager of DOE National Materials Programs for the Breeder Reactor Program, the Space Nuclear Reactor Program (SP-100), the Radio-isotope Thermoelectric Generator (RTG) Program and the Advanced Gas Turbine Materials Program. Served as a member and chairman of DOE-ORO formal investigations related to material problems at Doe facilities.

(1979-1981) DOE-ORO) Manager, Fossil Energy Materials Branch

(1972-1979) DOE Headquarters, Germantown, MD Chief, Materials and Chemisty Branch, Breeder Reactor Program

(1963-1972) General Electric Company, Nuclear Systems Programs, Cincinnati, OH Manager,
Systems Materials Technology (35 professionals and technicians)

(1951-1963) Oak Ridge National Laboratory, Metallurgy Division , Manager and Research Metallurgist, Materials Compatibility Group

Expertise: High-temperature materials technology directed at energy production for space and terrestrial applications. Authored over 30 open literature papers and topical reports in the high-temperature materials research and development field.

Honors: 1960 Chairman, Oak Ridge Chapter, American Society for Metals (ASM)
1976 Deputy Team Leader, Breeder Reactor Team visit to USSR
1982 Elected Fellow, ASM
1990 Selected as DOE-Oak Ridge High-Tech Federal Employee of the Year
1992 Designated Life Member, ASM International
1995 Named Tennessee Colonel by Governor Don Sunquist

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from "Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Board (DNFSB) Report DNFSB/TECH-4, May 5, 1995

page 6. The review conducted by the DOE Independent UF6 Cylinder Assessment Team (*Reference: "Draft Preliminary Report: DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, March 25, 1992*) was a comprehensive assessment of the entire cylinder program. The team reviewed the design, fabrication, transportation, filling, storage, handling, inspection, legal considerations, safety and health considerations, environmental considerations and ultimate disposition of the cylinders

Unfortunately, this report is still considered "draft" after three years.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Reports on DUF6 Cylinders by Independent Investigating Teams

"Draft Preliminary Report - DOE Independent UF6 Cylinder Assessment Team", DOE Oak Ridge Field Office, dated March 25, 1992

This report resulted from a DOE Memorandum "Uranium Hexafluoride Feed and Tails Cylinder Program Review" dated January 29, 1992 to P.Gross, et al., from Joe LaGrone, Manager, DOE Oak Ridge Field Office. The charter to the review team included the following statement:

You should assess the design, fabrication, transportation, filling, storing, handling, inspection, legal considerations, safety and health considerations, environmental considerations, and ultimate disposition of the cylinders.

Status of this report: Contrary to normal investigations of this type by DOE, this report was never formally issued and made available to the public.

"Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facilities Safety Board Technical Report DNFSB/TECH-4, May 5, 1995.

Status of this report: This comprehensive report was issued and made available to DOE/HQ and the public and resulted in DNFSB Recommendation 95-1 to DOE/HQ. (Not cited in the Draft PEIS on DUF6, December, 1997)

"Affordable Cleanup? - Opportunities For Cost Reduction in the Decontamination and Decommissioning of the Nation's Uranium Enrichment Facilities", National Research Council, National Academy Press, 1996.

Status of this report: Available to the public. Contains much information on the depleted uranium hexafluoride situation in the U.S., including recommendations. (Not cited in the Draft PEIS on DUF6, December, 1997)

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Seismic Risk-Paducah Site

Depleted UF6 Draft PEIS, December, 1997, Vol. 1 - Page 3-7

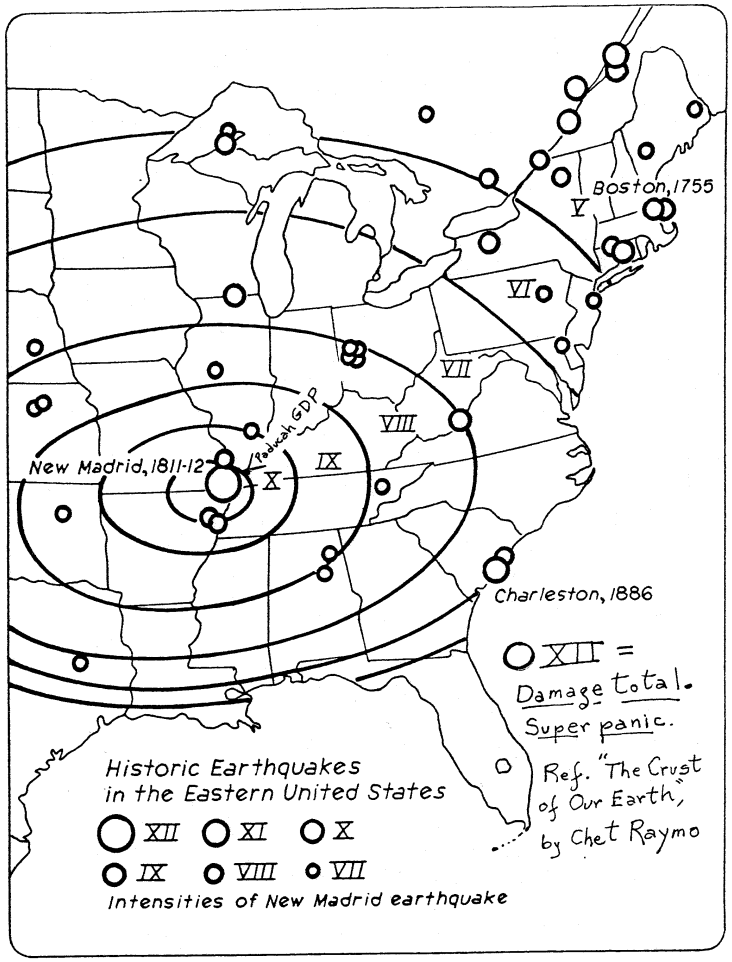
The largest recorded earthquake in the region occurred in 1812 and was centered in the New Madrid fault zone. This earthquake had a magnitude of 7.3 on the Richter scale, and the epicenter was 60 miles (96 km) southwest of the site (ANL) 1991 a). The estimated 1,000-year return period peak ground acceleration is 0.45 of the acceleration of gravity (DOE 1995c).

"The Coming Quake" by T. A. Heppenheimer, Times Books,1988 - References to the New Madrid Earthquake

p.238 The December 16, 1811 quake had been of magnitude 8.5 or 8.6 making it up to twice as powerful as the worst in California. Its largest aftershock had rated at 8.2, very close to the 8.3 of California's earthquakes of 1857 and 1906. The shock of January 23, 1812, had been less powerful, at 8.4. But the main quake of February 7 went all the way up to 8.7 or 8.8-- as much as three times the force of the California shakings.

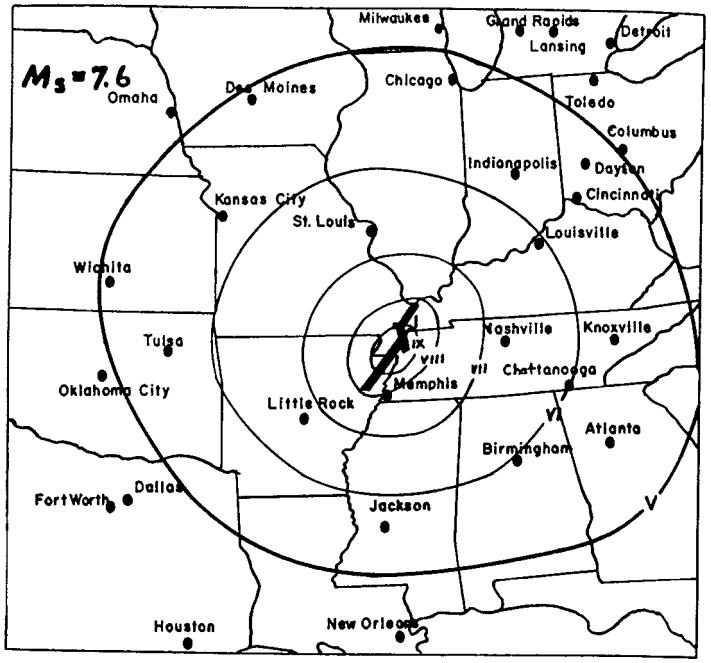
p.244 Nuttli (Otto) estimates that at present (1973), enough stress has built up along the faults to produce a quake of magnitude 7.6. That is the tremor worth fearing; and it has the potential to strike this very day.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE



37

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE



Map by Otto Nuttli showing damage areas, as indicated by zones of various Modified Mercalli intensity, that must be expected from a magnitude-7.6 earthquake on the New Madrid faults. Such a quake could occur today. The zigzag mark at the center is the trace of the New Madrid faults. (Courtesy U.S. Geological Survey)

"The Coming Quake," T.A. Heppenheimer, 1988, p 246

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

THE CRUST OF THE EARTH
Chapter 13 - The Greatest Quake
by Chet Raymo

The New Madrid earthquake was rated XII on the modified Mercalli scale of intensity. XII is the highest rating on that scale. The scale describes a level XII quake in this way; "Super panic. Damage total. Waves seen on ground surfaces. Lines of sight distorted. Objects thrown upward into the air."

It was the greatest earthquake to shake the United States in historic times, and possibly one of the greatest ever to rock the crust of the earth.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Inventory of Thin-wall UF6 Cylinders at Three DOE Sites

- May 3, 1990 Inventory List Given to DOE-ORO Investigating Team by Martin-Maretta staff in February, 1992

10-Ton Cylinders	4,230	Model T
14-Ton Cylinders	1,000	Model 48 HX
	3,640	Model 48 H
	6,602	Model O
	16,602	Model OM* (*4450 not codeable)
	23,806	Model 48 G

Total 14-Ton Cylinders 51,419
Total Thin-wall Cylinders 55,649

- Number of UF6 Cylinders in Long-Term Storage in Table given to DOE/ORO Investigating Team by D.L.Mason (Martin-Marietta, 1/92) 54,000

- Number in DOE/ORO Report, March 25, 1992 - 54, 768
- Number in DNFSB Report, May 5, 1995 - 55, 649
- Number in Draft PEIS, December, 1997 - 46,422

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Ref., "UF_6 Long-Term Storage Cylinder Integrity Management Plan," M.S. Taylor, et al., K/ETO-114, September, 1992

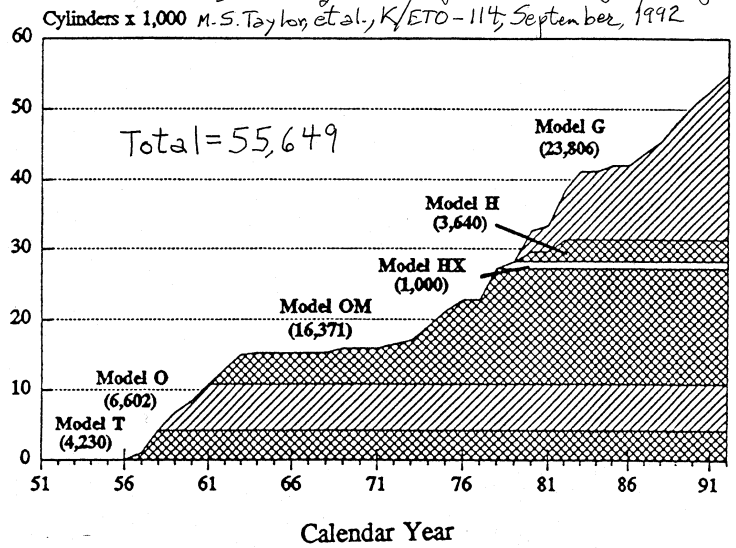


Figure 1. Cumulative "thinwall" cylinder purchases.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

DOE INDEPENDENT UF_6 CYLINDER ASSESSMENT TEAM

DRAFT PRELIMINARY REPORT

DOE OAK RIDGE FIELD OFFICE

March 25, 1992

TABLE 2
POTENTIAL DEFICIENCIES IDENTIFIED WITH LONG-TERM STORAGE UF_6 CYLINDERS

CONDITION	PGDP	PORTS	K-25	TOTAL
Total in long-term storage	35,339	13,359	6,070	54,768
Channel type stiffener (Type O)	5,313	83	163	5,559
Thin-wall skirted (Types T, H, and HX)	2,576	3,282	2,397	8,255
Bottom longitudinal weld		2,095 (Type T)		
In/near ground contact	2,818	0	949	3,767
Inaccessible plug end	10,162	10,259	810	21,231
Improper support upper tier	1,620		390	2,010+
Stacking incompatible designs		83	166	249+
Shell to lug contact	3,644	352	450	4,446
Other handling damage		4	285	289+
Valve leakage	Assessing	2	Assessing	Assessing
In poor drainage yard	12,153	0	100	12,253
Deficient saddles	19,994	0	12	20,006
Substandard bonnet nut/port cap	60/3	526/17	47/36	633/56
Valve replaced with plug			5	5+

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

UF_6 LONG-TERM STORAGE CYLINDER INTEGRITY MANAGEMENT PLAN K/ETO-114 September 1992

Table 2. Long-term storage inventory potential deficiencies

	Identified Potential Deficiency	Number of Cylinders
A.0	Direct Container Integrity Concerns	
A.1	breached cylinders- cylinders with holes in the cylinder shell	6
A.2	corroded cylinders- cylinders with visible pitting and/or scaling rust	15,000
A.3	leaking valves- valves and plugs that have recurring contamination	10*
B.0	Storage Facility Concerns	
B.1	substandard facilities- sinking or poorly drained load-bearing surfaces	12,000
B.2	improper support- upper tier cylinders supported by unsound points of contact	3,000
C.0	Uranium Control Issues	
C.1	non-depleted material- Normal or enriched material located in DU storage facilities	8
C.2	ID plates- loose or detached identification plates	200*
D.0	UF_6 Transfer Issues	
D.1	fill-limit consideration- cylinders without certified internal volumes or cylinders filled above the current maximum allowable limit established in ORO-651[13]	15,000
D.2	substandard valves- valves with missing or cracked parts, teflon tape on threads, bent stem, and/or improper engagement	3,000
D.3	plug replacing valves- plugs in place of valves	1,000*
D.4	defective cylinders- cylinders that do not pass the inspection criteria established in ORO-651 for liquid transfer	100*
D.5	non-conforming cylinders- cylinders that will not fit into currently designed autoclaves	140
E.0	Best Storage Practice Issues	
E.1	inaccessible cylinder- cylinders that cannot be accessed at both heads for a visual inspection	22,000
E.2	above internal vacuum- cylinders with internal pressure above the ideal vacuum conditions	1,000
E.3	uncoated cylinder- cylinders with no or little rust-protective coating	23,000*

* Improved estimates are to be determined from the baseline inspection.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

DELIVERABLES/MILESTONES/DATES OF COMPLETION (continued)

S. By September 30, 1996, remove all full depleted uranium cylinders from ground contact at Paducah.

T. Complete the required inspection of 12,340 cylinders as part of the triennial inspection program by September 30, 1996.

U. Complete annual inspection of 17,475 cylinders exhibiting accelerated corrosion and other problems (as defined in ETO-114) by September 30, 1996.

V. Continue the Biological Monitoring effort at Paducah and issue the annual report by April 30, 1996.

W. Complete the milestones and markers as defined in the FY 1996 baseline program plan.

WAD ISSUE DATE: October 1, 1995

SIGNATURES:

LOCKHEED MARTIN: L.E. Hall — Date 10-26-95

DOE CONTRACTING OFFICE REPRESENTATIVE: J.W. Parks — Date 10/30/95

DOE CONTRACTING OFFICER: Signature — Date 10/31/95

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "Investigation of Breached Depleted UF6 Cylinders", POEF-2068, ORNL/TM-11988, E.J.Barber, et al., September, 1991

page 4. Because the green salt deposit closely matches the color of the paint covering the cylinder, very careful inspection was required to spot the hole when viewed from the front of the cylinder.

page 29. An additional design fault in the UF6 storage cylinders is the protective coating applied to these cylinders. The color of the paint is so similar to that of UF4 that it hinders visual identification of reaction products from a breached cylinder. When a patch of rust forms under the paint, it has the same appearance as UF4 concealing a breach. It should also be mentioned that the quality of paint is highly variable and, in many cases, it offers little long-term surface protection.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts From Report KY/EM-187, "Lessons Learned From Paducah Site Pilot UF6 Cylinder Painting Project", R.I.Reynolds,et al. Nov.26,1996

page 1. "1231 cylinders have been painted with painting operations continuing."

page 2. "The cylinders are placed on their stiffening rings on wood timbers asnd chocks which supports the cylinder approximately 14 inches off the floor. The paint utilized is a one-coat system and consists of a Carboline inorganic zinc coating approximatelly three-to-five mils in thickness."

page 8. "Currently, the results indicate the following:

1. Most of the cylinders have relativelly loose and wispy rust but approximately 1,000 cylinders at Paducah have an underlayer of rust that is quite adherent and brittle. These cylinders are generally cylinders that have been in ground contact which accelerates rusting and pitting.
2. Although many cylinders manufactured after the late 1970's have some degree of painted surfaces, the paint is generally poorly adherent and brittle. Only the 6,000 DOE cylinders painted since 1990 have paint which provides some significant corrosion protection.
3. ---Bottom row cylinders vary according to storage conditions with most ground contact cylinders varying between 200 to 220 mils with the worst cylinder idenfied at about 177 mils. ---

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Figure 7 Breached Cylinder at Oak Ridge K-25 Site

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

U.S. Department of Energy Memorandum, February 20, 1992, "Plans for Ultimate Disposition of Depleted Uranium", To: Leo P.Duffy, Director, Office of Environmental Restoration and Waste Management, EM-1, From: Philip S. Sewell, Deputy Assistant Secretary for Uranium Enrichment, Office of Nuclear Energy

page 4. It is assumed that, beginning in 2020, 5,000 cylinders of depleted UF6 are emptied each year and the UF6 is converted to U3O8. Based on a schedule where conversion of UF6 begins in 2020, all the cylinders containing UF6 would be emptied by about 2065.

page 7. Summary. - - If alternate uses for the depleted uranium are not found to be feasible by approximately 2010, then steps will be taken to convert the UF6 to an oxide of uranium, U3O8, as the most appropriate form for ultimate storage and ultimate disposition. The U3O8 will be stored until it is determined that all or a portion of the depleted uranium is no longer needed. At that point, the U3O8 will be disposed as low-level waste.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "Depleted Uranium Hexafluoride Management Program", UCRL-AR-120372, June 30, 1995

Information Package 1, page 4

In 1977, French officials determined that storage of depleted UF6 from enrichment operations should be limited in time and quantity. License conditions were established for the enrichment facilities, which resulted in Cogema implementing a project for converting the depleted UF6 inventory to U3O8 on an industrial scale. Currently, Cogema packs and stores the U3O8 in 3-cubic-meter metal containers. Each container has a capacity of 9 tons. The containers are placed on concrete pads and are housed in metal framed, seismic resistant modular sheds. Each shed can hold 2,600 containers. With 12 sheds located onsite, Cogema estimates a U3O8 storage capacity of roughly 20 years (Cogema 1989)

(Gene Hoffman Note: One of the principal potential long-term uses of DUF6 cited by DOE is for application in future U.S. breeder reactors. If the U.S. persues breeders ever this application is many decades away. In addition it should be noted that the French are far ahead of the U.S. in breeder reactor demonstration and yet they still chose to convert their DUF6 to U3O8 for storage over 20 years ago.)

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from "An Integrated Solution For UF6 Tails Management", S. L. Rock, Allied Signal, Inc. and L. G. Davis, General Atomics, Proceedings of the Third International UF6 Conference, Paducah, Ky, November, 1995

"Storage in a Stable Form. Thirdly, the tails can be converted to a usable or uranium-retrieveable form such as metal or oxide. It should be noted that uranium metal cannot be stored simply, but must be protected from corrosion. U3O8 is the end product of all uranium decomposition. Also the production of metal from UF6 is relatively expensive compared to conversion to U3O8 and historically has created a significant hazardous material waste stream. - - Both the Department of Energy and the Nuaclear Regulatorly Commission have gone on record as favoring conversion to U3O8 as the most desirable and sensible approach."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from letter Allied Signal, Inc (M.D. Kosmider, plant manager) to Martin Marietta (Joe Russell), Subject: Critique of ORNL Report Entitled "Investigation of Breached Depleted UF6 Cylinders", dated February 7, 1992

"The only thing that disturbed me about the report was the lack of any mention of the long-term solutions to this problem. - - There are already 40,000 tails cylinders in storage; many are already dented from contact with surrounding cylinders lifting lugs; the number of tails cylinders is increasing by several thousands per year; and the report indicated that even a cylinder which is not dented has a storage life which probably does not exceed 50 - 60 years. In other words there exists a large potential for future problems which will not be resolved by improving painting, handling, inspecting, and stacking practices. Improving these practices will probably only delay the inevitable. - - - it must at least be mentioned that de-conversion of the tails to a relatively non-hazardous oxide form is the only way to eventually solve the problem."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Conversion of DUF6 To Safe (U-metal), Safer (UO2) and Safest (U3O8) Forms

--- 4,683 cylinders at Oak Ridge (oldest and most heavily corroded)

--- 13,388 cylinders at Portsmouth

--- 28,351 cylinders at Paducah

- o Transportation of degraded cylinders is a problem on-site and a much more challenging and expensive off-site transportation problem.
- o Conversion of Paducah cylinders on-site would eliminate off-site transportation problem.
- o Conversion of Oak Ridge and Portsmouth cylinders at a second conversion facility should be considered, this would -
  - expedite more timely conversion of the most hazardous cylinders and
  - provide technical and cost competion which would benefit the taxpayers

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from "Affordable Cleanup?", Report of the Committee on Decontamination and Decommissioning of Uranium Enrichment Facilities, National Research Council, D.F. Stein, Chairman, National Academy of Science, *National Academy Press, 1996*

Executive Summary - DUF6

A DOE study has found that past practices for storage of DUF6 have been inadequate in several respects (see reference below). There have been no serious consequences, however, and there is a vigorous program to correct past deficiencies.

There is general agreement, however, that DUF6 is an unsuitable chemical form for long-term storage; it is to reactive and volatile. Eventually it needs to be converted to the more suitable form of uranium oxide (U3O8). No large-scale uses have been identified, and the most promising potential uses do not preclude conversion to oxide.

> Recommendation. The committee recommends that, if consistent with the prioritized cost-and risk-reduction process, the DUF6 should be converted to the more stable chemical form, U3O8, for storage or disposal.

Reference: DOE, 1992, U. S. Department of Energy Independent UF6 Cylinder Assessment Team Draft Preliminary Report. Oak Ridge, Tennessee: DOE Oak Ridge Field Office.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from Draft PEIS, December, 1997

"In nearly 40 years of cylinder handling activities, no accidents involving releases from cylinders containing uranium hexafluoride have occurred that have caused diagnosed irreversible adverse effects among workers."

Excerpt from U. S. Nuclear Regulatory Report NUREG-1198, dated June, 1986, Executive Summary

"On January 4, 1986, at 11:30 a.m., a Model 48Y cylinder filled with uranium hexafluoride (UF6) ruptured while it was being heated in a steam chest at the Sequoyah Fuels Corporation facility near Gore, Oklahoma. The incident resulted in the death of one plant worker and injuries to several others as a result of exposure to hydrofluoric acid, a reaction product of UF6 and airborne moisture."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpt from CONF-9110117, Second International Conference, Uranium Handling Conference, 1991, *"UF6 Overfilling Prevention at Uurodif Production, Georges Besse Plant, p.65*

" On January 4th, 1986, a 48 Y model cylinder of uranium hexafluoride opened up while it was being heated in an oven at the uranium fluorination plant located near Gore, Oklahoma (USA) and operated by the Sequoyah Fuels Corporation. This accident caused the death of a plant employee and intoxication of several other people subsequent to exposure to the vapors produced by the released uranium hexafluoride (UF6), especially the hydrogen fluoride. Emission of toxic vapors lasted roughly 40 minutes. Carried by winds blowing at 40 km/hr, the cloud was visible more the 1.5 km away from the site of the accident. " (Accident reported in NUREG-1179, Vol. 1, February, 1986)

"The accident is one of the most serious accidents known yet involving uranium hexafluoride (UF6), given both the human consequences as well as the amount of UF6 released: approximately 13 tons of natural UF6."

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

FILL LIMIT PROBLEM

Excerpts from "A Review of UF6 Cylinder Practices and Criteria", C. W. Walter, KY/L - 1522, March, 1989

page 3. The determination of a maximum fill limit involves concern for system safety and efficiency. During much of the past 40 years of filling Model - 48 cylinders, a uniform safety factor was not established and even today discussions and changes are being made as concerns are raised and evaluated. - The physical property of UF6 to expand in volume as much as 40 percent when heated from a solid state at ambient temperature to a liquid at working temperature can create substantial containment problems. A cylinder, when completely filled with liquid at 175 degrees F and then heated above that temperature, will rupture due to hydraulic forces generated by the expanding liquid, thereby spilling the contents of the cylinder.

page 5. However, there are cylinders in storage yards that are filled to earlier fill limits which assumed greater minimum volumes than presently assumed and based on 100 percent fill. These cylinders cannot be shipped unless the excess material is removed and the cylinder meets the current shipping limits.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Corroded DUF6 Cylinders (less than 0.25-in. wall thickneess) Unloaded By Improper Process

Reference: Occurrence Report No. ORO-MMES-PGDPOPERD-1992-0018, dated March 10, 1992

Excerpts from Item 15. Description of Occurrence:

Two cylinders of non-enriched uranium hexafluoride (normally called "feed") were not fed by the precautionary method (normally called "cold feed") because hold tags had not been attached to them. -- Information that these steel cylinders had thin areas in parts of their surfaces was not properly communicated nor responded to. The "cold feed" method eliminates the possibility of surface rupture of cylinders with thin surface areas. "Cold feeding" is a plant practice whereby cylinders with surface thickness less than .250 inches are fed at reduced temperature, keeping cylinder pressure below atmospheric pressure. - -The two cylinders in question had areas of .245 inches and .223 inches respectively.

Item 23. Evaluation : (By Facility Manager/Designee

There appears to be deficiencies in both clearly defined procedures and formality in communication in this area. The lack of clearly established roles and responsibilities led to this occurrence.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Bending of Cylinder Walls

Excerpt from Martin Marietta Internal Memorandum, "Fourteen Ton Cylinder Problems", Victor M. Perez, PORTS, Chairman of UF6 Safety Handling Committee, to Roger McDermott, dated June 21, 1990.

page 1. "It was reported that another cylinder was stepped on by a UMH supervisor, and he felt the wall give. The Committee agreed to investigate this situation further.

Additional Information on Bending of Cylinder Walls

There are undocumented accounts of transport drivers noting flexing of cylinder walls during tie-down of cylinders on trailers.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Table 7-3. Comparison of Management Options for UF6

Evaluation Factor	Conversion to Oxide	Continued Storage
Health and Safety	Reduces hazard by conversion to a more stable form. Potential for occupational exposure and injury during conversion.	Hazard from storage of very reactive UF6. Hazard greatest during periodic transfer into new containers and if exposed to fire.
Future Considerations	No legacy to future generations. Oxide can be used as feedstock or disposed of.	Decommissioning of GDP site cannot be completed with this option. DUF6 still requires ultimate disposition.

Reference: "Affordable Cleanup?", National Research Council, 1996, page 171

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "Integrity of Uranium Hexafluoride Cylinders, Defense Nuclear Facilities Safety Board, DNFSB/TECH-4, May 5, 1995, p. 16

"A paper entitled *Investigation of Breached Depleted UF6 Cylinders*, presented at the Second Internaional Conference on Uraniulm Hexafluoride Handling, proposed experimental effort directed at examining the effect of a hole near the top of the cylinder that remains undetected. Scenarios had been proposed that could lead to a steam-driven expulsion of contaminmated liquid and HF from the cylinder due to the accumulation of water in the vapor space (due to rain and condensation) and subsequent chemical reactions. Further examination of this potential accident would appear warranted, based on the information available to-date."

"Consequences of seismic events in the storage yards are not addressed."

(Gene Hoffman Note: The hole-in- top of a cylinder safety concern cited above is justified by the possibility of cracks or holes resulting from transportation accidents or seismic events. The consequences of seismic events are very important when one considers that all options evaluated by DOE in the PEIS involve storage of degraded DUF6 cylinders for many, many years. This is especially true in view of the documents produced by many New Madrid experts, including Otto Nuttli. In 1973 Nuttli estimated that a 7.6 earthquake could occur in the Paducah region today.)

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "Integrity of Uranium Hexafluoride Cylinders" Defense Nuclear Facilities Board (DNFSB) Report DNFSB/TECH-4, May 5, 1995

page 5. The report (*The Ultimate Disposition of Depleted Uranium, T. R. Lemons, et al., K/ETO-44, December, 1990)* discussed possible options for ultimate disposition, such as transfer or sales to other government programs or to the private sector, but recognized that commercial and government sectors would use only a small fraction of the depleted uranium in the foreseeable future. The report recommended that: UF6 cylinders be inspected on a semi-annual basis; cylinder maintenance and storage yards be up-graded; and depleted uranium be converted to U3O8 for long-term storage or disposal. Contrary to the last recommendation, the present plan established by DOE provides for long-term storage of the depleted uranium stockpile as UF6 until conversion to uranium oxide begins in fiscal year 2020.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.) KNOXVILLE, TENNESSEE

Excerpts from "UF6 Long-Term Storage Cylinder Integrity Management Plan, K/ETO-114, September, 1992

page 2. With the growing inventory of depleted UF6, a study of the ultimate disposition of DU was conducted by Energy Systems in 1990. This study reviewed the actual and potential used for DU and provided recommendations toward the ultimate disposition. The study concluded that there are currently **few alternative uses of this material.**

page 3. In the past two years, significant substandard conditions have been identified. For example, cylinders in and near ground contact have been observed with accelerated corrosion; accelerated corrosion at the skirt-to-head connection has been reported, and improper stacking of these cylinders has been idenfied. All of these conditions can affect the life expectancy of the conainment vessels.

COMMENTOR NO. 53: HOFFMAN, EUGENE (CONT'D.)
KNOXVILLE, TENNESSEE

Uses for Depleted Uranium (Reference: "Affordable Cleanup?", National Research Council, 1996, pp. 158-163.

Shielding Applications

" The UO2 suggested for Ducrete represents a very high density oxide but is not the thermodynamically stable form; U3O8 (uranium oxide) has a lower density but is the stable form and would probably be the preferred form for any Ducrete planned for long-term use. Consequently, proposals for the use of Ducrete would not conflict with a decision to convert DUF6 to a more stable oxide."

Use as a Fluorination Agent

"An inherent disadvantage of these fluorination schemes using UF6 is the need to introduce uranium into otherwise nonradioactive chemical plants, with the resulting complications of licensing, radiation protection,and low-level waste generation."

Re-enrichment or Dilution

DUF6 Enrichment by AVLIS - "AVLIS requires uranium metal feed, so the DUF6 must be converted to metal; this conversion is an expensive process. - - Final decisions on AVLIS, in praticular the use of DUF6 feed, are probably several years in the future. In the meantime, significant quantities of low 235U assay UF6 (less than 0.21 percent 235U) could be converted to U3O8 without affecting the potential use as AVLIS feed."

Blending Agent - "The volumes of material required for blending are not large. Thus a blending agent would have little effect on a decision to proceed with conversion of the DUF6 to U3O8."

Potential Energy Resource for Reactors - "The deployment of the breeder reactor in the United States is uncertain. Based on an economic analysis, a recent NRC report notes the advanced liquid-metal reactors may become competitive with advanced light-water reactors sometime in the latter part of the 21st century (NRC, 1996). Hence, the potential use of DUF6 as a resource for breeder reactors is relatively far in the future."

COMMENTOR NO. 54: HANSON, KRISTI & DONHAM, MARK
BROOKPORT, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **54-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **54-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **54-3**

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. **54-4**

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **54-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **54-6**

Thank you for considering these comments.

Sincerely,

Kristi Hanson Kristi Hanson
Mark Donham Mark Donham
RR1
Brookport Il. 62910

COMMENTOR NO. 55: KENTUCKY RADIATION HEALTH & TOXIC AGENTS BRANCH FRANKPORT, KENTUCKY

Depleted Uranium Hexafluoride Management Program

Comment Form

The Department of Energy is interested in your comments on the *Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.*

There are several ways to provide comments on this document and these include:

- ✓ attending public hearings and giving your comments directly to DOE officials
- ✓ returning this comment form to the registration desk at the hearing
- ✓ returning this comment form or other written comments to the address on the back
- ✓ faxing your comments to 301/428-0145
- ✓ commenting via the Depleted UF_6 World Wide Web site: http://www.ead.anl.gov/uranium.html
- ✓ calling toll-free and leaving your comments via voice mail, 1-800-517-3191
- ✓ commenting via electronic mail: depleted_uf6@ccmail.gmt.saic.com

Comments

① DOE must immediately move to convert the entire inventory of DU to the oxide for long term storage. **55-1**

② Conversion can not wait for ten years or any period of time. **55-2**

③ DOE must conduct the conversion to the oxide at its present storage location. No transportation of DU to a conversion facility **55-3**

④ all cylinders must be checked for integrity prior to moving to the on-site conversion facility. all oxide must be stored on-site under cover. **55-4**

Thank you for your input. Please use additional sheets if necessary and attach them to this form.

Name John A. Volpe PhD (optional)
Organization Kentucky Radiation Health & Toxic Agents Branch
Address 275 E. Main St; MS HS2E-D (optional)
City Frankfort State KY Zip 40601
Phone number 502/564-3700 (optional)
E-mail address JVolpe@mail.state.ky.us (optional)

☒ Please add my name to the Depleted UF_6 mailing list.
☐ Please take my name off the Depleted UF_6 mailing list.

DEPLETED UF_6

Depleted Uranium Hexafluoride Management Program • Charles E. Bradley, Jr.
Department of Energy • Office of Nuclear Energy, Science and Technology • Office of Facilities
19901 Germantown Road • Germantown, MD 20874 •301/903-4781

COMMENTOR NO. 56: OAK RIDGE RESERVATION LOCAL OVERSIGHT COMMITTEE OAK RIDGE, TENNESSEE

LOC INC
Oak Ridge Reservation
Local Oversight Committee

April 22, 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Submitted Via Fax: (301) 428-0145

Subject: Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (UF6)

Dear Mr. Bradley:

The Citizens' Advisory Panel (CAP) of the Oak Ridge Reservation (ORR) Local Oversight Committee (LOC) submits the following comments on the subject document. Several members of the CAP attended the February 24, 1998, public hearing on the PEIS and reviewed the available documentation. The LOC Board has not had the opportunity to review and approve the comments and thus these comments should be considered submitted by the CAP only.

The LOC is a non-profit regional organization funded by the State of Tennessee and established to provide local government and citizen input into the environmental management and operation of the DOE ORR. The Board of Directors of the LOC is composed of the County Executives of Anderson, Knox, Loudon, Meigs, Morgan, Rhea, and Roane Counties; the Mayor of the City of Oak Ridge: and the Chairs of the Roane County Environmental Review Board (RCERB), the City of Oak Ridge Environmental Quality Review Board (EQAB), and the LOC Citizens Advisory Panel (CAP). The CAP currently has 19 members with diverse backgrounds representing the greater ORR region.

The CAP concurs that the alternatives considered in the PEIS are appropriate, but the assumptions which delay action to 2009 with completion in 2028 are not acceptable. We understand that the continued storage of the UF6 cylinders does not pose an immediate health or environmental threat. However, as time passes, the task of assuring safe storage will become more demanding, with increasing cost for surveillance and maintenance of the deteriorating cylinders. **56-1**

The condition of the oldest cylinders at Oak Ridge and Paducah should be considered when planning for decontaminating and decommissioning (D&D). The toxicity of the fluorine component is the primary concern with regard to health risk, although release of depleted uranium to the environment could result in a costly public relations disaster. **56-2**

Anderson • Meigs • Rhea • Roane • City of Oak Ridge • Knox • Loudon • Morgan

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COMMENTOR NO. 56: OAK RIDGE RESERVATION LOCAL OVERSIGHT COMMITTEE (CONT'D.) OAK RIDGE, TENNESSEE

C. E. Bradley, Jr.
April 22, 1998
Page 2

As you may know East Tennessee Technology Park (ETTP, formerly K-25) has an active reindustrialization program underway. The continued presence of the UF6 cylinders might negatively impact the site reuse activities from an aesthetic viewpoint or as a perceived risk to co-located workers, as well as by the loss of the storage yard land to new uses. **56-3**

DOE has a responsibility to begin reducing its stockpile of UF6. The CAP urges that an expedited conversion program be started immediately. We have reviewed the voluminous amount of information associated with this subject and the variety of suggestions on how to properly handle this situation. Our recommendations follow: **56-4**

1. Increase and expedite the current maintenance program to clean and paint all cylinders starting with the most needy. **56-5**
2. Improve the storage conditions so that all cylinders are accessible and safe.
3. Convert the UF6 to the more stable oxide (triuranium octaoxide) or metal form. There do not appear to be any technical barriers to beginning conversion. Begin the conversion process as soon as feasible. **56-6**
4. Start conversion with the oldest cylinders and those in the worst physical condition.
5. Place the conversion products in interim storage until a decision is made for permanent storage, use, or disposal.

The Energy Policy Act of 1992 provides for payment of the costs of remedial actions at gaseous diffusion facilities from the Uranium Enrichment & Decommissioning Fund. Appropriations received to date have lagged behind the available funds by an approximate factor of two. We urge that this money be made available in a timely manner for the UF6 processing that is needed. **56-7**

The LOC's CAP appreciates the opportunity to comment on the *Draft PEIS for Alternative Strategies for the Long-Term Management and Use of Depleted UF6*. If you have any questions, please call me at (423) 483-1333.

Sincerely,

Susan L. Gawarecki, Ph.D.
Executive Director

cc: LOC Board
LOC Citizens' Advisory Panel
Earl Leming, TDEC DOE-O
Bill Pardue, Chair, ORREMSSAB

COMMENTOR NO. 57: LAMB, RONALD KEVIL, KENTUCKY

APRIL 22, 1998

CHARLES E BRADLEY, JR.
OFFICE OF FACILITIES (NE-40)
OFFICE OF NUCLEAR ENERGY, SCIENCE AND TECHNOLOGY
U.S. DEPARTMENT OF ENERGY
19901 GERMANTOWN ROAD
GERMANTOWN, MD 20874-1290

COMMENTS: DEPLETED URANIUM HEXAFLUORIDE MANAGEMENT PROGRAM

THE CYLINDERS SHOULD CONTINUE TO BE STORED. THE OLDER OR COMPROMISED CYLINDERS SHOULD BE PLACED IN OVER PAKS LIKE THOSE USED TO PROTECT DRUMMED WASTE. ALL CYLINDERS SHOULD BE STORED IN AN EARTHQUAKE SECURE FACILITY. **57-1**

NO CONVERSION TO U308 SHOULD TAKE PLACE AT THE PADUCAH SITE DUE TO THE PROXIMITY OF THE NEW MADRID EARTHQUAKE FAULT AND THE CLOSE PROXIMITY OF THE PLANT NEIGHBORS. **57-2**

CONVERSION TO U308 WILL ADD TO THE WASTE INVENTORY BECAUSE OF THE LARGE VOLUME OF CYLINDERS. IF CONVERSION HAD BEEN CONSIDERED AT AN EARLIER TIME THE WASTE STREAMS COULD HAVE BEEN HANDLED EASIER. **57-3**

QUESTIONS:

IF CYLINDERS SHOULD BUMP INTO EACH OTHER DURING A SEISMIC EPISODE AND BREAK OFF NUMEROUS FILL VALVES, ARE THERE PROCEDURES IN PLACE TO HANDLE A LARGE NUMBER OF VALVE REPLACEMENTS ? **57-4**

HOW MANY BROKEN FILL VALVES IN THE 30,000 PLUS CYLINDERS WOULD CONSTITUTE A EMERGENCY ? **57-5**

WOULD STACKING THE CYLINDERS TWO HIGH IN CLOSE ROWS ADD TO THE DAMAGE OF MORE FILL VALVES BEING BROKEN DURING A SEISMIC EPISODE ? **57-6**

THANK YOU,

RONALD LAMB
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COMMENTOR NO. 57: LAMB, RONALD (CONT'D.)
KEVIL, KENTUCKY

finger?quake@elrond.ceri.memphis.edu at samwi... Page 1 of 3

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[elrond.ceri.memphis.edu]
Login name: quake                       In real life: Quake Informat
Directory: /ceri31/scis/quake           Shell: /usr/local/bin/tcsh
Last login Mon Oct  6, 1997 on ttyp6 from yavanna
Unread mail since Thu Apr  9 22:50:24 1998
Plan:

The following catalog is for earthquakes in the New Madrid seismic zo
and is produced by the Cooperative New Madrid Seismograph Network (CN
a member of the Council of the National Seismic System.  CNMSN suppor
comes from the United States Geological Survey and the State of Tenne

In the early 1800's, the New Madrid seismic zone was the site of what
are considered to be the largest earthquakes to have occurred in the
conterminous United States.  During the winter of 1811-1812, a series
of three earthquakes, estimated at magnitude 8 or larger, struck in a
period of three months.  There have been several magnitude 6-7 events
since that time and there is a continuing activity of small earthquak
that defines the present day seismic zone.  The principal seismic act
is found in western Tennessee, northeast Arkansas, and southeast Miss

Other catalogs for various regions of the United States can be obtain
using the finger mechanism 'finger quake@machine'.  The following lis
gives the machine names for different regions.

        uldfs.cr.usgs.gov       (USGS NEIC/NEIS world-wide)
        andreas.wr.usgs.gov     (Northern California)
        scec.gps.caltech.edu    (Southern California)
        fm.gi.alaska.edu        (Alaska)
        seismo.unr.edu          (Nevada)
        mbmgsun.mtech.edu       (Montana)
        eqinfo.seis.utah.edu    (Utah)
        sisyphus.idbsu.edu      (Idaho)
        quake.eas.slu.edu       (Central United States)
        tako.wr.usgs.gov        (Hawaii)

Additional catalogs and information are available on the World Wide W
at the URL 'http://www.geophys.washington.edu/seismobig.html'.

The Date/Time is given in Universal Time Coordinates (UTC), which
is 6 hours ahead of Central Standard Time (5 hours ahead of CDT).

Magnitudes are reported as Md (local duration magnitude) unless
otherwise noted.

Q denotes the location quality: A = good, D = poor.

Updated on December 12 10:00 CDT 1997.

 DATE-(UTC)-TIME   LAT    LON     DEP  MAG  Q       COMMENTS
yy/mm/dd hh:mm:ss  deg.   deg.    km
97/02/10 13:25:35  36.25N 89.45W  10.0 1.8  B  RIDGELY, TENNESSEE
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COMMENTOR NO. 57: LAMB, RONALD (CONT'D.)
KEVIL, KENTUCKY

finger?quake@elrond.ceri.memphis.edu at samwi... Page 2 of 3

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97/02/17 16:32:28  35.95N  90.60W  30.0 2.4   D  GOOBERTOWN, ARKANSAS
97/02/19 15:38:44  35.75N  90.14W   0.3 1.4   B  LENNIE, ARKANSAS
97/02/24 01:48:10  35.76N  90.14W   4.5 2.0   D  MISSISSIPPI CO., ARK
97/03/05 21:11:32  36.05N  89.80W   7.3 2.3   D  COOTER, MISSOURI
97/03/06 12:40:51  36.24N  89.44W   5.6 2.3   B  RIDGELY, TENNESSEE
97/03/07 23:38:58  36.26N  89.51W   7.5 2.0   B  RIDGELY, TENNESSEE
97/03/09 06:38:10  36.23N  89.43W   8.8 1.9   A  BOGOTA, TENNESSEE
97/03/12 11:16:12  36.54N  89.62W  24.7 2.2   D  CONRAN, MISSOURI
97/03/16 16:59:56  36.54N  89.67W  25.0 2.2   D  PORTAGEVILLE, MISSOU
97/03/16 19:07:28  34.27N  93.49W   5.0 3.4   D  GLENWOOD, ARKANSAS
97/03/21 03:07:56  36.15N  89.70W   9.1 2.1   A  ACORN CORNER, MISSOU
97/03/21 17:39:13  36.81N  89.51W   2.0 2.5   D  DOGWOOD, MISSOURI
97/03/23 09:36:34  36.18N  89.41W   9.1 1.9   B  MILLSFIELD, TENNESSE
97/04/06 14:41:12  36.25N  89.46W  10.5 1.6   A  RIDGELY, TENNESSEE
97/04/06 16:48:34  36.24N  89.46W  10.6 1.2   A  RIDGELY, TENNESSEE
97/04/12 02:27:18  36.01N  89.83W  25.7 1.4   B  HERMONDALE, MISSOURI
97/04/18 09:40:03  36.07N  89.89W  10.0 2.0   D  DENTON, MISSOURI
97/04/20 15:50:56  36.12N  89.75W  13.5 2.1   A  ACORN CORNER, MISSOU
97/04/26 00:50:26  36.46N  89.58W  16.0 1.8   D  PLEASANT POINT, MISS
97/05/02 03:13:48  36.25N  89.42W  10.8 1.3   B  RIDGELY, TENNESSEE
97/05/14 20:40:21  37.74N  87.58W  10.0 2.3   D  HENDERSON CO., KENTU
97/05/18 20:50:40  35.24N  91.25W  13.5 2.6   D  PATTERSON, ARKANSAS
97/05/20 05:28:32  36.65N  89.59W   5.0 2.2   D  KEWANEE, MISSOURI
97/05/20 22:24:57  36.32N  89.57W   5.6 1.6   A  MOORING, TENNESSEE
97/05/22 14:58:01  36.32N  89.54W   6.9 1.7   A  MOORING, TENNESSEE
97/05/23 05:34:08  36.63N  89.57W  11.4 2.0   B  KEWANEE, MISSOURI
97/05/31 21:52:55  36.31N  89.53W   5.9 2.1   B  MOORING, TENNESSEE
97/06/02 19:09:52  36.29N  89.46W   7.9 1.9   A  MADIE, TENNESSEE
97/06/14 05:43:48  37.16N  89.32W   2.0 2.2   D  SANDUSKY, TENNESSEE
97/06/17 01:30:41  36.30N  89.53W   8.1 1.8   A  MOORING, TENNESSEE
97/06/17 06:44:40  36.28N  89.54W   8.9 2.1   A  MOORING, TENNESSEE
97/06/26 17:55:30  36.67N  89.60W   3.1 2.5   D  KEWANEE, MISSOURI
97/07/03 12:45:00  36.33N  89.53W  11.8 2.0   B  MOORING, TENNESSEE
97/07/10 02:25:32  35.43N  89.55W  10.0 2.2   D  MASON, TENNESSEE
97/07/13 02:18:20  36.11N  89.76W  10.0 2.1   B  ACORN CORNER, MISSOU
97/07/21 20:30:43  36.44N  89.56W  15.5 2.2   A  POINT PLEASANT, MISS
97/08/09 19:07:50  35.68N  90.51W  11.4 2.2   D  TRUMANN, ARKANSAS
97/08/21 19:29:35  35.99N  89.85W  13.6 2.3   B  BLYTHEVILLE,ARKANSAS
97/09/03 18:16:40  36.63N  89.57W  8.01 2.2   D  NEW MADRID, MISSOURI
97/09/17 18:16:32  35.66N  90.48W   5.0 3.4   D  TRUMANN, ARKANSAS
97/09/24 04:20:26  35.58N  89.88W  26.0 3.0   D  TALLAPOOSA, MISSOURI
97/09/20 05:55:57  36.91N  90.69W  10.9 2.5   D  66.21 km west of Dex
97/09/27 12:14:11  36.19N  89.42W   6.6 2.9   B  CLOVERDALE, TENNESSE
97/10/02 06:56:16  36.00N  88.99W  15.0 1.9   B  25km E of DYERSBURG,
97/10/06 03:13:29  36.32N  89.45W   5.0 1.5   D  RIDGELY, TENNESSEE
97/10/17 09:50:51  36.15N  89.03W  10.0 1.5   D  MARTIN, TENNESSEE (A
97/10/20 01:00:46  36.02N  89.21W  10.0 1.2   D  DYERSBURG, TENNESSEE
97/10/24 08:35:16  31.17N  87.25W   5.0 4.9      BREWTON, ALABAMA (NE
97/10/26 23:27:12  31.10N  87.30W  10.0 3.7Lg    BREWTON, ALABAMA (NE
97/10/28 09:00:10  31.10N  87.30W  10.0 3.0Lg    BREWTON, ALABAMA (NE
97/11/05 17:06:02  35.63N  90.39W       1.6   C  MARKED TREE, ARKANSA
97/11/09 20:40:57  36.37N  89.48W   8.7 1.4   D  RIDGELY, TENNESSEE (
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COMMENTOR NO. 57: LAMB, RONALD (CONT'D.) KEVIL, KENTUCKY

finger?quake@elrond.ceri.memphis.edu at samwi... Page 3 of 3

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97/11/28 10:28:45  36.09N  89.73W  11.0 2.5    B  PEMISCOT CO, MISSOUR
97/12/02 23:41:15  36.57N  89.51W   7.9 2.7    B  FULTON CO. KENTUCKY
97/12/12 08:42:21  33.73N  87.20W  10.0 4.0Lg  A  WALKER CO. ALABAMA (
98/01/09 09:05:59  36.56N  89.52W   7.0 2.2    B  New Madrid, Missouri
98/01/17 19:40:07  36.58N  89.62W   6.5 2.2    B  New Madrid, Missouri
98/01/27 09:58.40  36.12N  89.57W  12.0 2.5    A  Dyersburg, Tennessee
98/01/28 22:05:12  36.10N  89.76W  11.4 2.7Lg  B  Caruthersville, Miss
98/02/12 09:37:49  36.14N  89.71W   9.6 3.0    A  Caruthersvi,lle Miss
98/02/19 14:05:27  36.54N  89.58W   8.9 2.7    A  New Madrid, Missouri
98/02/19 22:22:49  36.48N  89.56W   8.2 1.9    A  New Madrid, Missouri
98/02/26 02:10:25  36.49N  89.56W   5.2 2.5    B  New Madrid, Missouri
98/03/11 08:09:43  36.63N  89.32W   5.0 1.5    C  13.63 km northwest o
98/03/13 03:05:27  36.26N  89.61W   7.4 2,0    B  10.69 km north of Ca
98/03/15 06:56:46  36.43N  89.52W   5.3 2.5    B  6.63 km northwest of
98/03/21 06:52:23  36.15N  89.47W  15.8 1.6    B  12.51 km south of Ri
98/04/08 18:16:54  36.60N  89.02W  15.1 3.2Lg  D  16.16 km east of Hic
98/04/09 05:13:41  36.40N  89.53W   6.8 2.7Lg  B  3.48 km norwest of T
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COMMENTOR NO. 58: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH TAKOMA PARK, MARYLAND

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Comments of the Institute for Energy and Environmental Research on the draft of the Department of Energy Programmatic Environmental Impact Assessment for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, December 1997

by

Annie Makhijani and Arjun Makhijani

March 1998

The Department of Energy's Draft Programmatic Environmental Impact Statement (PEIS)for Alternative Strategies for the Long-Term Management of Depleted Uranium Hexafluoride purports to analyze the impacts of the storage, use and/or disposal of the 560,000 metric tons of depleted uranium hexafluoride currently stored in 46,422 cylinders at three sites located near Portsmouth, Ohio; Oak Ridge, Tennessee; and Paducah, Kentucky. This long term management is for the depleted uranium generated prior to 1993.

In this report the DOE examines six alternatives:

- The "no action" alternative which would be a continuation of the current management program, that is storage on site in cylinders of the depleted uranium hexafluoride.
- Two storage alternatives based on retrievability
  - in UF_6 form in yards, buildings or an underground mine
  - in oxide form in buildings, below-ground vaults or an underground mine
- Two use alternatives
  - radiation shielding for casks for storage of spent fuel or high level wastes after conversion to metal
  - radiation shielding for casks for storage of spent fuel or high level wastes after conversion to oxide
- Disposal as low-level waste in the oxide form in drums placed in
  - shallow earthen structures
  - vaults
  - mines

The Draft also makes mention of other possible uses of depleted uranium as part of the use alternatives (see below).

COMMENTOR NO. 58: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (CONT'D.) TAKOMA PARK, MARYLAND

One of these alternatives will be selected in the Record of Decision, which is scheduled for this year. DOE's preferred alternative is to use the entire inventory of depleted uranium after its conversion to a metal and/or oxide form.

The DOE's effort to address the long-term management of the country's depleted uranium hexafluoride, specifically the realization of the importance to convert this material into a stable form is long overdue. The draft PEIS is seriously deficient because it does not address the most environmentally appropriate option - specifically, the DOE did not include the alternative of disposing of depleted uranium according to the rules of 40 CFR 191 which govern the disposal of transuranic (TRU) wastes. IEER, in its comments (Mar 22, 1996) on DOE's Notice of Intent (Jan 25, 1996), had already noted that the proposed list of alternatives was incomplete since it did not include the option of disposal under 40 CFR 191. The DOE has rejected our comments without providing any technical or environmental explanation. Our comments of March 22, 1996 are attached . DOE should include this option in the Final PEIS. **58-1**

IEER agrees with DOE that the no action alternative is inappropriate and should be rejected because of the dangers of UF_6 storage. For the same reason, long-term UF_6 storage in new containers should also be rejected. Overall, conversion to oxide would reduce risks. While conversion poses risks to workers and the off-site population, continued storage also poses serious risks. **58-2**

However, the various alternatives the DOE has considered have not been properly assessed in this PEIS.

A. Conversion of uranium hexafluoride

Most of the alternatives considered involve the conversion of uranium hexafluoride. Three alternatives would convert uranium hexafluoride to an oxide and one alternative would convert uranium hexafluoride to a metal. This conversion would have the positive result of putting the depleted uranium in a more stable chemical form, therefore eliminating the chances of an hazardous releases of UF_6 and hydrofluoric acid from aging corroding cylinders. DOE's analysis is incomplete or deficient in regard to the **58-3**

- fate of the empty cylinders,
- commercial use of contaminated anhydrous hydrogen fluoride (produced during the conversion process),
- the radiological effects on workers.

1. Fate of the empty cylinders

DOE admits that ".. the ultimate disposition of the empty cylinders was not analyzed in detail as part as the alternative management strategies." The empty cylinders would become part of the DOE scrap metal inventory. The options for disposition are: recycling **58-4**

COMMENTOR NO. 58: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (CONT'D.) TAKOMA PARK, MARYLAND

"... into LLW disposal containers, reuse as LLW containers, free release for re-melting, and disposal as LLW." However DOE has not analyzed the environmental and health impacts of these proposals. This lack of analysis is a serious problem since the volume of contaminated metal involved is large and doses to the public and to workers may be significant. **58-4 (Con't.)**

2. Commercial use of contaminated HF and CaF_2

The DOE has not properly assessed the management of both HF, a by-product of the conversion process, and calcium fluoride (CaF_2), a product of the neutralization of HF. Both these products will be slightly contaminated and in the Cost Analysis Report for the Long-Term Management of Depleted Uranium Hexafluoride concerns are expressed as to the public acceptance of the uranium contaminants. Regardless of this concern, the DOE, in its Draft PEIS, assumed that these products could be commercially sold for unrestricted use. It is unacceptable to release a non-labeled contaminated product which has not received public acceptance. The Cost Analysis Report also states that the demand for HF is "still very uncertain". An other option is to use the HF for the production of UF_6. For this option as well as the commercial use option, DOE has not addressed the fact that part of the UF_6 inventory is recycled UF_6 which is contaminated by radionuclides other than uranium-238, such as Tc-99 and U-236 which both have a long half life. **58-5**

3. Radiological effects on workers

In their calculation of radioactive dose assessment, DOE does not take into account internal radiation doses that would be received by involved workers during the conversion process. This is a serious deficiency since involved workers are the most at risk. DOE claims that measures taken to prevent inhalation and ingestion of radioactive material would effectively protect the involved workers. The emphasis on prevention measures is not enough without a monitoring program installed for health purposes. DOE also claims use of respirators will reduce workers doses. But routine reliance on respirators is unacceptable as a radiological control practice. Moreover, some of the depleted uranium comes from the enrichment of UF_6 from recycled uranium from spent fuel. This UF_6 contains some radionuclides of concern such as technitium-99, a long lived beta emitter and uranium-236, a long lived alpha emitter. DOE does not seem to have analyzed the radiological impacts. **58-6**

B. Uses of depleted uranium

1. Uses analyzed

DOE's preferred alternative is to use the entire inventory of depleted uranium after its conversion to a metal or an oxide form for radiation shielding in storage casks for spent fuel. However since these casks would have to be licensed by the NRC (6.11-9-1 Engineering analysis report) this choice is premature. Even if the licensing is approved cask fabrication creates more problems than solutions. The problems are that **58-7**

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- it is not a final solution since the casks envisioned do not meet the criteria for deep repository disposal. Hence this is not a solution but a stop-gap storage method that would create more contamination and radioactive waste in the form of used casks. The DOE has not done the preliminary work ascertaining the license ability of the casks. DOE's choice of preferred option is premature and inappropriate.
- DOE doesn't say what will happen to the DU in the casks. It only states that: "No assumptions were made regarding the fate of the oxide- and metal-shielded casks after use. The empty casks could be recycled, stored, or disposed of as LLW." (p. H-32).

58-7 (Con't.)

For the manufacturing casks as with the conversion process, the contribution to the dose from internal radiation to involved workers has not been assessed.

2. *Other uses not analyzed in depth*

With the long-term storage options DOE preserves the possibility to pursue the use of depleted uranium in light water reactor fuel cycle, advanced reactor fuel cycles and, dense material applications. The light water reactor option has two sub-options: the re-enrichment of DU and the use of DU for MOX. Among these options, the fact that the use of depleted uranium in advanced reactors (that is fast neutron reactors, also known as breeder reactors) is at all considered is particularly disturbing. Depleted uranium being the raw material for plutonium production, by converting it into a material not only much more radioactive but also weapons usable would not only defeat the stated purpose of the PEIS which is to "achieve the safe and effective long-term management of depleted UF_6." It would also have serious proliferation consequences.

58-8

3. *Uses not analyzed*

The feasibility of using depleted uranium hexafluoride for the blending down of surplus highly enriched uranium was not considered in this PEIS. Although it would utilize only a small portion of the stock, this use would have several advantages, among them: the contribution to non-proliferation, a minimum of handling, and incorporation of depleted uranium into spent fuel. This use option could be made part of any of the alternatives except UF_6 storage.

58-9

C. IEER's recommendations

IEER recommends that:

- depleted uranium be classified as a waste equivalent to TRU waste for management purposes

58-1 (Con't.)

- UF_6 be converted to an oxide form and declared a waste to be handled on a par with repository-designated TRU waste, with the possible exception of a relatively small quantity to be used for the blending down of highly enriched uranium. This should be the preferred option in the Final PEIS

58-2 (Con't.)

COMMENTOR NO. 58: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (CONT'D.) TAKOMA PARK, MARYLAND

- The issue of internal radiation for involved workers during conversion and cask fabrication be addressed carefully along with an assessment of the effects of uranium-236 and technitium-99

58-6 (Con't.)

- the fate of the empty UF_6 cylinders and their proper disposition should be studied

58-4 (Con't.)

- the fate of the anhydrous hydrogen fluoride and calcium fluoride should be properly studied
- radioactive materials such as HF from UF_6 processing and steel from empty UF_6 cylinders not be circulated in the civilian economy.

58-5 (Con't.)

COMMENTOR NO. 59: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH TAKOMA PARK, MARYLAND

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Comments of the Institute for Energy and Environment on the Department of Energy Notice of Intent addressing the Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, Federal Register, Thursday, January 25, 1996

by

Annie Makhijani and Arjun Makhijani

22 March 1996

The Department of Energy has announced its intent to prepare a programmatic environmental impact statement addressing the use and/or disposal of the 560,000 tonnes of depleted uranium hexafluoride currently stored in cylinders at three sites located near Portsmouth, Ohio; Oak Ridge, Tennessee; and Paducah, Kentucky.

The DOE plans to consider a set of six preliminary alternatives:

- The "no action" alternative which would be a continuation of the current management program, that is storage on site in cylinders of the depleted uranium hexafluoride.
- Two storage alternatives based on retrievability
  - in the UF_6 form
  - in the oxide form
- Two use alternatives
  - radiation shielding after conversion to metal
  - radiation shielding after conversion to oxide
- Disposal as low-level waste in the oxide form in drums placed in
  - engineered trenches
  - below-ground concrete vaults
  - mines

IEER welcomes the DOE's effort to address the long-term management of the country's depleted uranium hexafluoride. However the DOE list of alternatives does not include all reasonable alternatives. Specifically DOE should add another option to the above mentioned list. This option would be the disposal of depleted uranium according to the rules of 40 CFR 191 which govern the disposal of transuranic (TRU) wastes.

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COMMENTOR NO. 59: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (CONT'D.) TAKOMA PARK, MARYLAND

Currently, uranium is still classified as a source material. In cases where it might be disposed of as a waste the Nuclear Regulatory Commission has put it by default into the category of class A low-level radioactive waste according to 10 CFR 61.55 (6). 10 CFR 61.55 allows near surface disposal. The inappropriateness of this default classification is demonstrated be the NRC's own assessment that shallow-land burial of depleted uranium could result in unacceptably high doses to future generations. [1] However in its notice of intent, the DOE has left the low-level category of depleted uranium ambiguous. In the three scenarios of the disposal alternative, the DOE does not specify in which low-level waste class it puts depleted uranium. The first one - disposal in engineered trenches - corresponds to a classification of depleted uranium as class A low-level radioactive waste. The last two - disposal below-ground in concrete vaults and disposal in mines - imply that the current classification is inadequate. DOE should clearly include waste classification as an issue as it relates to depleted uranium in its implementation plan and address it in detail in the PEIS.

We set forth below the scientific reasons why depleted uranium should be put in the same classification as transuranic wastes for the purpose of waste management and disposal. This would mean that depleted uranium would have to be placed in a deep geological repository.

The current definition of TRU waste according to 40 CFR 191.01 (i) is: ". . .waste containing more than 100 nanocuries of alpha-emitting transuranic isotopes, with half-lives greater than twenty years, per gram of waste . . . ."

What matters to health and environmental considerations is the specific activity of the radioactive wastes, the nature of the radiation being emitted during the radioactive decay (alpha or beta and whether the decay is accompanied by gamma radiation) and, the energy per radioactive decay. Depleted uranium is, in these essential respects, the same as the transuranic constituents of TRU waste. The specific ways in which uranium or the transuranic radionuclides in TRU waste might affect people will, of course, depend on the chemical form of the waste, the packaging, and the disposal method.

There is one nominal difference between TRU waste and depleted uranium. TRU waste consists of elements with atomic numbers greater than or equal to 93 -- that is of elements with atomic numbers greater than uranium, whose atomic number is 92. But this is a difference of nomenclature; it has no bearing upon health and environmental issues.

A. Properties of depleted uranium

1. *Specific Activity*

The radioactivity per unit weight (called specific activity) of depleted uranium metal is dominated by its principal constituent, uranium-238. It also depends somewhat on the exact extent to which uranium-235, and hence also uranium-234, have been separated and

[1] Final Environmental Impact Statement for the Construction and Operation of the Claiborne Enrichment Center, Homer Louisiana, NUREG-1484, Vol. 1, August 1994.

passed into the enriched uranium stream. It may vary from about 360 nanocuries/gram to about 450 nanocuries/gram. Even assuming that only uranium-238 remains, the specific activity would be still about 340 nanocuries/gram which is 3.4 times higher than that defining transuranic waste.

The specific activity of other chemical forms is somewhat lower than for uranium metal, because when radioactive uranium is chemically bound with non-radioactive isotopes of elements like oxygen and fluorine, its specific activity is correspondingly lower. Table 1 shows the specific activity of four forms of depleted uranium. For convenience we have assumed a single reference value of 360 nanocuries/gram for the specific activity of uranium metal which is the lowest practical value in the range cited above.

Table 1 also shows, for reference, the minimum specific activity of transuranic waste as defined by regulations and the radioactivity of ore containing 0.2 percent uranium.

Table 1
Specific Activities of various chemical forms of depleted uranium, TRU waste and 0.2% uranium ore

Chemical form	Specific activity, nCi/g
uranium metal (U)	360
uranium oxide (U_3O_8)	300
uranium tetrafluoride (UF_4)	270
uranium hexafluoride (UF_6)	240
transuranic activity in TRU waste	>100 (See note 2)
0.2 % uranium ore	4 (See note 3)

Notes for Table 1
1. Specific activities of the four forms of uranium have been rounded to two significant figures, and that of uranium ore to one significant figure.
2. The minimum limit of 100 nanocuries/gram of transuranic elements for waste to be classified as TRU waste includes only those isotopes of transuranic elements with half-lives greater than 20 years. The most common isotope in TRU waste that is eliminated from the counting in this way is plutonium-241, which has a half-life of 14.4 years. However the decay product of plutonium-241, americium-241 is included in TRU waste because it has a half-life of about 432 years. All these uranium isotopes we are dealing with in these comments have half-lives far longer than 20 years.
3. The specific activity of 0.2 percent uranium ore shown includes all decay products of uranium-238 up to and including radium-226, assuming they are in secular equilibrium with uranium-238. Radon-222, and its decay products are not included.

It is clear from Table 1 that depleted uranium is comparable in specific activity to transuranic waste. This conclusion is independent of the chemical form of the depleted uranium. Note that depleted uranium is far more radioactive than uranium ore because the ore is mixed with large quantities of non-radioactive materials. Thus, putting depleted uranium in mines is in no way like replacing the original material that was mined out of the ground. Rather it is analogous to putting TRU waste in the ground.

2. *Mode of decay, energy of decay, and half-life*

The main radionuclide of concern in most TRU waste is plutonium-239. Other radionuclides that are present in significant quantities are plutonium-240, plutonium-238, neptunium-237, and americium-241. The predominant mode of decay of all of these radionuclides is alpha decay. That is also the case with all three uranium isotopes (uranium-238, uranium-234, and uranium-235) present in depleted uranium. In all these cases, the emitted alpha particles have energies between 4 and 6 MeV, so that the total energy deposited in tissue per picocurie of radioactive material in the body is the same. Thus, once a unit of radioactivity of TRU waste or of depleted uranium is in the body, the amount of radiation dose per unit of time is approximately the same.

Table 2 shows the principal characteristics of concern of the main radionuclides in TRU waste and in depleted uranium. Note that the decay products of uranium-238 build up over hundreds of thousands of years, and we have ignored these for the sake of argument in these comments.[3]

Table 2
Properties of Uranium Isotopes and Selected Transuranium Elements

Isotope	Main decay mode	Alpha particle energy, MeV	Half-life, years	Comments
uranium-238	alpha	4.1	4.46 billion	
uranium-234	alpha	4.8	245,000	
neptunium-237	alpha	4.8	2.14 million	
plutonium-238	alpha	5.5	87.7	
plutonium-239	alpha	5.1	24,110	
plutonium-240	alpha	5.1	6,537	
plutonium-241	beta	see note 2	14.4	not included in TRU waste definition
americium-241	alpha	5.5	432	strong gamma emitter

Notes
1. All energies rounded to two significant figures. The alpha emitting radionuclides emit alpha particles with more than one characteristic energy, with each energy level being produced with a known probability. The alpha particle energy shown is an approximate average of these particles energies, weighted by the emission probability.
2. Plutonium-241 is not included in the definition of TRU waste since it has a half-life of less than 20 years. Its beta particle energy is 0.021 MeV.

B. Chemical forms of depleted uranium

As has been shown, regardless of its chemical form, depleted uranium is always more radioactive than the lowest specific activity defining TRU waste. However, some chemical forms are more reactive than others. For example UF_6 is very reactive. In the

[3] In general, the specific activity of wastes containing mainly plutonium-239 will decline as time progresses, but that of wastes containing mainly uranium-238 will increase as time progresses, due to the differences in half-lives of the decay products of these two radionuclides

COMMENTOR NO. 59: INSTITUTE FOR ENERGY AND ENVIRONMENTAL RESEARCH (CONT'D.) TAKOMA PARK, MARYLAND

presence of moist air, UF_6 reacts with the water in the air to form uranyl fluoride particulates (UO_2F_2) and hydrogen fluoride fumes (HF) both of which are very toxic. In water hydrogen fluoride becomes a very corrosive acid. Anhydrous hydrogen fluoride is also corrosive. Other chemical forms are less reactive, the oxide forms of uranium being the most physically and chemically stable. DOE should consider disposal of depleted uranium as an oxide (U_3O_8 or UO_2) under 40 CFR 191 rules.

C. Conclusions

We recognize that in comparing uranium and plutonium on the basis of equal masses of these two elements in pure form, plutonium is far more radioactive than uranium. This is because the half-lives of the isotopes of plutonium shown in Table 2 are far shorter than those of uranium. This means that a given mass of uranium decays more slowly -- that is, it gives off fewer alpha particles per unit of time. However, the far lower specific activity of uranium isotopes in depleted uranium relative to pure plutonium is irrelevant to this discussion because we are examining the properties of materials on the basis of the radioactivity per unit mass of waste to be disposed of. TRU waste is defined as that containing more than 100 nanocuries/gram. By weight it consists mainly of non-radioactive materials mixed with small masses of transuranic elements. By contrast, depleted uranium would be disposed of in nearly pure form, with only the possible addition of and element such as oxygen. As a result, TRU waste is comparable to depleted uranium. DOE TRU waste is slated for disposal in a deep geological repository.

Therefore we believe that depleted uranium should be put in the same category as TRU waste so far as its characteristics for waste management and disposal are concerned. Therefore in the PEIS the DOE should:

- reexamine the waste classification of depleted uranium based on the explicit recognition of the scientific facts discussed above and,
- add one alternative consisting of converting depleted uranium to the oxide form (U_3O_8 or UO_2), and disposing it of in a geologic repository under 40 CFR 191 rules. The proposed PEIS would be fundamentally flawed and deficient if it omitted this option.

The implementation plan for the PEIS should include these two items.

COMMENTOR NO. 60: EDMONDS, ROBERT F., JR.
OAK RIDGE, TENNESSEE

Author: Robert F Edmonds Jr

Subject. Comments on"Programmatic Environmental Impact Statement for

Following are the comments of Duke Engineering and Services Inc. (DE&S) on the draft PEIS dated December 1997.

1. Volume 1, Page S-3: We agree that conversion of the UF6 to U3O8 is the safest next step. This step can and should be initiated soon. The PEIS provides no compelling reason not to proceed with this step. There are abundant safety and environmental reasons, as documented in the PEIS, why continued storage as DUF6 is not the best alternative. Further, conversion to U3O8 does not preclude reuse of the depleted Uranium in the event national defense needs dictate or reuse options are ultimately proven cost effective. **60-1**

2. Cost Analysis Report, Paragraph 4.1.2 Treatment of Emptied Cylinders- The PEIS Cost Report assumes that empty DUF6 cylinders are crushed and sent to DOE facilities for disposal. There is no cost associated wibt disposal. This appears to be a completely unsupported assumption. There will be a cost, possibly a substantial cost, associated with disposal of the empty cylinders. They could be contaminated and require special handling. **60-2**

3. Cost Analysis Report, Paragraph 2.4.2 Use as Uranium Dioxide in DUCRETE for Shielding Applications: Report discusses the conversion of DUF6 to UO2 which in turn would be used to make DUCRETE. It should be pointed out that conversion of DUF6 to U3O8 and then to DUCRETE is an equally acceptable option. **60-3**

4. Cost Analysis Report, Paragraph 4.2.2 Revenue from Sale of Byproduct AHF and CaF2: This paragraph, as well as the PEIS Volume I, speak about sale of AHF byproduct. It should be noted that there is also a market for Aqueous HF. It is an equally acceptable option to make and market Aqueous HF. **60-4**

Thank you for the opportunity to comment. Please address any questions on these comments to Bob Edmonds at the below address.

Robert F. Edmonds, Jr.
Manager, Oak Ridge Office

COMMENTOR NO. 61: BARCLAY, MIKE & JANASKIE, MARK
OAK RIDGE, TENNESSEE

Name: Mike Barclay, Mark Janaskie Organization: DPRA, Inc.

Date Sent: 4/23/98

Document Ref.: PEIS: DUF6 PEIS OVERALL CONTENTS

----- COMMENT -----

Comments on the UF6 PEIS QUESTION:

The preferred UF6 management scenario presented in the PEIS carries with it a huge price tag. As such, would funding availability create performance uncertainties for DOE that need to be acknowledged? Specifically, will the funds to begin conversion be available in the amounts needed to initiate large-scale conversion efforts by the year 2009? Will annual funding be available in sufficient amounts to support conversion of the entire inventory within the expected year conversion period? Both questions point to temporal uncertainties that have a bearing on DOE's strategy for interim storage and maintenance of UF6 cylinders. Lesser amounts of funding would require longer - potentially much longer - storage, and a much greater emphasis on the corrosion protection and reconditioning of UF6 cylinders. As best we can discern from the PEIS and from discussions at the public hearings, DOE's strategy for UF6 cylinder corrosion control s to paint the cylinders with the worst corrosion. Perhaps inherent in this strategy is the idea that conversion efforts will start soon enough (e.g. 2009) and will conclude quickly enough (e.g. 2029) that a larger number of cylinders do not need reconditioning to prevent additional corrosion. Is this generally accurate as to DOE's underlying strategy? How many cylinders does DOE anticipate painting at the three sites? It is our understanding that corrosion coatings from paint will last about ten years. Other corrosion protection options, although slightly more costly initially, offer much longer corrosion protection. Specifically, thermal spray coatings provide 30+ years of corrosion control, and offer other significant advantage including dramatic cost savings potential when life cycle costing is factored into total cost considerations. Has DOE factored life cycle costing into its decision making regarding the choice of paint over other coating options? Why did DOE choose paint as a preferred coating choice? **61-1** **61-2**

QUESTION: As stated in the PEIS, DOE's preference is to convert the entire inventory of UF6 material into usable products. Given the large volume of UF6, it is unclear whether a correspondingly large market demand exists for products arising from the conversion effort. Has DOE conducted a thorough market analysis (applications, demand) for UF6 conversion products? If so, please describe the results of this analysis, and an estimate of the percentage of the inventory for which definable, cost-effective usages exist? **61-3**

QUESTION: Given that there appears to be a limited market for the converted uranium oxide **61-4**

COMMENTOR NO. 61: BARCLAY, MIKE (CONT'D.)
OAK RIDGE, TENNESSEE

(at least based on current information), what will happen to the remainder of the UF 6 stockpile? In terms of program management, it seems certain that the remainder of unconverted UF6 will become a waste (per U.S. EPA regulations), and therefore will likely be transferred to DOE's EM program. Given this scenario, is there an integration of efforts currently taking place between DOE programs to address this kind of future scenario? In addition, have there been any discussions between DOE programs as to how the waste would be formally transitioned into the EM program? Also, given the transition of UF6 as waste into the EM program, is there an existing remediation/cleanup fund established to manage UF6 as waste material? **61-4 (Con't.)**

QUESTION. The PEIS states that there is a very substantial cost associated with transferring the non-conforming cylinders to a central location for conversion. The actual reference case stated in the PEIS estimates this cost at more than $800 million. Of that $800 million, approx. $161 million is for what DOE terms "overcontainers". Given that reference case in the PEIS, we would appreciate responses to the following questions:

1.) Has DOE looked at other options to "re-engineer" the non-conforming cylinders for transport/shipping, so as to eliminate the need to employ overcontainers?
2.) Is there an actual U.S. Dept. of Transportation regulation/requirement to use overcontainers for the UF6 cylinders? If so, what is it? **61-5**
3.) Has the DOE held discussions with the U.S. DOT to discuss the requirements for shipping non-conforming cylinders? If so, is this what DOE based its $161 million overcontainer estimate on in the PEIS?
4.) Using the DOE reference case of $161 million for overcontainers, what is the true unit cost per cylinder for transporting the non-conforming cylinders to a central location for conversion?
5.) Does the term "overcontainers" mean the same as "overpacking", as in waste operations?

QUESTION. We understand at the Nevada Test Site (NTS) has recently changed its Waste Acceptance Criteria in the last year or so, so that it can receive more DOE waste for disposal. Given the scenario that DOE determines that UF6 conversion is not economically feasible or prudent, would anything prevent the DOE from sending the UF6 waste to the NTS for disposal, or even interim storage (retrievable storage) prior to DOE developing a better, more economically efficient method to convert theUF6? **61-5**

COMMENTOR NO. 62: ROSS, WAYNE A., & HAASS, MATHEW, P.E.
RICHLAND, WASHINGTON

COMMENTS ON THE DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE

BY
Wayne A. Ross, Staff Engineer
Pacific Northwest National Laboratory
And
Mathew Haass, P.E.
Geosafe Corporation, Richland, WA
04/23/98

The following comments represent those of the authors and are not official comments of Battelle PNNL or Geosafe. They result from our continuing interest in the adoption of a lower-cost, long-term management strategy for the depleted uranium hexafluoride (UF_6).

We have previously provided information on the Molten Glass Reactor (MGR) Process for the single step immobilization of the uranium hexafluoride. Attached is a copy of the material previous provided in 1995 and 1996 on this process. This process has a factor of at least two lower cost than those included in the EIS. It should also have less environmental impacts. This option was not identified or considered in the EIS and is not within the bounds of the EIS for cost or for impacts. Therefore the EIS failed to consider a reasonable, technically feasible, cost-effective and environmentally favorable alternative for the disposition of the depleted UF_6. **62-1**

We recognize that additional work will be needed to verify the process, but as was stated in the Summary of the Cost Analysis Report Section 3.0 "Most technologies would require significant engineering development." Thus the MGR process with the previous developments for high-level and mixed waste vitrification and the development of the In-situ-Vitrification Process (ISV) would make the state of development superior to many of the other proposed alternatives. Thus, the lower state of development of the MGR process is not a sufficient reason for omitting it from consideration. **62-2**

The MGR process would be generally consistent with the intent of the preferred alternatives "use of the material." The MGR process would place the uranium in a high concentration in a vitreous state near the earth's surface, thus providing the opportunity to retrieve and reprocess the material as a very high grade ore, if in the future there is a need for depleted uranium. At the same time, the uranium has very low availability to the environment, as the vitreous waste form provides very good containment of the uranium. **62-3**

The "disposition of other alternatives" in the engineering analysis documents (section 4.5) stated "Another possible suboption is vitrification, in which depleted uranium oxide would be enclosed in glass. The basic technology is developed (for disposal of high-level radioactive waste), but other types of waste preparation are generally preferred for depleted uranium. Vitrified waste would require more space for disposal. In addition, a vitrification facility would be more complicated and costly to build and operate than a cementing facility." These statements to dismiss the alternative, while possibly applicable to a stand alone vitrification processing facility that would incorporate the waste into glass in canisters for disposal, are not applicable to the MGR Process and therefore the MGR process does not qualify for exclusion based on it. The MGR would have lower disposal area requirements and lower capital and operating costs that any of the proposed facilities. **62-4**

We are very interesting in developing additional information about the MGR Process. If you would like additional information please contact us.

The following are additional comments from our review of the document:

1. There does not appear to be a strong basis for the preferred option. All alternatives have similar impacts and costs. **62-5**

2. The PEIS Summary document should contain a discussion of the various life cycle cost of the alternatives. **62-6**

COMMENTOR NO. 62: ROSS, WAYNE A., & HAASS, MATHEW, P.E. (CONT'D.) RICHLAND, WASHINGTON

3. The use of discounted cash flow, while technically justifiable, obscures the actual costs for the various processes. I have not seen many DOE projects where the costs have decreased with time. They nearly always increased. Discounting at a rate of 7% makes major operating costs in the out years very small and meaningless. A constant dollar basis is more meaningful, but probably still optimistic. **62-7**

4. The projection that all of the materials will be used seems highly speculative. I did not identify in the draft how all the uranium would be used. An accounting of the use of the materials should be included in the final EIS. The accounting could identify future uses currently unidentified. Some order of magnitude calculations give the following results. Page H-10 indicates that 933 casks would be produced for 20 years for a total of 18,660 casks. I don't think there is sufficient uranium to produce that many casks based on other information. The current forecast (DOE/RW-0008 Rev 12, page 23) indicates that there will be less than 90,000 MTU of commercial spent fuel. If one uses the Multiple Purpose Cask (MPC) as the model cask, then each cask will hold 11 MTU. Thus, if all the spent fuel was to be shipped in MPC, about 8200 shipments is all that would be needed. It seems unrealistic, however, that all of the fuel would be shipped to the repository in single use casks. It would be far more economical for reactor operators to use reusable casks that can be use for 100's of shipments. Thus the use of most of the inventory for casks seems unrealistic and the preferred alternatives basis that all materials can be used is high speculative. Your position would be greatly strengthen if you had some statements from DOE-RW that they were planning on using the uranium for this purpose. With respect to the Hanford SNF in K-Basins there has been serious concerns expressed about the presence of uranium metal in the repository. Further, we anticipate that the use of uranium as counter weights would not be highly regarded by industry, when they found the needs for radiation monitoring and inventory control were necessary. This leads us to the conclusion that a significant fraction of the materials will need to be processed and disposed. The MGR being a modular process could accomplish this very effectively and could be implemented in a relatively short period of time. **62-8**

5. It was interesting to note that one of the major hazards identified was the shipment of HF. The MGR process converts the fluoride to calcium fluoride and dissolves it in the glass structure thus eliminating the HF hazard. It also means that there is only one transportation operation in the MGR process further reducing transportation impacts. **62-9**

6. The concentrated form of the final waste form requires less land space that other options since all of the uranium could be disposed in an area about 1200 ft by 1200 ft (33 acres). Note this is less than the disturbed area for one cask manufacturing facility (36 acres) **62-10**

COMMENTOR NO. 62: ROSS, WAYNE A., & HAASS, MATHEW, P.E. (CONT'D.) RICHLAND, WASHINGTON

Attachment

TREATMENT AND DISPOSAL OF UF_6 BY A MOLTEN GLASS REACTOR

Wayne Ross, John Tixier, and Xiangdon Feng
Pacific Northwest Laboratory[1]

SUMMARY

An economical method for the treatment and disposal of uranium hexafluoride (UF_6) has been conceived and is described in this proposal. The method would react the UF_6 within a large molten glass reactor (MGR), which would leave the uranium in moderate concentration in a highly stable glass form in a disposal site. The large processing capacity, minimal need for processing chemicals, and low operational labor should make the process very cost-effective. Order-of-magnitude estimates indicate that it will cost less than one-half of previous estimates which only included costs to convert the UF_6 to UO_2 without considering disposal costs. The process could be implemented in phases using the mobile equipment so large capital expenditures for treatment facilities are not needed. This enables processing of the most hazardous fraction of the current inventory in the near term, in concert with recent recommendations of the Defense Nuclear Facilities Safety Board. The needs of the associated development program are identified.

BACKGROUND

Uranium hexafluoride has been accumulating for 40 years at the nation's enrichment facilities. The national inventory is now of the order of 500,000,000 kilograms, with the largest inventories at Paducah and Portsmouth and a smaller inventory at Oak Ridge. The Defense Nuclear Facilities Safety Board has recently reviewed the situation and found increasing hazards for the continued storage of the tails as uranium hexafluoride and has recommended that DOE take several actions. Its recommendations include: 1) action to protect against the dispersal of large amounts of uranium to soil and groundwater in years to come, 2) an early start to remedial action should be planned and then instituted, and 3) a study be instituted to determine whether a more suitable chemical form should be selected for long-term storage of the depleted uranium. In doing this, the Board also recognized that it could be a massive problem with extraordinary financial costs.

A 1991 study done by Oak Ridge on just the conversion of the material to UO_2 estimated that the cost would be about $2.3-3.1 billion. More recently, in a press release[1], M+4 Technologies estimated that the worldwide market for treatment of uranium hexafluoride tails would be about $6-10 billion. Thus, it is apparent that the costs for treatment and disposal of these materials could be a multi-billion dollar activity and opportunities to significantly reduce those costs should be vigorously pursed

[1] Pacific Northwest Laboratory is operated for the U.S. Department of Energy by Battelle Memorial Institute under Contract DE-AC06-76RLO-1830.

COMMENTOR NO. 63: CRONIN, BILL & HARMON, MELINDA CARBONDALE, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 63-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 63-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 62-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 62-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 62-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 62-6

Thank you for considering these comments.

Sincerely,

Bill Cronin
Melinda Harmon
95 Lonesome Rd
Carbondale IL 62901

COMMENTOR NO. 64: MURRAY, ALEXANDER P. GAITHERSBURG, MARYLAND

24305 Clematis Drive,
Gaithersburg, MD 20882,
April 21, 1998.

Charles E. Bradley, Jr.,
Office of Facilities (NE-40),
Office of Nuclear Energy, Science, and Technology,
U.S. Department of Energy,
19901 Germantown Road,
Germantown, MD 20874.

RE: Depleted Uranium PEIS:
DOE/EIS-026, "DRAFT PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE " (PEIS), dated December, 1997.

and its supporting documents:
UCRL-AR-124080, "DEPLETED URANIUM MANAGEMENT PROGRAM: THE ENGINEERING ANALYSIS REPORT FOR THE LONG-TERM MANAGEMENT OF DEPLETED URANIUM HEXAFLUORIDE, Rev. 2, Volumes 1 and 2, (EAR), dated May, 1997.

UCRL-AR-127650, "COST ANALYSIS REPORT FOR THE LONG-TERM MANAGEMENT OF DEPLETED URANIUM HEXAFLUORIDE," (CAR), dated May, 1997.

Dear Mr. Bradley,

Thank-you for the opportunity to review and comment on the Depleted Uranium Programmatic Environmental Impact Statement (DU PEIS). I find it to be interesting reading, having worked in and out of uranium-related programs for two decades. I find that the PEIS has over simplified and, in some cases, over-looked important facets of DU that have important implications for its management, and I feel compelled to comment on the subject for the record. My comments are attached. Summarizing, the comments are:

- Disposal and waste management are significant issues not well addressed in the PEIS. It is highly probable that a significant fraction of the DU - perhaps all of it - will end up as a radioactive waste, either as itself or in a reuse "product." It is not until well into the PEIS (Chapter 5) that the reader is informed that near surface disposal will significantly exceed 10 CFR Part 61 limits (for NRC/commercial facilities) and DOE limits for public doses. In other words, codified regulations will be broken. Also, mined cavity disposal, which may be a solution for DU, does not currently exist for LLW, and there are no current plans for mined cavity disposal of LLW in the U.S. 64-1

- Market demand does not and is not likely to exist for the reuse of DU, and the PEIS does not identify routes to build such a market. Currently, cost and liability are almost insurmountable hurdles for the "reuse" of DU, as its competitor for the (most likely) reuse scenarios (spent fuel shielding) is concrete. The use of DU shielding requires an integrated approach to minimize consumer, utility, and DOE costs, and DOE acceptance of DU liability (basically disposal). This implies that even for reuse scenarios, the DU form must be compatible with disposal. Myself and other authors have written on this extensively. 64-2

- No significant uses of DU currently exist in shielding applications. No licensed spent fuel casks use DU shielding, and there are no current plans or pending applications for spent fuel casks 64-3

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using DU. DOE-RW has identified DU as a cost and machining disadvantage for spent fuel casks. The PEIS needs to openly state these points, and identify means to resolve them. Again, myself and others have written on this extensively.

- The analyses and alternatives are uneven and neither analyzed at comparable levels nor taken to equivalent endpoints. For example, all of the uranium oxides will perform differently. The gelation-produced uranium dioxide is equivalent to nuclear fuel in terms of high density and low porosity, and will have improved leach resistance, heat transfer, and sizing as compared to the other oxides (including the lower density uranium dioxide) - in short, it's a better material. Significant items have been left out of the analyses (e.g., disposition of shielding, rollup of disposal impacts, and protective action distance impacts on site sizes). There is no reconciliation between known technologies/impacts and those in the report - for example, the proposed uranium dioxide pellet furnaces used for analysis in the PEIS correspond to 100-200 teU/yr capacity, not the 7,000 teU/yr capacity claimed by the analysis. The same pellet technology also currently requires about 1 FTE/te/yr, not the 0.014 FTE/te/yr used in the PEIS. The conversion reactors (low number and large size) appear to be very optimistic. The gelation facility includes two plants (one to U3O8, and one to UO2), which is not consistent with the technology and explains why its impacts are slightly higher. The PEIS should recognize these shortcomings, limitations, and differences, and be more equivalent in its analyses. *64-4*

- The limitations of the technolgies should be recognized in the PEIS, and means identified to address them. Only the French conversion to U3O8 technology has been used on a scale approaching that needed for the PEIS, and it needed compactors to increase the density to circa 3 g/cc. To state that current pelletization technology is established for the throughputs and equipment used in the PEIS analyses is incorrect - the gelation route with VTF's has actually achieved higher equipment rates per unit floor area. *64-5*

- Recent NRC positions in the area are not stated in the EIS, but are alluded to in the supporting documentation. The NRC (in a response to the FR notice and in a separate EIS) has clearly stated concerns about the lack of a use for the DU, the likely probability that a significant amount (if not all) of the DU will become waste, and the high probability that DU will require "deep disposal" because of unacceptably high MEI doserates from near surface disposal. Such significant conclusions by a regulator should be included and discussed in the PEIS. *64-6*

- DU metal seems to receive a favorable treatment in the PEIS with impacts significantly below historical experience. This appears because some of the release fractions and impacts are underestimated significantly (beyond technological optimism). This should be corrected in the PEIS. *64-7*

- Gelation technology appears to receive a less than favorable treatment in the PEIS, using TCE as a solvent instead of oil, tray instead of tube furnaces, and including a U3O8 production step, followed by nitric acid dissolution and UO2 production (the aforementioned two plants in one misrepresentation). While in the final analysis the difference is small, it is incorrect, and the PEIS should correct the misrepresentation. There are recent published articles (which you have copies of) that give a detailed description of gelation technology as applied to DU, and these should be used as references in the PEIS. *64-8*

- Costs are not brought forward in the PEIS. Costs from the CAR and from published articles should be discussed and reconciled in the PEIS, as cost is likely to be a significant determinant in the DU disposition option selected. *64-9*

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- DUSCOBS and PYRUC shielding materials are not discussed in the PEIS. DOE appears to have an interest in these materials, and they are likely to have better properties for disposal than either DU metal or uranium oxide in concrete. As such, they should be mentioned and discussed. *64-10*

I hope you find these comments useful and incorporate them into the PEIS. If you have trouble finding any of the publically available articles, please let me know.

Sincerely Yours,

Alex Murray

Alexander P. Murray,
Private Consultant.

Attachment.

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Comments:

a. Waste In Section S.4.8 on page S-40, waste management impacts are discussed. DOE should consider briefly highlighting the potential uranium content of the secondary streams, along with a brief assessment of acceptability for either reuse/nonradioactive disposal or disposal as radioactive waste. DOE should expand the discussion in the last paragraph about uranium disposal as LLW. The DOE may wish to cite regulatory agency positions on the wastes, including the NRC position letter (from Benero) sent to DOE as part of this EIS process and the NRC LES EIS analysis. For example, the NRC documents provide analyses supporting DU disposal as a LLW, but note that its disposal could require a mine or another means of "deep" ("Non near-surface") disposal. Currently, no "deep" disposal sites exist, and all current LLW disposal sites (existing and planned) use near-surface facilities. Thus, it would seem that disposal of DU may have significant impacts and regulatory requirements beyond those listed in the PEIS. DOE should consider adding the cumulative impacts from DU oxide disposal to Section S.4.13 "Cumulative Impacts." *64-11*

- Leach Rates - Page 2-22 briefly mentions leach rates and waste forms, and states that grouted wastes are representative of immobilized waste forms with low leach rates, with the implication that grouting is also representative of vitrification. DOE should clarify this text, as grouting may be representative for some parameters (e.g., facility size) but not representative in others (e.g., energy usage, emissions). Also, while grouting should provide for somewhat lower leach rates as compared to the ungrouted material, vitrification would be expected to provide for much lower leach rates than grouting (typically, 5-6 orders of magnitude less), and this may be an issue for some disposal options. Consequently, these items should be discussed. *64-12*
- Empty Cylinders - The impacts from disposition of the empty cylinders are not included, although potential options are listed (page 2-23). It would seem reasonable to provide a brief discussion on these options and include impacts from cylinder disposition in the EIS. *64-13*
- Water Impacts - The summary table of impacts (Table 2-2) and the supporting text for the water and soil section (page 2-50) note that the groundwater uranium concentrations will exceed drinking water guidelines. It is recommended that the expected concentrations are also expressed in terms of individual radiation doses. *64-14*
- Waste - Pages 2-52 et seq present a summary of the waste management impacts from the impacts. Comparisons are primarily with the DOE waste management system, although these facilities could also be commercially operated under NRC or State regulations. Consequently, DOE should consider adding a comparison to commercial LLW generation rates and categorization per 10 CFR Part 61. The section would also include estimated uranium levels for the magnesium fluoride waste (from DU metal production) and discuss the aspects of DU disposal, including the potential need for either a dedicated or a deep disposal facility. *64-15*
- Dilution of Effluents - On page 5-51 the text indicates effluent levels exceeding EPA guidelines for uranium, but notes that the concentration would be much lower and below the guideline after dilution in nearby surface water. This should be clarified, and potential dose consequences of these effluents presented. *64-16*
- Metal Waste - Page 5-76 of the PEIS presents waste management for the metal cask manufacturing route. Waste management appears to have overlooked secondary *64-17*

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wastes related to manufacturing, which are unique to uranium metal. For example, induction furnaces for uranium metal are usually lined with graphite, which requires periodic removal and replacement (sometimes as frequently as every ten charges or so). Also, while the proposed approach appears to use primarily direct casting, some uranium metal machining operations may be required, and, historically, these generate significant wastes containing partially oxidized uranium metal. The PEIS should include these potential impacts that primarily affect only the metal route. *64-17*

Doses from DU Disposal: Section 5.6 (pages 5-78 et seq) and Appendix I present the impacts from disposal of the DU, for both the operational phase and the post-closure period. The radiological impacts from the accidents seem unexpectedly high; for example, the analysis shows public doses of up to 1.1 rem and noninvolved worker doses as high as 140 rem, apparently due to earthquake initiated events, without explanation. The routine impacts also seem high for the postclosure phase and appear to follow the radiological order: mine impacts>vault impacts>trench impacts. Calculations appear to use an infiltration area effect and do not account for chemical form, solubility, and kinetic effects. Table I.31 contains zero values for the dry site doses for all three disposal approaches, and no collective dose estimates are included. These points are non-obvious and it is recommended that they are explained in more detail. *64-18*

b. Unspecified Applications: On page S-11 and later in the summary (pages S-42 et seq), DOE identifies the preferred alternative strategy as use of 100% of the DU hexafluoride inventory, as either uranium oxide, uranium metal, or a combination of both, without specifying the use of the material and the potential impacts (positive and negative) from such DU use. The PEIS also does not provide information indicating a market demand capable of consuming 100% of the DU inventory, but the conversion of the DU hexafluoride would occur as "... uses for these [uranium oxide and metal] products become available" (page S-43). Without applications for significant quantities of DU oxides and metals, these DU materials may ultimately become a waste material. The discussion does not discuss regulatory and licensing requirements for these DU applications. It is recommended that (1) DOE identifies the likely market consumption of DU oxides and metals over the timeframe of the EIS, (2) DOE estimates the impacts from these potential DU uses, (3) DOE considers the potential of the converted DU materials becoming a waste, thus, requiring conversion into forms compatible with disposal, and (4) DOE evaluates the likely regulatory and licensing aspects. *64-19*

c. DU as Cask Shielding: DOE appears to be relying upon the potential future use of DU as SNF cask shielding for a large consumption of its DU inventory (see page S-43 and 1-8, and Volume 2 of the EAR, which analyzes a DU cask manufacturing facility as the only use of DU). If this is indeed the case, DOE may wish to describe and discuss it in a little more detail in the PEIS summary and in Section 2.5 (pages 2-54 et seq), and it should be noted that no currently licensed or planned SNF cask uses DU. *64-20*

d. Fate of DU Shielding: As currently written, the PEIS does not include a discussion of the eventual fate and potential impacts of the DU SNF cask after its use (e.g., see pages 2-14 and *64-21*

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2-15). Pages 5-55 and 5-65 also mention that DU cask disposition after use is excluded, and page 5-65 notes that disposal would amount to an additional 180,000 cubic meters (6.4 million cubic feet) of waste requiring disposal, with a (calculated) average specific gravity of 2.2. This does not seem inconsequential, particularly if a dedicated disposal facility is required and the impacts are estimated to be similar to disposal (e.g., page 5-83 et seq; exceeding 10 CFR Part 61.41 dose limits). Also, there are statements in the document that question if significant quantities of DU metal are suitable for disposal (e.g., last paragraph on page 2-21). Inclusion of a discussion about the disposition of the DU cask after use, and potential impacts, is recommended. **64-21**

e. "Uranium Oxides." The PEIS generally combines all uranium oxide compounds under the title "uranium oxides" for consideration in the alternatives and strategies (see page S-6 et seq). This seems too all inclusive, as uranium oxides have significantly different chemical and physical properties that produce a wide range of ES&H impacts. For example, uranium octaoxide is a high porosity powder, with a low density and a significant respirable fraction. Uranium dioxide powder is also porous, and can spontaneously ignite in air. On the other hand, sintered uranium dioxide has the highest density of the uranium oxides and is essentially pore-free. The presence (or absence) of pores also has significant implications for the potential disposal of the material, either as a management option or as an end-use item, a denser, essentially pore free material would appear to be advantageous. Thus, a uranium dioxide material sintered to a lower density (say, 4-5 g/cc) would not be expected to perform as well in a disposal environment as a uranium dioxide sintered to a high density (say, 9-10 g/cc). It is recommended that more qualifiers are given to the term "uranium oxides," perhaps including low and high density as the principal discriminators. **64-22**

f. Equivalent Bases and Life-Cycle Effects: The text does not seem to incorporate a life-cycle approach to the different management alternatives and compare them on an equivalent basis (see pages S-7 et seq). For example, recycle (if a market exists) and disposal would seem to be the logical endpoints for all of the alternative branches shown in Figure S.2, and may influence the impacts and potential alternative(s) selected. However, disposal is only shown for the disposal as oxide alternative. It would seem that the "manufacture and use" alternatives will ultimately result in impacts from the DU component; for example, the material (perhaps as itself or in a product) could be shipped to a disposal facility. Such potential impacts do not appear to be included in the analysis, and may even preclude some options or require additional conversion and conditioning; for example, without supporting analyses, it is unlikely that significant quantities of DU metal can meet the regulatory requirements of disposal sites. Thus, pursuit of use as a metal option may require another conversion facility (with its impacts) to convert the DU metal into a form compatible with disposal. Other examples of the need for equivalent bases include the oxide conversion routes, due to fundamental differences in the uranium oxide forms. One of the specific oxide conversion routes (gelation) appears to be manufacturing uranium dioxide with properties comparable to high density nuclear fuel which would be anticipated to have improved stability and related properties as compared to the other oxides. The gelation route also appears to include two plants - one for uranium octaoxide production and one for dissolution/uranium dioxide production - which appears inconsistent with literature reports on the process (i.e., only one plant; no production of uranium octaoxide) and **64-23**

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the other oxide conversion routes. Long-term storage also appears to lack the realization of *ultimate disposal in the future*. The PEIS should consider and analyze the alternatives on an equivalent basis with the same/comparable endpoints and include life-cycle effects.

g. Results: Pages S-15 et seq summarize and compare the results of the impacts for the alternative management strategies. Some of these results seem inconsistent and are not intuitively obvious. For example, it is not clear why the use as uranium oxide results in higher impacts than the use as uranium metal (see pages S-20 and S-49) - the opposite would be anticipated. Land use impacts seem uneven; conversion and metal use plants would be anticipated to have larger land use because of facility size and require potentially larger setbacks for potential accident mitigation from uranium releases (see the NRC LES EIS). It is not clear if the disposal analyses include all of the potential long-term impacts and doses from uranium leaching from the disposal area. It is recommended that DOE consider greater consistency in the results and clarify the summary. **64-24**

h. Ranking: The summary of the results (page S-15 et seq) does not include a ranking of alternatives, and implies that all of the alternatives are acceptable. DOE may wish to rank or identify those alternative(s) that appear more favorable than others based upon the analysis. DOE may also want to consider if any of the proposed alternatives are precluded by the analysis; for example, page 5-84 mentions individual (groundwater ingestion) doses of 100 mrem/yr from disposal, thus exceeding 10 CFR Part 61 standards of 25 mrem/yr. Page 5-84 also mentions a scenario for a hypothetical future resident living on the disposal site and receiving radiation doses as high as 10 rem/yr. The PEIS summary also mentions an NOV on storage at the Portsmouth facility, which might imply that a no-action alternative is not a viable option for this site. **64-25**

i. Technology and Equipment Development: The PEIS encompasses numerous technologies that are at different stages of development, in terms of process, understanding, equipment, (potential) impacts and uncertainties. For example, of the conversion, application, and disposal impacts discussed within the summary, none are practiced on any scale domestically, and only conversion to the octaoxide is practiced on a large scale internationally, producing a low density product. Thus, there is only one direct analogy. DOE should consider including a technology discussion, with status and assessment, perhaps with either a time schedule or probability of success, for some of these technologies. For example, it seems like a significant extension of existing uranium dioxide sintering technology to take pellets from 100 te(U)/yr/line to 7,000 te(U)/yr/line. From the uranium dioxide technology perspective, microspheres (e.g., from gelation) may be the more mature technology because of the (potential) use of tube furnaces and pilot plant tests with equipment processing rates an order of magnitude larger. Similarly, a uranium dioxide/concrete cask approach appears to be a significantly easier technology to understand and scale than casting a 40 te(U) metal shield. **64-26**

j. Existing Facilities and Experience: There are obvious analogies with existing, commercial fuel cycle facilities, which process uranium hexafluoride into uranium dioxide (for nuclear fuel) and

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(to a lesser extent) uranium metal. These facilities are already licensed by the appropriate regulatory agencies. The PEIS does not mention these facilities, either as a source of experience or as a source of processing capacity, particularly during the development of uses for the DU materials and as a means for surge capacity. The PEIS also does not appear to draw upon the operating experience of these facilities, including waste generation and uranium content of byproducts. DOE may wish to include the experience of operating commercial facilities and comment upon their potential use (or non-use) during the development of applications and uses for the DU. *64-27*

k. Regulatory Basis for Future Facilities: The PEIS indicates several facilities may be involved for the management alternatives, and may involve DOE, commercial, and/or both types of facilities. DOE should briefly discuss the regulatory bases for these facilities, potential differences (if any), and any impacts, and any effects from facilities transitioning from DOE to the NRC regulatory environment. *64-28*

l. Economics: The PEIS mentions a separate Cost Analysis Report (CAR) as providing input to the PEIS (e.g., page 1-7). However, program costs do not appear to be included in the analyses. DOE should consider including the costs and other economic impacts in the PEIS, perhaps as part of the summary (e.g., in Table S-2). *64-29*

m. DU Quantities: The insert on page S-2 identifies some 46,422 DU cylinders distributed between the three sites. While the total quantity is listed in the main text of the report, it would be helpful to have the approximate masses (as either MTU or MTUF6) for the three sites listed in the summary as well. The insert on page S-2 also notes that an additional 8,000 cylinders have been produced by USEC. It is suggested that this number is also divided between the sites and expressed in mass quantities. It is also recommended that a brief discussion about the USEC DU is included, perhaps as part of the first paragraph on page S-4. While the EIS excludes the USEC DU from its analysis, it also implies that there is a reasonable probability of it becoming DOE's responsibility. Consequently, DOE may want to consider that possibility in its impact analysis. *64-30*

n. Other DU Uses: Page 2-21 mentions non-shield use of DU. No mention is made of quantities or relative percentages of the DU inventory. Also, it is not self-explanatory that DU cask manufacturing and uses bound all of the potential uses; for example, metal uses would appear to require a significant amount of alloying and/or machining, and involve handling and disposal concerns. DOE may wish to include a longer discussion and a better explanation. *64-31*

o. Other Sites: Pages 3-58 et seq present information on the generic sites for wet and dry locations, and mention that the site data for each are derived from actual wet and dry sites. It is suggested that the actual sites which provide the basis for the generic locations are listed. *64-32*

p. TimeFrame: Page 4-2 lists a 41 year time period for the EIS (through the year 2039), and

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indicates activities beyond 2039 would be subject to appropriate NEPA reviews and decisions in the future. This appears to truncate the analyses for some of the alternatives which might influence the selection of the preferred option; for example, impacts from wastes in a disposal cell are unlikely to occur by 2039, major cylinder/container replacements may be required for the storage option in the 10-20 years after 2039, significant applications may not have developed etc. DOE may wish to consider a time period consistent with the logical conclusion of the options or their "life-cycle," which may require a timeframe beyond 2039. *64-33*

q. Failure Rates: Pages 5-3 and 5-19 discuss the estimated cylinder failure rates for the No Action and UF6 Storage alternative. These appear to use the opposite ends of the failure rate range - No Action uses the lowest failure rate, while Storage uses the highest failure rate - without explanation. Also, the existing cylinders may not have adequate wall thicknesses under either alternative due to corrosion over the years (see Appendix E), and the DU may have to be transferred to new cylinders within the timeframe covered by the EIS. DOE should consider presenting a discussion on these items in the text. Also, on page 5-40, Table 5.4 lists tank rupture accidents as "incredible" events. Usually, these are assigned a value corresponding to the "extremely unlikely" frequency bin. A brief discussion is recommended. *64-34*

r. Site Sizes: Page 5-55 identifies land use requirements for the facilities. These seem small, particularly when compared to other proposed facilities performing similar operations (e.g., the LES EIS analyzes a generic conversion facility with a site area of 1,000 acres). The text also does not indicate if any major setbacks, protective action distances (PAD's), or planning zones are likely to be needed around the facility because of the handling of large quantities of DU, the hexafluoride, and/or the metal (including melting operations). DOE should consider a discussion in the text on these subject matters. *64-35*

s. Accident Consequences: Pages 5-55 et seq discuss the use and impacts of uranium dioxide as shielding, and pages 5-66 et seq discuss the use and impacts of uranium metal as shielding. Some of the values imply non-intuitively obvious lower impacts from a metal route as compared to the oxide route; it is recommended that these are discussed and explained in more detail. For example, the text on page 5-71 estimates the highest consequences from an accident with the metal route as 15 mrem (from a fire involving three cylinders, an energetic accident with reactive materials), as compared to 270 mrem (from an earthquake during uranium dioxide storage, a low energy event with non-reactive materials) - there is no explanation for the difference. Also, the supporting information in Appendix H shows similar inconsistencies; the unlikely accidents for the oxide (Table H-5, page H-18) are significantly higher than the corresponding accidents for the metal (page H-17). Page H-17 also contains apparent inconsistencies and incongruances; the mishandling/dropping of solid DU metal accident releases a greater quantity of uranium than the molten uranium accidents. Upon further review the source of these apparent anomalies goes back to Section 6.11 of the EAR, where different material at risk and release fractions were used. All of the metal cases examined used the least bounding values, and values inappropriately low for the phenomena being modelled per the DOE accident handbook. These errors should be corrected. *64-36*

COMMENTOR NO. 65: UNIVERSITY OF MARYLAND
BALTIMORE, MARYLAND

School of Medicine

UNIVERSITY OF MARYLAND
AT BALTIMORE

UNIVERSITY PROGRAM IN TOXICOLOGY

April 21, 1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley:

Enclosed are comments on the Department of Energy's "Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DOE/EIS-0269). Thank you for the opportunity to comment on this PEIS. We would appreciate being kept informed as this work progresses. If you have any questions regarding our comments, please feel free to contact either Mr. Ted Henry or myself at 410-706-8196.

Sincerely,

Katherine S. Squibb, PhD
Associate Professor

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COMMENTOR NO. 65: UNIVERSITY OF MARYLAND (CONT'D.)
BALTIMORE, MARYLAND

Comments

on

The Department of Energy's Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride

By:
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University of Maryland, Baltimore
April 20, 1998

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Comments on the Department of Energy's
Draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride

The Department of Energy's (DOE) Draft Programmatic Environmental Impact Statement (D-PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride (DU-HF) is lacking with respect to it's assessment of the long-term impacts of converting and using DU-HF. A review of the summary clearly depicts DOE's strong interest in utilizing this stockpile, but the supporting evidence does not adequately address the legitimate environmental concerns associated with DU use - concerns which are based on a growing body of scientific data. While the summary presents a clear picture of DOE's commitment to provide "support for the development of applications for depleted uranium products," it does not, and with our current knowledge probably cannot, adequately assess the current extent of environmental impacts at the three DU-HF sites. In turn, it cannot assess what impacts to the nearby communities and the local environment will result from future releases of the evaluated alternatives. Without better scientific knowledge of the toxicity of DU, it is impossible to provide even a guess of the potential impacts, which makes the risk projections provided within this summary of little value. As a result, we support the long-term storage of this material, with improved containment and monitoring, until we are better equipped to assess the toxicity and safe uses of the DU stockpile. *65-1*

Up front, it should be noted that our limited resources only allowed us to review the summary and not the entire PEIS. Thus, we acknowledge that some discussion within the body of the PEIS itself may address a few of the concerns raised in the comments that follow. We believe that it is acceptable for us to comment based solely on the summary, as this is the main document likely to be reviewed by the commenting public. We hope that these comments are still useful for DOE and we request that these comments be considered with the utmost diligence.

Current Storage

Significant concerns exist with current storage conditions based on the fact that cylinders now show evidence of corrosion and that at least seven cylinders have developed breaches. While the management plan in place is to "continue safe storage," it seems to be in question whether safe storage is currently taking place. This is supported by community concerns that have been expressed from around the sites, and the Notice of Violation that has been issued by the Ohio Environmental Protection Agency. We assume that the Defense Nuclear Facilities Safety Board has suggested improving both inspection time tables and storage approaches. *65-2*

While the summary explains that a dense plug is formed by the reaction of moist air with the exposed DU-HF, the summary does not address if any studies have been made to assess the adequacy of such a plug. Certainly, this plug may not be air tight, allowing additional moisture to enter the container thereby acting as a continued source of HF gas. It would seem prudent for DOE to develop a better storage system regardless of the decision to use or store these cylinders. Either way, many *65-3*

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of these containers will still house DU-HF for years or decades to come, and will require improved storage capabilities.

Assessment of Risks

While the summary lists various technical assessments that have been or are being conducted, none of these studies nor this PEIS really assess the potential environmental impacts from the current production and storage operations or the proposed alternatives. This flaw has been seen in PEISs produced for other purposes by DoD, where the PEIS selects a direction to focus development dollars, but does not consider the specific technologies that may be employed and does not consider the site-specific characteristics. In the end, such factors will strongly influence the extent of contamination and impacts from the general approach (i.e. use as oxide) selected. Once the process reaches the point where these specific factors are assessed, there will be serious pressures to make the approach work given the time and financial investments made. This limits the adequacy of the site-specific assessments when they are made. In turn, we strongly suggest that DOE take a serious look at the potential risks from converting DU-HF and its use as oxide or metal before one selects a programmatic alternative. Factors that should be considered in this evaluation are the migrating potential of DU that will be released, the cumulative impacts of such releases in conjunction with pre-existing contamination, and the potential impacts on costs of the selected approach when the toxicity of such compounds are elucidated. *65-4*

Affected Environment

The summary sorely lacks a description of the environmental sampling that has been conducted at each site. In the case of Paducah, Kentucky, it is mentioned that the effluent discharges are regulated under Kentucky Pollutant Discharge Elimination System, but there is no discussion of whether radiological parameters and/or uranium metal are monitored in this system. While the specifics of such a monitoring program may be beyond the scope of this summary, whether or not environmental sampling from Big Bayou and Little Bayou Creeks has been considered in selecting the proposed alternative is relevant and critical. The extent of contamination in surface water and sediments is a significant issue, since future activity will add to the levels already present even if future emissions do not exceed the governing release limits of the time. There is no discussion of such sampling, and there clearly needs to be in order to determine the current baseline risk level at the site, both for human health and ecological receptors. The potential exposure pathways (see below) and current ambient levels are important for projecting future exposure scenarios. *65-5*

As with the Paducah site, there is no mention of the current extent of contamination in local media at the Portsmouth site in Ohio. Assuming significant contamination is already present as suggested by the groundwater data that are referenced, would it affect the feasibility of the selected alternative if it were deemed necessary to conduct such operations at other sites? This question requires serious consideration, particularly since the conversion technology to be used to produce the oxide or metal is not assessed in the D-PEIS. If contamination is approaching environmental limits, then even the expected discharges may not be acceptable. As with any Brownfields site, the investor *65-6*

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(DOE in this case) certainly should want to know whether they will be able to conduct operations at the site or nearby (as suggested on S-14), requiring adequate site characterization. From the description of environmental settings, it is unclear whether the environmental data on the natural environment are limited to climatic conditions or if the site specific environmental data includes current contamination levels. *65-6 (Con't.)*

Exposure Pathway Assessment

In Table S-2, the chemical exposure of concern for both the non-involved worker and the general public is listed as falling below a hazard index of 1. Did the calculation of such risks include all the pertinent exposure pathways which may apply, including fish/game consumption, drinking water, inhalation, etc? It would be inappropriate to consider just the workplace exposure for the non-involved worker, if that person lived nearby and fished in the local stream. In predicting future impacts or risks, one must consider the individual's total exposure. This has been a serious flaw within risk assessments at Superfund sites, and improving this approach is not unreasonable to request given that 1) this is a "looking forward" assessment which allows us to be more protective since the contamination has not yet been produced, and 2) we are still unable to adequately assess other parameters, such as synergistic effects, which do reduce the conservativeness of the risk projections being made. *65-7*

Toxicity of Uranium

Based on the limited research that has been completed on the toxicity of uranium metal, it seems quite premature to be selecting an alternative in this PEIS for the next 40 years. In light of the ignorance with which the Department of Defense exposed Gulf War soldiers to DU, DOE should strongly consider whether it wants to make the same short-sighted mistake. We have been intensively studying lead for decades and we are still learning more everyday about its toxicological effects and the low levels at which such effects are exerted. We are still trying to recover from the use of this metal in paint and gasoline, which is a direct result of our inability or disinterest in predicting environmental accumulation and the resulting impacts if the compound turned out to be toxic. As a society, we must not make the same mistake again by blindly pursuing commercial use of the DU-HF stock. *65-8*

Given the extensive research currently underway regarding DU, it does not seem appropriate to be completing this PEIS at the present time. Research at the Armed Forces Radiobiology Research Institute suggests that DU may be more mutagenic than lead, and that this metal can reach the brain and fetuses of exposed animals. Additionally, work is currently being conducted on exposed Gulf War veterans at the VA Hospital in Baltimore, Maryland, which may provide valuable information on the distribution of DU within the body and possible impacts on specific organ systems in humans. It would seem logical to learn from our mistakes and select long-term storage until we are better able to assess potential human health impacts from its toxicity as well as its radiological emissions in localized lung tissue. *65-9*

COMMENTOR NO. 65: UNIVERSITY OF MARYLAND (CONT'D.)
BALTIMORE, MARYLAND

Until the results of these various investigations are published and reviewed by the scientific community, we cannot know if the projections of adverse effects are accurate. The chemical toxicity of low level DU exposure does not seem to have been adequately considered. The monitoring of effects in soldiers is still in progress, so we question statements describing how "a few workers have been exposed to estimated amounts of uranium approximately three times the guideline levels used for assessing irreversible adverse effects, but none of these workers actually experienced such effects." The effects used to establish the guideline values do not include low level, chronic effects of DU just now being recognized. *65-9 (Con't.)*

Release and Environmental Fate

Predicting the extent of release and long-term fate of the DU released during its conversion and subsequent use should be meticulously evaluated. On page S-42, the authors state the "potential uses that are capable of consuming a substantial fraction or all of the depleted uranium inventory are not yet fully developed, and it is entirely possible that the 100% use scenario may involve some of the material being converted to an oxide and used, with the remaining portion being converted to uranium metal and used." Without reviewing the specific industrial processes to be implemented in the conversion and use alternative, it is impossible to accurately assess how much DU would be released. This is a serious issue since other industrial sites have been closed down due to the excessive release and migration of DU. This quote also reveals that little is known about what commercial applications will exist for the converted material. Despite these unknowns, the PEIS clearly reflects an entrepreneurial eagerness by DOE to utilize the stock in this fashion. This assessment of the summary is further supported by a statement on the following page in which the authors indicate that "this preferred alternative allows flexibility in responding to changing market conditions and to the continued development of new uses for conversion products." We question whether this is appropriate, as the conversion process may be pushed forward without a clear plan and understanding of its eventual use. This, in turn, will evoke significant pressures to find a use for the oxide or metal and likely reduce the quality of the decision process used to determine acceptable use. *65-10*

Ecological Impacts

The consideration of ecological impacts in the summary is limited. A full paragraph discusses the loss of habitat resulting from carrying out particular alternatives. However, no concrete information is provided regarding the chemical effects of elevated uranium concentrations on ecological receptors, although the potential for such effects is mentioned. While few data exist for specific ecological impacts, a study by Los Alamos on the long-term fate of DU found significant concentrations in various aquatic plant species as well as aquatic organisms such as tadpoles. Detritus, benthic diatoms and phytoplankton were predicted to contain the highest levels of DU in the environment, and the impacts of the conversion and use alternative on these important parameters of the food chain should be considered. In short, an adequate assessment of the data that do exist should be made, and critical data gaps should be pinpointed before we decide whether use of this stockpile is prudent. *65-11*

COMMENTOR NO. 65: UNIVERSITY OF MARYLAND (CONT'D.)
BALTIMORE, MARYLAND

Miscellaneous Assessment Observations

Given the lack of discussion regarding the environmental assessments at the sites, a few observations are worth noting. For instance, radioactivity and/or uranium appear to have been found in groundwater at the Portsmouth and K-25 sites, but not at the Paducah site. As for the estimated maximum radiation dose to a member of the general public, the value presented for the Paducah site is 3 mrem/yr, but only 0.07 mrem/yr for the Portsmouth site. This is quite a difference for two similar sites which raises questions with regard to the adequacy of the assessment, or indicates that significant differences exist between the site estimations and/or quality of operations. Such observations within the summary suggest that DOE should take a closer look at the quality of the assessments conducted or the manner in which the assessment was presented in the summary. Even if it is the latter, this is a significant issue as many from the public who provide comments will only have the time or ability to review the summary. It is important for DOE to be as clear as possible and provide the public with the opportunity to constructively assess the PEIS without undue burden. *65-12*

COMMENTOR NO. 66: GRABER, JEAN & DICK
GOLCONDA, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. *66-1*

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. *66-2*

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. *66-3*

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. *66-4*

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. *66-5*

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. *66-6*

Thank you for considering these comments.

Sincerely,

Jean & Dick Graber

COMMENTOR NO. 67: CONNOLLY, DENNIS
COBDEN, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 67-2

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Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 67-6

Thank you for considering these comments.

Sincerely,

Dennis Connolly
115 Baker Hill Rd.
Cobden Illinois
62920 3316
4/10/98

COMMENTOR NO. 68: SHORT, DUANE
STONEFORT, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 68-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 68-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 68-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 68-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 68-6

Thank you for considering these comments.

Sincerely,

Duane Short
Rt. 1 Box 208
Stonefort Il
62987

COMMENTOR NO. 69: GANYARD, PATRICIA
POMONA, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 69-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 69-3

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Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 69-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 69-6

Thank you for considering these comments.

Sincerely,

Patricia E. Ganyard

COMMENTOR NO. 70: KNOPP, LISA
CARBONDALE, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

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These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 70-2

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Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 70-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 70-6

Thank you for considering these comments.

Sincerely,

Lisa Knopp

Lisa Knopp
500 W. Sycamore
Carbondale, IL 62901

COMMENTOR NO. 71: SANTA FE ALLOYS & LOS ALMOS CONSULTANTS ALBUQUERQUE, NEW MEXICO

SANTA FE ALLOYS & LOS ALAMOS CONSULTANTS, (SFA/LAC)
4515 Stockbridge Ave., NW, Albuquerque, NM, 87120
(505) 899-2178, E-mail-elliottgrb@juno.com

4/28/98
Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
US DOE
19901 Germantown Rd.
Germantown, MD 20874
Ph (301) 903-5512; Fax (301) 903-4905; Charles.Bradley@HQ.DOE

Subject: Non-proprietary comments regarding the draft PEIS

Dear Mr. Bradley:

Thank you very much for talking with me and for requesting some opinions from me.

As we have discussed, Santa Fe Alloys (using Federal funding) and Los Alamos Consultants (using private funding) have devised and experimentally developed continuous metallothermic reduction procedures for production of uranium and other metals over a period of nearly 20 years. Most of the successful experiments on these procedures were carried out at the SFA/LAC laboratory in NM.

Comments on the Draft PEIS--This Writer's Opinions:

Overall High Quality: Your wise recommendation, as based on the material presented, is to convert the DUF_6 to metal or oxide and to use the DU for shielding of HLW. It was very much needed. That way the DU will be recoverable later while being protected for now.

To emphasize the need to save DU, the reader should recognize that many of the better uranium sources worldwide have already been destroyed to collect and use U-235, but leaving >99.5% of the natural U unused. Saving the remainder (mostly U-238) as breeder fuel would allow its use substantially fully as reactor fuel (as Pu-238) by future generations. Yet some people seriously recommend burying this fuel as waste! Wasting the DU would be an environmental atrocity.

(See "Management and Disposition of Excess Weapons Plutonium," National Academy Press, 1994, p.28, and DOE/NN-0007, Jan. 1997, p.39, showing that Pu fuel is now used in other countries.) 71-1

COMMENTOR NO. 71: SANTA FE ALLOYS & LOS ALMOS CONSULTANTS (CONT'D.) ALBUQUERQUE, NEW MEXICO

SANTA FE ALLOYS & LOS ALAMOS CONSULTANTS, (SFA/LAC)
4515 Stockbridge Ave., NW, Albuquerque, NM, 87120
(505) 899-2178, E-mail-elliottgrb@juno.com

Avoidance of Too Strict Definitions of Processes to Be Used: From a chemical and engineering view, this PEIS should be looked on as sketches of what sort of approach could be used to convert the DUF_6 to metal or oxide. As such these sketches allow realistic broad decisions such as saving the DU for future use, as just discussed.

However, the current overregulation from within and outside of DOE tends to turn such sketches into rigid models before experiment has shown what would be realistic. Consider, for example, the recent failures of numerous radwaste vitrification units--inadequately tested proposals rigidly specified what turned out to inadequate approaches. 71-2

Here the decision to use continuous metallothermic reductions for production of uranium for cask shielding is sound. However, as discussed below, the writer recommends versions of reductions that differ significantly from the version described, e.g., UCRL-AR-124080 Vols 1 and 2 Rev 2, Sec 6.10-4.

However, there is need to examine cost features.

Locations and Types of Facilities Needed for UF_6 Conversions to Metal of Alloy:

Alternative to Hydrogen Reduction of UF_6 to UF_4: Historically this reduction has been used before the continuous metallothermic reductions of UF_4 by Mg in molten salt as done by SFA prior to its work for AVLIS with ORNL (Lockheed Martin) and LLNL.

However, an alternative continuous metallothermic approach (description proprietary by LAC) by SFA would convert UF_6 to UF_4 in molten salt prior to continuous Mg reductions to metal or alloy. 71-3

Incorporating this LAC metallothermic reduction to UF_4 as a precursor to the U-metal production would (a) avoid the cost of separate hydrogen reduction facility and operations, (b) integrate well with the molten salt operations of the Mg-UF_4 reductions, and (c) avoid some shipping and handling.

Alternative to Aqueous Separation of MgF_2 By-product from NaCl Molten Salt Additive: Because of experimental flaws in ORNL pilot tests, which seemed to invalidate containers used by SFA for continuous metallothermic reductions, the separation of MgF_2 by-product continuously from molten salt was abandoned in the system of the PEIS--instead batch aqueous separations were incorporated into the DOE plans. 71-4

COMMENTOR NO. 71: SANTA FE ALLOYS & LOS ALMOS CONSULTANTS (CONT'D.) ALBUQUERQUE, NEW MEXICO

SANTA FE ALLOYS & LOS ALAMOS CONSULTANTS, (SFA/LAC)
4515 Stockbridge Ave., NW, Albuquerque, NM, 87120
(505) 899-2178, E-mail-elliottgrb@juno.com

However, SFA is eager to correct the ORNL flaws and demonstrate that continuous circulation of molten salt carrier with removal of solid, clean MgF_2 by-product can be maintained.

Alternative to Formation of U-3%Fe Alloy in UF_4-Mg Reductions: As described, the continuous metallothermic reductions lead to U-Fe alloy, which has the advantage of a lower melting point than pure U. However, the U-Fe alloy is brittle in castings and unwanted in breeding. Therefore, the production and casting of pure U should be evaluated also. *71-5*

Location of U-Metal Production Facilities: To avoid the expenses and hassles of shipping radioactive materials by people's houses, it seems best to move the DUF_6 cylinders on-site at Paducah, ORNL, and Portsmouth to already HEPA-filtered buildings. Then, movable, also HEPA-filtered, UF_6-UF_4 units for continuous metallothermic reductions can be operated to produce U castings already suitable for use in casks. Then, with one radioactive shipment, the unshielded casks and the shielding castings could be assembled at the HLW site. *71-6*

It seems reasonable, and in accord with many environmentalists' wishes, that the casks could be stored long-term in underground mausoleums, where they were available for remote monitoring and eventually for HLW recycle and DU reactor use.

Reduction of Costs for Operations and Maintenance in the Manufacture of Metallic Shielding: With some $800 million as the cost of Operations and Maintenance (Cost Analysis, UCRL-AR-127650, May 1997, p. 57) for manufacturing metallic shielding, it becomes very important to move the material rapidly through the processing, e.g., in ten years. *71-7*

If an SFA continuous metallothermic reduction unit produced 1 cu ft of DU/hr full time for a year, the unit would produce 8760 cu ft of U. With 820,000 cu ft of U in cylinders, it would take 70.8 unit years to dispose of the DUF_6. With those assumptions, 10 SFA units could dispose of the DUF_6 within ten years.

ACTION:
With billions of dollars at stake, it seems urgent to get more

COMMENTOR NO. 71: SANTA FE ALLOYS & LOS ALMOS CONSULTANTS (CONT'D.) ALBUQUERQUE, NEW MEXICO

SANTA FE ALLOYS & LOS ALAMOS CONSULTANTS, (SFA/LAC)
4515 Stockbridge Ave., NW, Albuquerque, NM, 87120
(505) 899-2178, E-mail-elliottgrb@juno.com

experimental work from SFA. With even three months work, SFA working in its licensed DU laboratory could (presumably) demonstrate, and revalidate, containment for its water-free operations of continuous metallothermic reductions.

Later, other work could be discussed.

Sincerely,

Guy R. B. Elliott
President

COMMENTOR NO. 72: GOVERNORS PATTON, PAUL E., VOINOVICH, GEORGE V., & SUNDQUIST, DON PADUCAH, KENTUCKY; PORTSMOUTH, OHIO; OAK RIDGE TENNESSEE

April 27, 1998

The Honorable Federico Peña, Secretary
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 30585

RE: "Draft PEIS for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride," DOE/EIS-0269 dated December 1997.

Dear Secretary Peña:

More than forty years ago the U.S. Department of Energy began the uranium enrichment initiative that created a common link between Ohio, Kentucky, and Tennessee. This commonality includes the U.S. Department of Energy's legacy of waste, a significant portion of which is made up of depleted uranium hexafluoride. Today, our three states are working together in order to recommend the selection of an appropriate and lawful alternative for the long-term management and use of depleted uranium hexafluoride. We believe that such an alternative must minimize impacts on human health and the environment, as well as benefit the overall mission of our states and the U.S. Department of Energy ("DOE"). *72-1*

Ohio, Kentucky, and Tennessee have the following significant concerns regarding the above-referenced document:

- DOE should consider the immediate conversion of all depleted uranium hexafluoride (DUF6) to the less hazardous uranium oxide (U3O8) and provide above ground storage of the U3O8. We do not believe that waiting for possible market demands for the DUF6 is justification for delaying this project. It is incumbent upon DOE to immediately begin seeking funds from Congress for this conversion. We urge DOE to complete conversion by the year 2018 or earlier and reduce the mortgage of maintaining the cylinders. *72-2*
- A long-term strategy for DUF6 must include DOE's entire cylinder inventory, including heel and small cylinders. The 10,000+ cylinders of DUF6 generated by the United States Enrichment Corporation (USEC), which will revert to DOE ownership upon privatization of USEC, must also be considered in any plans. *72-3*
- An estimated $480 million has been accrued by USEC since 1993 in order to offset the cost of the future conversion of DUF6 generated by USEC. DOE should work with Congress now to ensure this fund is not diverted into the federal treasury for an unrelated use. In addition, DOE might consider partnering with the future owner of USEC in a long-term strategy for managing and converting DUF6, in order to avoid redundancy of efforts. Any partnering effort, however, must not slow progress toward conversion. *72-4*
- Natural phenomena events or accidents may not have been adequately considered in the PEIS. DOE must identify the "worse-case" cylinder conditions and explicitly use this information in the hazard modeling descriptions. *72-5*

COMMENTOR NO. 72: GOVERNORS PATTON, PAUL E., VOINOVICH, GEORGE V., & SUNDQUIST, DON PADUCAH, KENTUCKY; PORTSMOUTH, OHIO; OAK RIDGE TENNESSEE (CONT'D.)

- In order for states to effectively evaluate the potential impacts of the preferred alternative, DOE must provide information on the location of the sites where conversion would occur and how wastes generated from this process will be managed. In order to avoid the undue risk of transporting deteriorating cylinders, we recommend that DOE evaluate the feasibility of on-site conversion plants. *72-6*
- DOE must ensure that funding for safe storage and maintenance of DUF6 cylinders and storage yards is at an adequate level to protect human health and the environment. *72-7*

The States welcome the opportunity to work closely with the Department of Energy in addressing these complex issues and moving rapidly toward an alternative that will well serve the public and the environment. In addition, we urge DOE to carefully consider the more detailed comments being submitted by each of our states' environmental regulatory agencies.

Sincerely,

Governor Paul E. Patton

Governor George V. Voinovich

Governor Don Sundquist

cc: Charles E. Bradley, Jr., U.S. Department of Energy
James Hall, Manager, U.S. Department of Energy U.S. Department of Energy
William H. Timbers, Jr., United States Enrichment Corporation
Ohio Congressional Delegation
Kentucky Congressional Delegation
Tennessee Congressional Delegation

COMMENTOR NO. 73: HARTZOG, GEORGEANN
ALTO PASS, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 73-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 73-2

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. 73-3

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 73-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 73-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 73-6

Thank you for considering these comments.

Sincerely,

Georgeann Hartzog
Georgeann Hartzog
1170 Rattlesnake Ferry Rd
Alto Pass, IL 62905

COMMENTOR NO. 74: STAHNKE, LINDA
MURPHYSBORO, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. 74-1

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. 74-2

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If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. 74-4

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. 74-5

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. 74-6

Thank you for considering these comments.

Sincerely,

Linda Stahnke
LINDA STAHNKE
414 N 4th ST
MURPHYSBORO IL 62966

COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION FRANKFORT, KENTUCKY

JAMES F. BICKFORD
Secretary

PAUL E. PATTON
Governor

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY RD.
FRANKFORT KY 40601

April 23, 1998

Mr. Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Re: U.S. Department of Energy's Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DOE/EIS-0269) dated December 18, 1997.

Gentlemen,

The Kentucky Division of Waste Management (Division) has reviewed the December 18, 1997 *U.S. Department of Energy's Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride* (DOE/EIS-0269). Since the Paducah Gaseous Diffusion Plant currently store and manage the largest volume of Depleted Uranium Hexafluoride (DUF6) in the nation, the Division is very interested in the decision making process for the long-term storage and management of the DUF6. Attached are the Division's general and specific concerns of DOE's proposed alternative and long-term strategy.

If you have any questions or require additional information, please contact me or Russ Taylor at (502)-564-6716.

Sincerely,

Robert H. Daniell, Director
Division of Waste Management

RHD/TT/jkg

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COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) FRANKFORT, KENTUCKY

cc: Robert Sleeman, DOE
Carl R. Freode Jr., USEPA
Jimmie Hodges, DOE
Myrna Redfield, DOE
James Hall, DOE
William H. Timbers, Jr., USEC
Jimmy Massey, BJLLC
John Morgan, BJLLC
KDWM-Paducah
DWM Main File #980

COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) FRANKFORT, KENTUCKY

Kentucky Division of Waste Management's General and Specific Comments on the DOE's Draft Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride (DOE/EIS-0269) dated December 18, 1997.

General Comments:

1. DOE's Preferred Alternative: DOE's preferred alternative, as repeatedly mentioned in PEIS is to use the entire inventory of DUF_6 as metal or oxide. However, no evidence has been documented in the PEIS, which suggests that the market demand exists or will be found for all or even a significant part of DUF_6 inventory in the near future. Moreover, two independent studies (*"Integrity of Uranium Hexafluoride Cylinders", DNFSB/TECH-4, May 5, 1995, and "Affordable Cleanup? : Opportunities for Cost Reduction in the Decontaminating and Decommissioning of the Nation's Uranium Enrichment Facilities", Board on Energy and Environmental Systems, Commission on Engineering and Technical Systems, National Research Council of the National Academy of Sciences, February 9, 1996*) also report that the market demand doesn't currently exist for the DUF_6 or its conversion products, nor is the demand anticipated in the near future. In light of the present uncertainties in the market demand, the Division therefore recommends that the DOE should consider converting the entire inventory immediately to the more stable form U_3O_8. The long-term storage of this material is much safer than the current storage of DUF_6 and it can also be retrieved if future demand is obtained. *75-1*

2. Time Frame: The PEIS doesn't justify the 40-year time frame considered. Justification is warranted for the same. The PEIS recommends storing the cylinders until 2010, after which 20 years would be required to convert the entire inventory of DUF_6 using DOE's preferred alternative. During these years, there is continued storage of DUF_6 required, which will also necessitate the continued monitoring activities. The Division therefore recommends that the process of conversion should be expedited in order to minimize the risk to the human health and the environment from continued storage of deteriorating cylinders. This would also help in cutting down the cost on the annual maintenance and surveillance activities. *75-2*

3. Management of USEC cylinders: The PEIS doesn't take into account the cylinders (~8000) produced by United States Enrichment Corporation (USEC) since its privatization. The ownership of these cylinders has yet to be determined. It is the Division's understanding that under the current agreement between DOE and USEC, the USEC will be able to return to DOE, any waste not easily disposed of commercially. In this scenario, if these cylinders are considered waste, there is a possibility that they could be returned to the DOE. This represents a significant increase in the inventory. Hence the Division recommends that a contingency plan should be incorporated in the PEIS to address the USEC cylinders. *75-3*

4. Conversion Facilities/Site Selection: It is the Division's understanding that the DOE has not yet come to the conclusion of final selection of the site, as is evident from the PEIS. The PEIS describes the impact on the environment, considering various generic settings. However, the Division believes that site specific impact is also necessary after final selection of the site. For example, it is clear from the PEIS that the DOE has not given enough attention to the earthquake prone regions, and the seismic activities at the sites proposed for storage of the waste. The Division believes that it is critical and the site-specific information should be included in the PEIS. If PGDP is selected as one of the conversion facilities for example, then new facts gathered about this should be considered. The summary of some recently gathered seismic data at Paducah site is given in the specific comments. *75-4*

5. Generation of Secondary Waste: Preliminary calculations performed by Division indicate that if DOE's preferred alternative were used, large amounts of secondary waste could be generated. More specifically, around 70% of the product stream will consist of Uranium (in the metal or oxide form) and 30% will be in the form of other products (anhydrous HF, CaF_2, or MgF_2). The Division believes that the potential exist that all the handling, transportation, and disposal for uranium left at the end of the treatment process will meet Low-Level Waste (LLW) requirements. Moreover, unless the specific technology is available to totally remove all the radioactive contamination from these secondary products (e.g. HF, CaF_2, MgF_2 etc.-), all the disposal, handling, and treatment activities for this waste must follow the (LLW) management guidelines. Please provide a description of all potential anticipated wastes that may be derived from the preferred alternative. *75-5*

Specific Comments:

1. One of the chemicals of potential concern (COPC) identified in the conversion (to oxide or metal) is ammonia. Provide a brief discussion regarding the generation of ammonia. *75-6*

2. DOE has proposed a 40-year time frame for the proposed alternatives. Please provide a detailed justification for the proposed 40-year time frame. *75-7*

3. Consideration of "no-action" alternative should include at a minimum, implementation of Recommendation 95-1 of the Defense Nuclear Facilities Safety Board. *75-8*

COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) FRANKFORT, KENTUCKY

4. It is clear from the PEIS that DOE has not given enough attention to the earthquake prone regions, and seismic activities at the sites proposed for storage of the waste. The Division believes it is critical that site specific information is included within the PEIS.

The following is a summary of new information discovered at the PGDP: Dr. Ronald Street of the University of Kentucky, Department of Geological Sciences commenced an investigation of earthquake related features in the vicinity of the PGDP (*Acquisition of Shear Wave Seismic Reflection and Refraction Data in the Area of the Northwestward Trending Contaminant Plume at the PGDP*). The purpose of this investigation is to map geologic contacts between the Mississippian limestone, the McNairy Formation, the lower Continental Deposits, and the upper Continental Deposits. It has been proposed that faulting has created horst and graben features in these units and that these features may affect groundwater flowpaths in the area on the Northwest and Northeast plumes. A pilot study conducted by Dr. Street located a small graben structure north of the PGDP. As part of the current project, Dr. Street has collected 17.3 km of six and twelve fold reflection and refraction data using a 24 bit floating point seismograph unit. Work on this project started in May of 1997 and a final report is due to AIP in May of 1998.

Preliminary interpretations of the data collected in this study were presented to the AIP in February 1998. These interpretations, which are subject to change, indicate that the PGDP is underlain by a series of northeast trending fault zones exhibiting substantial vertical offset on the surface of the Mississippian Limestone as well as the upper surface of the McNairy formation. *75-9*

In other work conducted by Dr. John Nelson of the Illinois Geological Survey northeast trending faulting was found in sediments north of the PGDP in Southern Illinois. Dr. Nelson identified faulting in road cuts and railroad cuts. He also identified a graben in the surface of the McNairy formation with a vertical offset of 200+ feet.

Dr. Tom Hildenbrand (USGS, Menlo Park) compiled magnetic, seismic moment, and gravity maps for the Paducah region. An anomalous feature appeared approximately 5 miles northwest of the PDGP on all three maps, gravity high, a magnetic high, and a cluster of small earthquakes. This feature has been interpreted as a mafic intrusion located near the community of Needmore. Earthquakes in the vicinity of this possible intrusion are thought to be the result of the regional compressive stress field being deflected around the structure.

This evaluation indicates that the probability of significant seismic activities within this region is high and that further consideration is needed within the PEIS.

5. The PEIS should describe clearly the criteria for choosing the sites for treatment/disposal. The Division believes that such information is crucial. It is the *75-10*

COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) FRANKFORT, KENTUCKY

Division's understanding that several options will be available for the conversion process of UF_6 to either oxide or metal and production of anhydrous HF. Because there are varying chemical products and potential waste products generated with different conversion methods; DOE must provide a general description of waste products and waste which are anticipated to be generated. If a method has been selected, please state the method. *75-10 (Con't.)*

Additionally, DOE must address the management and disposal of miscellaneous wastes that will be generated during the conversion process. This would include management and disposal of potentially large volumes of low-level wastes from the neutralization of HF; also various filters and filtered materials. *75-11*

Finally, discussion is needed for the management of "cylinder heals" from the bottom of the DUF6 cylinder. This material contains a variety of radionuclides (i.e. daughter products and other contaminants) that are not suitable for conversion into uranium oxides or uranium metal. *75-12*

6. While evaluating the alternative "conversion of UF_6 to oxide or metal form", different steps have been delineated as is the case with the other alternatives. In this particular case, the facilities for conversion process, storage of converted uranium form, and the manufacturing of the casks (which is the end use for this alternative, and this is DOE's preferred alternative) are all planned to be located at separate locations. There will be transportation required between these locations. The PEIS should address the impacts of the transportation, including the potential impacts on the environment, human health. However, the transportation impacts could be minimized if DOE would integrate the conversion and manufacturing plants in one complex. This would reduce the amount of land required thereby decreasing possible habitat loss. It is not clear whether DOE has considered this alternative. If not, we recommend that this option be considered. *75-13*

7. A correction is needed on page 3-7, Section 3.1.4.1; the reference to the earthquake magnitude of 7.3 should have been referenced as the "Nuttly Scale" and not as the "Richter Scale". Although, the Nuttly Scale does converts to 8.0 on the Seismic Moment scale sometime referred to as the Richter scale. *75-14*

8. Section 3.1 Paducah Site; U.S. EPA has authorized the Commonwealth of Kentucky for the Resource Conservation and Recovery Act (RCRA) Program. Therefore, when references are made to the U.S. EPA RCRA program, the Kentucky Hazardous Waste should also be referenced. *75-15*

9. Pages2-60 and 2-61; 2-64 and 2-65; 2-68 and 2-69; 3-2 and 3-4; Figure 3.1 of Volume I of the Draft DUF6 PEIS are missing. A comprehensive review could not be performed due to the lack of these pages. Provide the missing pages. *75-16*

COMMENTOR NO. 75: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) FRANKFORT, KENTUCKY

10. Page 5-108, Section 5.8.2.1 Paducah Site; the last paragraph states that 11 pollutants have been detected in the groundwater effecting quality. This statement is incorrect. Numerous pollutants have been detected at the PGDP. In fact, one of the most predominant contaminants at the site is omitted, Technetium 99. Other radionuclides and organic contaminants have been detected in groundwater throughout the PGDP. *75-17*

COMMENTOR NO. 76: STATE OF OHIO ENVIRONMENTAL PROTECTION AGENCY COLUMBUS, OHIO

OhioEPA
State of Ohio Environmental Protection Agency

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1800 WaterMark Drive
Columbus, OH 43215-1099

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P.O. Box 1049
Columbus, OH 43216-1049

April 21, 1998

The Honorable Federico Pena, Secretary
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: " Draft PEIS for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride," DOE/EIS-0269 dated December 1997.

Dear Secretary Pena:

Ohio EPA has long been interested in the management of depleted uranium hexafluoride (DUF6). Ohio's concerns result from the 13000+ cylinders of DUF6 which have been stored for decades at the Portsmouth Gaseous Diffusion Plant in southern Ohio. As you may know, management of DUF6 at the Portsmouth site was the subject of recent judicial and administrative consent orders signed by the U.S. Department of Energy ("DOE") and the State of Ohio. The State of Ohio is working to support an appropriate lawful alternative for the long term management and use of DUF6. We have reviewed the above-referenced document and offer the following comments:

1 **There is no evidence to suggest that market demand exists or will be found for all or even a large part of DOE's DUF6 inventory in the near term or the foreseeable future. Therefore, conversion should begin as soon as possible and be completed by 2018 or earlier. DOE should begin now to seek funds from Congress for conversion, and should consider the immediate conversion of all the DUF6 to U3O8, and long-term above-ground storage of this material.** According to the draft PEIS, the preferred alternative for long-term use of DUF6 is conversion of 100% of stockpiled DUF6 to oxide (i.e., U3O8 and/or UO2) and depleted uranium metals. Conversion would not begin until 2010, and would occur over a twenty year period on the basis of market demand. However, in the Draft PEIS, DOE states that "the actual percentage of depleted UF6 inventory for which uses will be identified within the time frame assessed in the PEIS (i.e., up to the year 2040) will be determined as uses develop and conversion begins." In other words, this market demand is uncertain. *76-1*

The National Research Council of the National Academy of Sciences (NSF)[1] conducted

[1] "Affordable Cleanup?: Opportunities for Cost Reduction in the Decontaminating and Decommissioning of the Nation's Uranium Enrichment Facilities". Board on Energy and

George V. Voinovich, Governor
Nancy H. Hollister, Lt. Governor
Donald R. Schregardus, Director

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COMMENTOR NO. 76: STATE OF OHIO ENVIRONMENTAL PROTECTION AGENCY (CONT'D.) COLUMBUS, OHIO

a review in 1996 of possible uses for depleted uranium in shielding applications, as a fluorinating agent, and for re-enrichment by Atomic Vapor Laser Isotope Separation (AVLIS). According to the NSF, market demand does not currently exist for DUF6 or its conversion products, nor is demand anticipated in the near future. This is corroborated by the DNFSB who stated in a 1995 report[2] that according to DOE, only a "small fraction" of depleted uranium has a use in the "foreseeable future".

We recognize that market demand is, at best, uncertain. DUF6 can be stored more safely in a converted state. Therefore, rather than wait for market demand to drive conversion, DOE should begin now to seek funds from Congress for conversion, and should consider the immediate conversion of all the DUF6 to U3O8, and long-term above-ground storage of this material, which can be retrieved if demand is established. If a market exists for a small percentage of DUF6, only those cylinders in the best condition should remain unconverted for use by the market. *76-1 (Cont'd.)*

2. **The draft PEIS provides no assurance that DOE will fund and implement an adequate long-term program of inspecting and coating cylinders throughout the life of the DUF6 cylinders, prior to conversion.** Safe cylinder management requires an adequate inspection program combined with an aggressive cylinder coating program. Several times throughout the PEIS, it is indicated that funding for a cylinder coating program is "uncertain". However, DOE states in the PEIS that coating is expected to be successful and therefore, minimal releases of DUF6 from cylinders to air and groundwater are expected. It is unclear how DOE can assume coating will be successful if funding is uncertain and the success rate of coating cylinders is unknown. Even if funded, there is no assurance that coating will be adequately applied and renewed frequently enough to prevent or slow corrosion. DOE must comply with all DNFSB recommendations for management of cylinders and yards, and with the DUF6 management plan contained in Ohio orders. *76-2*

3. **DOE should ensure that the PEIS addresses the management of DUF6 in compliance with RCRA and state hazardous waste law. The February 28, 1998 Director's Findings and Orders reiterated Ohio EPA's view that DUF6 is a mixed waste regulated under RCRA and state hazardous waste law. These Findings and Orders provide an exemption from state hazardous waste requirements for a 10-year period to allow DOE to identify and implement an appropriate and lawful strategy for use, reuse, or conversion of this material. The Findings and Orders require compliance with a safe management plan for the DUF6 during the 10-year period. Ohio has also reserved legal rights to reassert state hazardous waste requirements. Thus, it is imperative that the PEIS address the management of** *76-3*

Environmental Systems, Commission on Engineering and Technical Systems, National Research Council of the National Academy of Sciences, February 9, 1996.

[2]"Integrity of Uranium Hexafluoride Cylinders", Defense Nuclear Facility Safety Board Technical Report, May 5, 1995.

COMMENTOR NO. 76: STATE OF OHIO ENVIRONMENTAL PROTECTION AGENCY (CONT'D.) COLUMBUS, OHIO

DUF6 as a mixed waste under RCRA and state hazardous waste law.

4. **A variety of independent and DOE estimates regarding breached cylinders are available but not considered in the draft PEIS.** The draft PEIS estimates that 59 breaches and releases from cylinders could occur over the next forty years, assuming control of external corrosion by painting cylinders. Assuming no control of corrosion, the draft PEIS estimates that 731 breaches and releases could occur. However, according to the Defense Nuclear Facility Safety Board (DNFSB)[1], it has been stated by DOE and the former MMES that 200 cylinders are expected to breach if no corrosion control is undertaken, and more than 1000 cylinders have the potential to breach in storage within 22 years (by the year 2020). *76-4*

5. **DOE's estimate of three to four cylinder spill accidents from breaches due to corrosion appears unrealistically low.** The draft PEIS estimates that as a result of all activities associated with the preferred alternative, three to four spill accidents will occur by 2038 as a result of cylinders that will breach due to corrosion. However, DOE records show that from 1990 to 1992, seven cylinders stored at the DOE three gaseous diffusion plants have breached due to corrosion. In light of DOE's own predictions mentioned in comment #2 above, as well as the current age of the cylinders, unknown cylinder corrosion rates, and the uncertainty of a long-term, ongoing cylinder coating program, a more realistic estimate of cylinder spill accidents due to corrosion must be made. *76-5*

6. **If cylinder breaching rates have been underestimated, all other calculations made in the draft PEIS that were based on this breach rate, such as the impact of a release of DUF6 to soil, groundwater, human health, etc., have also been underestimated. These estimates should be revised accordingly.** *76-6*

7. **Conversion of DUF6 to U3O8 should be expedited in order to minimize the risk to human health and the environment from continued storage of deteriorating cylinders.** In order to implement the preferred alternative in the Draft PEIS, DOE recommends storing cylinders until 2010. Then, a period of twenty years, at a cost of $200 million per year, would be required to convert the entire DUF6 inventory to either depleted metals or oxide at one conversion plant, the site of which has not yet been determined. During conversion, aqueous HF would be generated and marketed. According to the National Research Council, a twenty year conversion rate and was chosen to reduce the cost of plant investment (spread the cost out over twenty years) and to render the HF production rate less disruptive to the market. The rate at which HF would be generated over twenty years is equal to approximately 2% of the estimated annual market in North America. It is recommended that conversion be completed by 2018 or earlier. Expediting conversion will minimize the risk of continued storage and defray the annual cost for cylinder maintenance and surveillance, which is estimated by DOE at $12 to 15 million. *76-7*

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[1]Recommendation 95-1 to the Secretary of Energy pursuant to 42 USC 2286a(5) Atomic Energy Act of 1954, as amended.

COMMENTOR NO. 76: STATE OF OHIO ENVIRONMENTAL PROTECTION AGENCY (CONT'D.) COLUMBUS, OHIO

8. **Rather than construct a conversion plant at a single location and transport all cylinders to the conversion site, DOE should evaluate the feasibility of on-site conversion of DUF6 to U3O8.** According to DOE, 50% to 95% of the DUF6 cylinders have corroded to the point that they are not capable of being handled and transported without undue risk. The draft PEIS states that cylinders would be over packed or their contents transferred into new containers prior to transporting them to an undetermined conversion plant. If cylinders can be converted onsite without transporting them, this will minimize the number of times they are handled, therefore, limiting the risks associated with transferring cylinder contents and transporting them to conversion sites. In addition, the time required for over packing, transferring contents, and transporting cylinders could be saved. The use of a mobile treatment unit that could be transported to each GDP site should be considered. In the alternative, DOE could construct a plant onsite at each GDP (if seismic conditions allow), within an existing, unused gaseous diffusion building. *76-8*

9. **Seismic and flooding concerns were not adequately discussed in the draft PEIS.** For example, Paducah, Kentucky is located approximately 60 miles from the New Madrid fault. Earthquakes of a magnitude of 8.4 to 8.8 on the Richter scale have been measured in the region. These have the potential to damage stored cylinders. The majority of cylinders are stored at Paducah. Seismic issues for Ohio, Kentucky and Tennessee must be adequately considered in the PEIS, especially in light of continued storage of cylinders until at least 2010, and conversion at an unknown site. *76-9*

10. **DOE should evaluate a long-term strategy for DUF6 that would include DOE's entire cylinder inventory including heel and small cylinders as well as the current inventory of 10,000+ cylinders of DUF6 generated by USEC since it's 1993 inception.** When privatization occurs, these USEC-generated cylinders will become the responsibility of DOE. Pursuant to the federal privatization legislation, funds have been accrued for each kilogram of DUF6 generated by USEC in order to pay for future treatment of tails. Currently, this fund may now hold as much as $480 million. When USEC is privatized, this fund will be turned over to the federal treasury. DOE should take steps to secure these funds to offset the cost of conversion of the DUF6 to be acquired from USEC, as well its existing inventory of DUF6. *76-10*

Ohio EPA is willing to work closely with DOE on this issue. We suggest forming a workgroup that includes representatives of Ohio, Kentucky and Tennessee that can work with DOE to find a solution that meets the needs of all three states as well as DOE. Please contact Donna Goodman of my staff at (740)385-8501 if you have any questions or wish to discuss this further.

Sincerely,

Donald R. Scherregardus
Director

COMMENTOR NO. 77: WATKIN, MARY ELLEN & MONTEITH, JERRY COBDEN, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. *77-1*

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. *77-2*

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. *77-3*

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. *77-4*

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. *77-5*

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. *77-6*

Thank you for considering these comments.

Sincerely,

Mary Ellen Watkin
Jerry C. Monteith
511 Oak St.
Cobden, IL 62920

(MARY Ellen WATKIN)

(Jerry Monteith)

* PADUCAH is 25 miles from our home in Southern Illinois.

COMMENTOR NO. 78: BELLETIRE, KATHY
MARION, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6 **78-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **78-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **78-3**

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Thank you for considering these comments.

Sincerely,

Kathy Belletire
6710 Wards Mill
Marion Il 62959

COMMENTOR NO. 79: COOTS, LOU
PADUCAH, KENTUCKY

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 23, 1998

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Thank you for considering these comments.

Sincerely,

Ms. Lou Coots
Ms. Lou Coots
330 N. 38th St.
Paducah, Ky. 42001

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY MCDERMOTT, OHIO

Portsmouth-Piketon
Residents for
Environmental
Safety and
Security

P.R.E.S.S.

Vina K. Colley, President
3706 McDermott Pond Creek
McDermott, Ohio 45652-8937
Telephone: (614) 259-4688
Fax: (614) 259-3912

Hello,

My name is Vina Colley a former worker who suffers form a disabling illnesses as the result of U235 in my lungs and toxic exposures from working at the Portsmouth /Piketon Uranium Enrichment plant located here in Piketon.

I am here today representing PRESS Portsmouth/Piketon Residents for Environmental Safety and Security. Press is a member group of several national organizations representing communities living in the shadows of the U.S. nuclear weapons complex such as the Alliance for Nuclear Accountability (formerly the Military Production Network),Military Toxic Project, Reclamation & Conversion Project, and Task Force on Radiation and Human Right.

Press doesn't represent the union body of the Piketon plant but workers like my myself that have been effect from this facility. PRESS represents the interests members of the directly affected.

We are her today to speak about one of the biggest problems facing the public from the DOE/DOD programs the Uranium Hexafluoride (UF6) DU cylinders. A hazardous materials specialist, David Kozlowski was quote as saying " Uranium Hexafluoride is highly corrosive ", its effect to those hydrochloric acid. Sites such as Piketon, he said are regarded as potential "general emergency" sites by the DOE, meaning if there were gas formation it could require evacuation of nearby areas. **80-1**
While in D.C. last year with the national groups we were told by another top person for the DOE that painting, these cylinders was like putting lipstick on a corpse. Slightly contaminated DU cylinders become a problem equal to high level radioactive waste as they age because of the decay daughter product to radium.

I would like to remind you of the 1978 spill here at the plant when over 21 thousand LBS left this site by air, ground and water many workers where effected. In September of 1996 another airborne plume went off site ~~and~~ in between the lithuim storage building and the national guards bulding. This airborne plume headed toward Wakefield. **80-2**
I have been told that workers were paid over time and told to stay inside, I also called a reporter when this was happening, he called the plant and they lied about the release and two days later put there own story in the paper. I would like someone to tell me why we have alarms and run through drills and when there is an actual potential **80-3** **80-4**

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

dangerous releases there is no sound of alarms to warn the citizens of the surrounding communities. Residents didn't know about the situation so therefore didn't know to stay inside. **80-4 (Con't.)**

Charles Bradley you didn't seen to believe me about the airborne plume from the DU cylinder could form,you though it would suck back inside the cylinder like the video that was show here. That video is misleading in ways. ~~B~~ removed tape was update **80-5**

I would like to view another picture of children standing around DU cylinders. This should not be allowed with all the information about the hazard of this product,and the problems with on site hazards here at Piketon **80-6**

PRESS considers a decision that there is little effect to the public and it's workers to be a serious environmental justice concern and and was not address adequately in the draft PEIS.

PRESS along with the Military Toxic Project is asking for the comment period be extended to six months to give folks the opportunity to meet with you in a roundtable meetings, much like the Federal Facilities Restoration Dialogue meetings. We need to have the opportunity to discuss the strategies that have been proposed. **80-7**

I am putting in records the letter form the Military Toxic Project.

PRESS an other viewer should see in writing all agreement between the state of all three facilities OakRidge, Paducah, and Piketon.

All agreements between CONGRESS the USEC,DOD, DOE, and any others involved. **80-8**

The EPA was to fine this facility I believe over the DU clinders, we would like to know how much, and why.

I would like to remind you that Piketon has never been licensed to accept or store Radioactive waste and we have broken many laws by doing so. You have consistenly withheld information from the citizens about radioactive release whether planned, routine, or accidently. **80-9**
PRESS feels that there is a number of cylinders no longer inventory and would like to know who is hidding them, or where they stolen or is some one all ready doing conversion?

PRESS is worried that a earthquake would create multiple cylinder failures at all the sites,also worried over the possibly of aircraft wrecking and hidding the cylinders. **80-10**

Press feels we need to look at some real problem that the National Research Council as put on the table. **80-11**

We feel that untill we find a safe way to handle these cylinders they ~~should be put in~~ earthquake proof containers or maybe find away to heat them up in the place where stored, then put then in new cylinder untill new safe technology comes along. **80-12**

I have a Report from George Hoffman to put in Record

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

I would like to put in record a report from Gene Hoffman. At request, I will make a copy for people here that would like one. Also a letter sent to NY TIMES BUREAU from Leonard A. Dietz. [redacted] about the DU issue. 80-13

I would like to thank you for this time to speak.

Venia Callery
PRESS

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

SCIENCE FOR DEMOCRATIC ACTION

an ieer publication

Volume 6, Number 2 November 1997

Worker Radiation Dose Records Deeply Flawed

BY ARJUN MAKHIJANI AND BERND FRANKE

As part of its responsibility for the production and testing of nuclear weapons, the Department of Energy (DOE) and its predecessor agencies (the Atomic Energy Commission, 1947–1974; and the Energy Research and Development Administration, 1974–1977) have been responsible for ensuring that workers were not exposed to more than the allowable amounts of radiation. The DOE has also been responsible to adhere to what is called the "ALARA" principle—the idea that radiation exposures should be kept "As Low As Reasonably Achievable" with available technology.

The goal of setting radiation dose limits and following the ALARA guideline is to protect worker health by limiting exposure. But if exposure is not properly measured, radiation exposure regulations cannot be enforced, nor can guidelines be followed. Health monitoring personnel may not be aware of instances when workers are overexposed. Diseases that workers may be at greater risk of contracting may go undetected, harming them and their families. Health studies based on worker dose data would produce misleading results because dose records would be incomplete and knowledge of doses would be inaccurate.

A worker at the Plutonium Finishing Plant at Hanford, Washington receives a whole-body survey to detect potential radioactive contamination.

From the beginning of the nuclear era until 1989, *radiation doses from radioactive materials inhaled or ingested by workers were not calculated or included in worker dose records.* This was revealed by DOE in a background paper sent to IEER on April 7, 1997.[1] DOE and its predecessor agencies did make measurements of internal exposure to radioactive materials, though often sporadic (see below), mainly by taking urine samples. After the mid-to-late 1960s, there was also selective use of more sophisticated counters that

See **Worker Doses**, *page 4*

Editorial

Identify Groups of Workers at Risk

As noted in the accompanying article, the Department of Energy has stated that it did not calculate internal doses for workers, and therefore did not integrate them into dose records until 1989. This single fact means that historical worker dose records for 500,000 to 600,000 DOE workers are open to question and that a large number of them—those belonging to workers at risk of internal exposure—are flawed.

The DOE was not actually required to do such integration of internal and external doses, as we note in the article. Still, in the 1950s it was possible to crudely calculate internal worker doses and enter them into worker dose records (though such estimates would often have underestimated exposures). Relatively precise estimates were possible after the mid-1960s by matching up urine data with direct measurements of lung burdens, as IEER did in the case brought against

See **Editorial**, *page 2*

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Editorial, *from page 1*

National Lead of Ohio by workers at the Fernald Plant in 1991. (See SDA Vol. 5 No. 3) But the AEC, its successor agencies, and their contractors did not make the effort until 1989, when new regulations required it.

As the case of iodine 131 in fallout out shows, (see article, p. 3) the nuclear weapons establishment chose not to properly inform the public about the risks and sacrifices that it was imposing upon them. The counterpart for workers of the public relations campaign that accompanied atmospheric testing was constant reassurances that doses were under allowable limits—and vigorous contestation of worker compensation claims even though the DOE and its predecessor agencies had failed to do their homework on what worker exposures actually were, and though relatively accurate estimates were possible after the mid-1960s.

Relatively precise estimates of internal doses were possible after the mid-1960s.

It is time for the DOE to straighten out the mess by commissioning an independent assessment of the state of internal and external dose data. Simultaneously, the DOE must expeditiously review workers' records to determine which *groups of workers* who labored to make and test this country's huge nuclear arsenal were at risk of high internal exposures and/or high lifetime exposures. The reconstruction of individual worker doses would be a very costly and difficult exercise, which would in many or most cases also be frustrating because huge uncertainties will inevitably remain. That is why we advocate the calculation of doses to groups of workers to determine at-risk groups for the purposes of medical monitoring and, if warranted, compensation. That way most resources can be devoted to workers rather than technical studies.

It is also possible that the DOE and its contractors have used incomplete dose records to argue its case in compensation cases and other lawsuits. It is improper for the government to continue to fight workers' claims based on exposure data that systematically underestimated doses. A review should be conducted to determine if DOE or its contractors have presented any pre-1989 records as accurate data on internal worker doses.

Private industry failed to calculate internal worker doses until the 1991–1994 period. We have not examined any set of data relating to workers in the private sector of the nuclear industry. The industry's failure to measure internal doses needs to be reviewed and an assessment should be made of its impact on workers.

There are two rays of hope in this dismal picture. One is that DOE began in 1989 to incorporate internal dose estimates into worker dose records. The other is that DOE and its predecessor agencies appear to have taken sufficient measurements to enable group worker doses to be approximately calculated, at least in the one instance where IEER has had access to the raw data. Since its inception, the DOE has made some effort to track individual worker exposures, which has undoubtedly resulted in lower overall exposures than would have occurred if no effort were made. But these measures have been grossly inadequate. If the DOE can spend $4.5 billion a year on laboratory testing and computer simulation of nuclear weapons, which we have found to be essentially unnecessary for maintaining safety (See SDA Vol. 5 No. 2), it can find the resources to do justice to the people exposed to radiation while building nuclear weapons.

—ARJUN MAKHIJANI AND BERND FRANKE

SCIENCE FOR DEMOCRATIC ACTION

Science for Democratic Action is published four times a year by the Institute for Energy and Environmental Research.
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We gratefully acknowledge our funders whose generous support has made possible our project to provide technical assistance to grassroots groups working on nuclear weapons-related issues, and our nuclear materials outreach project.

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Thanks also to the SDA readers who have become donors to IEER. Your support is deeply appreciated.

Credits for This Issue:
Production: Cutting Edge Graphics
Photos: Robert Del Tredici

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Managing Editor: Pat Ortmeyer

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Let Them Drink Milk

Iodine-131 Doses from Nuclear Weapons Testing

BY PAT ORTMEYER

...it seems necessary to adopt a rather conservative attitude toward the involuntary exposure of the general populations. An error on the radical side will not be immediately apparent, but the chickens will inevitably come home to roost at some later date.

—Howard L. Andrews,
National Institutes of Health,
September 13, 1953[1]

The National Cancer Institute (NCI) recently released results of its 14-year study showing that fallout of iodine-131 from atmospheric tests conducted in Nevada in the 1950s and early 1960s resulted in thyroid doses to virtually all of the 160 million people living in the United States at the time. The estimated 150 million curies of iodine-131 released from the tests resulted in a cumulative average thyroid dose to the population of 2 rad.[2] Children were particularly affected; their doses averaged 6 to 14 rad, with some doses as high as 112 rad. Prior to this study, the most recent estimates of children's thyroid doses from iodine-131 in fallout, reported to Congress in 1959 and cited as recently as 1997, gave a dose range for children of 0.2 to 0.4 rad—15 to 70 times less than the NCI dose estimates.[3] (Note: These are estimates of thyroid doses, not whole body doses. See Centerfold table on dose.)

Thyroid irradiation increases the risk of cancer to children. A 1995 peer-reviewed publication says there is "convincing evidence" of increased thyroid cancer risk to children under age 15 whose thyroids are exposed to 10 rad or more.[4] This study mostly concerned individuals exposed to external radiation sources such as X-rays, but the effect on tissues from ionizing radiation from internal sources is essentially the same.[5] (See footnote for full explanation.)

Thyroid cancer is relatively rare, but the NCI estimates that 10,000 to 75,000 thyroid cancers can be expected as a result of these doses, roughly five to ten percent of which will be fatal. (The upper estimate of 75,000 is more plausible, since the lower estimate assumes that internal radiation doses from iodine-131 are "as little as one-fifth as hazardous" as the same dose of external radiation.[6] This assumption is very dubious, not based on human data, and not protective of public health.) About 40 percent of thyroid cancers due to iodine 131 fallout have yet to be diagnosed, according to the NCI,[7] and survivors of thyroid cancer require lifelong treatment with a synthetic thyroid hormone essential for metabolism and other physiological functions. Thyroid irradiation has also been linked to other thyroid disorders, such as autoimmune hypothyroidism, autoimmune thyroiditis, hyperthyroidism, incident to Grave's disease, and thyroid nodules.[8] Estimates of the level of dose at which these effects occur vary considerably.

While NCI has not estimated the number of children who were put at risk due to fallout, simple demographics coupled with the published numbers indicate that millions of people who were under 15 during the period in question may have received over 10 rad. Doses to girls may be of particular significance, as the incidence of thyroid cancer among women is more than twice that of men.[9]

Iodine can be inhaled, or ingested through contaminated eggs, cottage cheese, or leafy plants and vegetables. But the main pathway of exposure was through ingestion of contaminated milk. As fallout settled on fields and pastures after each test, cows and goats would eat the grass and the iodine would become concentrated in their milk. Children received higher doses because in general they consumed more milk than adults, and their thyroids were smaller and growing more rapidly. The estimated 20,000 people in the county at the time who drank goat's milk also received higher doses—up to 20 times greater than those drinking cow's milk—because goat's milk concentrates iodine-131 more than cow's milk.[10] Doses to goat's milk drinkers could, in the most affected counties, have been as high as 180 to 316 rad.

Some of the highest thyroid doses in the country were in areas far from the test site.

High doses were not limited to those areas directly downwind of the tests. Local precipitation or wind patterns in areas far from the test site caused selective deposition of fallout, or "hot spots," a phenomenon understood by the Atomic Energy Commission (AEC) from the time of the first test, "Trinity," in 1945. As a result, some of the highest estimated thyroid doses in the country were in areas far from Nevada, such as in Meagher County, Montana, with an average dose of 15.8 rad, and Custer County, Idaho with 15.4 rad. Other high doses were estimated throughout the midwest: 8.6 rad in Lyman, South Dakota (26 to 60 rad for children), and 8.1 rad in Lewis County, Missouri (24 to 37 rad for children).[11]

The Atomic Energy Commission understood early on that locating the test site in the western part of the

See **Milk**, *page 11*

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Worker Doses, *from page 1*

directly measure radionuclides in workers' bodies. The DOE was not required by regulations to calculate worker doses, but only to keep records of whether workers were internally exposed to more than certain amounts of radionuclides.

The lack of historical internal dose data in worker dose records has important consequences for public policy on health issues, for scientific investigations of radiation risk, and most of all for the more than half a million workers (and their families) who have been involved since the Manhattan Project in making and testing US nuclear warheads. In 1989, DOE began to correct this historical problem by initiating a program of integrating internal and external worker doses.

Exposure Limits

Limits for allowable exposure have varied over the years, and have generally tended to decline as evolving knowledge about the cancer risks from radiation indicated that the dangers it posed were greater than previously thought. (See Centerfold.) In order to ensure that workers are not overexposed, the most important routes of exposure must be properly monitored. Consideration must also be given to the fact that ionizing radiation affects people in various ways.

When only external radiation is involved, measurement of worker dose is accomplished by the use of film badges, (small photographic plates sensitive to gamma and beta radiation), or thermoluminiscent dosimeters (reusable devices that measure external radiation—also referred to as TLDs). These devices can measure how much radiation a worker has been exposed to, but not the amount of radiation that may have been taken into the body through inhalation, ingestion or other means.

Internal radiation exposure occurs when radioactive materials get inside the body and decay, irradiating nearby tissues. Internal radiation is often more organ-specific than external radiation. If the radionuclides become lodged in particular parts of the body, such as the lungs or bones, for instance, these areas are irradiated far more than others. Risk of internal exposure is high in workplaces where the air becomes contaminated with radioactive materials or dust, as has frequently occurred in various kinds of uranium processing plants and in uranium mines. Workers can also be exposed internally through ingestion of radioactive materials (if the radioactive materials get into the mouth from the air, for example) or by absorption through wounds or cuts.

From the beginning of the nuclear era until 1989, internal radiation doses were not calculated or included in worker dose records.

Internal exposure is less likely in situations where the radioactive materials are sealed or separated in some other way from the work environment, such as in glove boxes. However, if accidents occur in these situations, or if equipment such as a ventilating system or glove box is not efficient or in proper working order, then workers could be exposed internally as well.

For almost the entire period of nuclear weapons production, limits have been imposed on exposure from both internal and external routes. Some current limits apply to combined external and internal exposure, while past limits have applied specifically to particular organs, such as the lungs. For instance, the limit for lung exposure until 1958 was 15 rem per year for workers and off-site populations. It was lowered for off-site populations to 1.5 rem per year in 1959.

Monitoring Doses

Internal dose is monitored in various ways. One common way is to measure radionuclide concentrations in urine. If one knows the rates of excretion corresponding to various body burdens, then is possible to calculate these body burdens and thereby infer the radiation dose.

Another method is to measure the gamma radiation being emitted by the radionuclide inside the body. Since a portion of gamma radiation penetrates the body, a fraction of the gamma rays emitted by radionuclides inside the body escape outside it. This is measured by putting the worker or part of his or her body into a "counter," which is a chamber that measures gamma radiation. Thus, we have "whole body counters," "lung counters," and so on. Care must be taken to exclude or adjust for other sources of environmental radioactivity in the measurement of internal body burdens, notably radon and its decay products.

Internal doses can also be assessed indirectly by measuring the concentrations of radionuclides in the air in the plant. In areas where exposure is more likely, workers can wear portable air monitoring devices to measure concentrations of radionuclides in the "breathing zone"—that is, in the air very close to their faces. Internal worker doses can be estimated if breathing rates, efficiencies of protective devices worn by workers (if any), and other factors are known.

It is essential that radiation monitoring be carried out accurately and in sufficient detail. For instance, film badges and TLDs must be stored properly when not in use, so that they are not contaminated between worker exposure times. Also, workers at risk of internal exposures must be monitored frequently enough to accurately determine internal body burdens of radionuclides. This is because over time the body eliminates radionuclides:

See **Worker Doses**, *page 5*

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Worker Doses, *from page 4*

some are excreted in a very short time, while others are eliminated very slowly. (The amount of time it takes to eliminate half of the body burden of a radionuclide is called its biological half-life.) It is also important to know the chemical form of the inhaled or ingested radionuclide because the rate at which it is eliminated from the body depends on the solubility of the particular chemical compound.

Failure to Monitor

The April 7, 1994 background paper sent to IEER by the US Department of Energy Office of Worker Protection Programs and Hazards Management clearly set forth what IEER had suspected for several years, that

> . . . [u]ntil 1989 in DOE, and 1991-1994 in the nuclear industry (NRC and Agreement States) internal radiation doses were not calculated [sic] for workers. Radiation activity in excess or percent of body burdens were recorded in the DOE prior to 1989

Thus, while workers were being monitored for internal body burdens, these body burdens were not being translated into radiation dose estimates; nor were any radiation dose estimates corresponding to internal radionuclide body burdens entered into the dose records of workers.

While there was no regulatory requirement to actually calculate worker doses, the lack of internal radiation dose estimates in worker dose records means that the records of workers who were at risk of internal exposures are incomplete, misleading, and inaccurate. The degree of incompleteness and inaccuracy will vary from one worker to the next, from one historical period to the next, and from one facility to the next. But the overall result is that *large numbers of workers have received information about their radiation exposures which systematically understates their actual exposures.*

Another consequence of the incomplete internal dose records before 1989 is that in compensation cases involving workers who had internal exposures, the DOE and its contractors may have based their arguments on incomplete data that underestimated exposures. Many cases may therefore have been unjustly decided against workers. Whether the DOE or its predecessor agencies knowingly omitted internal dose information from some worker compensation cases is, at this time, an open question, but a reasonable one to pose.

While it is not possible to give an accurate estimate of the proportion of the 500,000 to 600,000 workers who have worked for the DOE that were at risk of exposure beyond allowable limits, we note that at the uranium processing plant in Ohio, commonly called the Fernald Plant, most workers were at risk in the early years. In fact, in 1955, the worst year for worker exposure, IEER estimates that almost 90 percent of workers were exposed to more than the allowable dose limit of 15 rem to the lung. (See SDA Vol. 5 No. 3.)

There are a number of other direct consequences of seriously incomplete dose records:

- Internal exposures of uranium workers may also have led in some cases to heavy metal poisoning, notably of the kidneys. Such cases could have been better detected had internal dose information been a part of dose records.
- Improper medical diagnoses may have resulted in some cases because dose records were incomplete.
- Corrective measures to improve working conditions were likely delayed or not implemented in many cases because dose records did not show overexposures.

The problem was most acute in the period before the mid-to-late 1960s for two reasons. First, evidence indicates that this was the period when workplace conditions were the dirtiest and when workers were at higher risk of exposure. This observation cannot be used to arrive at conclusions about specific workers or even specific plants. But to date, most of the evidence we have examined indicates that for various reasons, exposures were generally highest in this period.

Second, this period is prior to the availability of counting techniques that allowed for direct measurement of body burdens. Action levels were set for radionuclides in urine. So long as the content of specific radionuclides was below these action levels, body burdens and worker doses were assumed to be below the maximum allowable limits. After lung- and body-counters became available in the early 1960s, there were delays in using them. Even after they were brought into use, for example in 1968 at Fernald, urine measurements continued to be the main method for monitoring internal dose.

Unfortunately, the monitoring procedure adopted by the DOE and its contractors was flawed. IEER's analysis of Fernald dose records in 1985 revealed the following problems:

- The lung burden inferred from urine data was consistently underestimated because of improper assumptions about the ratio of urinary excretion per unit of uranium lodged in lung tissues.
- Urine was not monitored for all radionuclides.
- Urine monitoring was generally too infrequent to allow for accurate determination of body burdens and their change with time. Since many chemical forms of radionuclides are excreted relatively rapidly, infrequent monitoring was likely to miss doses from accidents and other occasional but high exposures. Further, in many cases, urine measurements were so infrequent that even chemical forms with relatively long biological half-lives would not have been accurately detected. As a result, low urine concentrations may not have corresponded to low exposure, but merely to a long

See **Worker Doses**, *page 6*

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Worker Doses, *from page 5*

time lapse between the intake of the radionuclide and the taking of urine samples (or lung counts).

■ The solubility of the compound inhaled or ingested was not determined or, if known, was not recorded.

■ The relationship of urine sampling time to exposure was, in most cases, unknown.

As a result of all these factors, the assumption that the dose was below allowable limits if the concentration of a radionuclide in urine was below the action level was scientifically unsound. Even when the actual doses were below allowable limits, the internal doses should have been entered into worker dose records and added to external doses in appropriate ways.

Whole-Body and Organ-Specific Doses

Radiation standards limit dose both to specific organs as well as to the whole body. Consider, for example, doses to the lung. The lung may be exposed by external gamma radiation from sources outside the body, resulting in doses essentially equal to those for other organs in the body. It may also be exposed from inhaled radionuclides. In order to ensure compliance with the lung dose limit, which was 15 rem in the 1950s through 1980s, DOE and its contractors only had to consider internal body burdens of radionuclides. (However, as we have indicated, before 1989 internal doses were not calculated from these data.) In most cases, such as at the Fernald plant, lung doses were inferred from measurements of uranium in urine. If these were found to be below allowable concentrations, compliance with the 15 rem/year limit was assumed to have been demonstrated.

In the period since the late 1980s, the regulatory practice has been to use "committed effective dose equivalents."[2] In this model, "effective dose" is calculated by multiplying doses to individual organs or tissues, like the thyroid, bone tissue, or the lung, with a weighting factor that accounts for the relative likelihood of cancer mortality from exposure to a particular organ. This allows exposures to a single organ and exposure of the whole body to be considered together. Further, internal organ doses are calculated on the basis of a fifty-year "committed" dose —that is, the entire dose from a radionuclide to an organ over a fifty year period (in most cases, the majority of the dose is delivered in a few years or less). These two concepts, "effective dose equivalent" and "committed dose" are put together to arrive at "committed effective dose equivalent." For regulatory purposes, the entire committed dose is attributed to the year in which the radionuclide is incorporated into the body. But even in this new practice, the organ doses arising from internal radiation must be known, because without that data, the correct effective dose equivalent cannot be calculated. This change in regulations requiring calculation of effective dose equivalents caused DOE to begin to move to a policy of integrating internal and external radiation doses.

The same institutional outlook that put weapons production before environmental protection also relegated sound worker dose records into second place until after the Cold War.

While the unavailability of precise scientific techniques before the mid-1960s would have precluded accurate internal dose assessment, the doses could have been inferred from urine data and integrated into dose records, but were not. After the mid-1960s, the AEC and its contractors could have made relatively accurate worker dose estimates, but still failed to do so. It would appear that the same institutional outlook that put weapons production before environmental protection also relegated sound worker dose records into second place until the Cold War began to wind down.

Consequences of Underestimating Dose

Underestimation of internal doses is not just poor practice for worker health protection. It also creates problems for epidemiological studies. Accurate epidemiological work is needed to estimate the health risk of radiation exposure, and this requires studies with sound data on doses to various groups of workers.

Cohort studies, for example, compare the health status of people with various degrees of exposure. Such studies are common among worker populations and help to assess the risk of exposure to radiation (or other disease-causing agents). But if worker dose records are distorted by omission of a crucial component of dose, highly exposed workers and workers with low exposures could be jumbled up in ways for which no statistical control is possible.

For instance, studies that consider external exposure only would group workers with low external doses together and those with high external doses in another group. If some or all of the low external exposure group workers had higher internal doses than the high external exposure group, the study would be comparing workers with high exposure to others also with high exposure![3] Such a study would be misleading and tend to underestimate risk estimates. By contrast, if the high external exposure group had even higher internal exposures, the study would also be misleading and would tend to overestimate radiation risk.

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Worker Doses, *from page 6*

The April 1997 DOE background paper also points out that lifetime dose records have not been carefully maintained though the risk to workers is based on lifetime radiation dose. If dose records are not transferred from one contractor to the next at a plant, or from one plant to another when the worker changes jobs, worker health as well as public health is compromised because it becomes impossible to accurately track the health effects of occupational exposure. Of course, this is another complicating factor in doing epidemiological studies and assessing radiation risk.

External Exposure Data

The state of external dose data also needs to be carefully examined. The DOE has admitted the following problems[4]:

■ External exposure data are often incomplete and unreliable.

■ Raw dose data and electronic versions of the data (which are often used by researchers in studies) do not always agree.

■ In some cases, worker dose records contain entries stating that the dose was zero, regardless of what the actual dosimeter reading may have been.

Finally, there were very few measurements made of worker exposure to non-radioactive hazardous materials. But we do know from the nature of work done at nuclear weapons plants that many workers were exposed to or were at risk of exposure to acids, organic solvents, beryllium, fluorine and fluorides, and heavy metals.

As a result of all of these problems we can conclude that knowledge of workplace exposure during nuclear weapons production and testing was poor, and the results of at least some epidemiological studies are likely to be misleading. At present, it is impossible to say what health effects might be revealed by properly conducted studies. But we can say with confidence that the radiation doses for large numbers of workers were higher than those that are apparent from their dose records because internal doses were omitted until 1989, and because there were many deficiencies in other dose records.

1. The background paper was faxed to IEER on April 7, 1997 in preparation for a meeting an IEER staff member was attending with the staff of DOE's Office of Worker Protection Programs and Hazards Management on April 11, 1997.
2. This model is referred to as the ICRP 30 dosimetric model. ICRP is the International Committee on Radiological Protection. The model was announced in publication 30.
3. This kind of situation is quite possible because many important radionuclides, including uranium-238, plutonium-239, strontium-90, and tritium would typically provide low external doses but high internal doses.
4. For more on problems with DOE's external dose data see A. Makhijani, H. Hu and K. Yih, eds., *Nuclear Wastelands*, (Cambridge, MIT Press, 1995), pp. 262-63.

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COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

A CENTERFOLD FOR TECHNO-WEENIES

Exposure and Dose

This Centerfold provides information about dose in rad and how it relates to energy deposited in tissue, as well as a brief history of the evolution of radiation exposure standards and regulations. We also include additional information about iodine-131 and thyroid doses received by the US public during the years of atmospheric testing.

A rad is defined as the deposition of 100 ergs of energy per gram of tissue. Since the measurement is *per gram*, then the same dose in rad can reflect very different radiation exposures, depending on the mass into which the energy is deposited:

If the dose is:	...and the total mass into which the energy is deposited is:	...then the total energy deposited is:
2 rad	2 grams (weight of an infant's thyroid)	400 ergs*
2 rad	20 grams (weight of an adult's thyroid)	4,000 ergs
2 rad	70,000 grams (the official definition of "standard man" in radiation protection practice; equal to about 154 lbs.)	14 million ergs

Conversely, the same amount of deposited energy can result in very different *doses*, depending on the mass into which the energy is deposited:

If the total energy deposited is:	...and the total mass into which the energy is deposited is:	...then the dose is:
4,000 ergs	2 grams (weight of an infant's thyroid)	20 rad
4,000 ergs	20 grams (weight of an adult's thyroid)	2 rad
4,000 ergs	70,000 grams (the official definition of "standard man" in radiation protection practice; equal to about 154 lbs.)	0.0006 rad

* In everyday terms, an erg is a very small amount of energy. It takes almost 1.5 million ergs to light a 40-watt bulb for one hour. But in the context of the tiny cells that make up living beings, 100 ergs is a large amount of energy. One erg is enough energy to disrupt tens of billions of the chemical bonds that hold molecules together.

For more on rad, rem and roentgen, see "Dear Arjun," page 13.

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Iodine-131

■ **General:** Its name is from the Greek word "ioeides," meaning "violet colored," after the violet color of iodine in a gas form. As a solid it is shiny, black and non-metallic. In its non-radioactive form occurs on land and in sea in sodium and potassium compounds, and is necessary for proper functioning of the thyroid.

■ **Half-life:** 8.04 days

■ **Atomic number:** 53.

■ **Decay mode:** beta radiation.

■ **Sources:** Fission product created in nuclear reactors and in nuclear weapons explosions.

■ **Release of iodine-131 per kiloton of fission explosive power:** 129,000 curies.

■ **National Cancer Institute estimate of iodine-131 releases from the Nevada Tests:** 150 million curies.

■ **Organ most affected:** thyroid.

■ **Main pathway:** milk.

■ **Other pathways:** ingestion of other dairy products, vegetables, fruits, and eggs; inhalation; and external irradiation.

■ **Direct physical effects:** radioactive iodine damages or destroys thyroid cells.

■ **Health effects:** Increased risk of thyroid tumors, notably in children. Likely increase of thyroid cancer risk in children exposed before the age of 15 years. Children under two at highest risk. Females have more than twice the risk of males. Linked to other thyroid disorders, such as autoimmune hypothyroidism, autoimmune thyroiditis, hyperthyroidism incident to Graves's disease, and thyroid nodules.

■ **NCI estimate of thyroid dose from Nevada Tests averaged over entire country:** 2 rad.

■ **NCI estimate of thyroid dose to children aged 3 months to five years in high fallout areas:** 27 to 112 rad.

■ **Official iodine-131 release estimate from Chernobyl:** 7.3 million curies (decay-corrected to ten days after the start of the accident.

■ **Iodine-131 inventory in the Chernobyl reactor on April 26, 1986, the day the accident started:** approximately 84 million curies.

■ **IEER's rough estimate of actual releases from Chernobyl over the course of the ten-day fire:** 10 to 18 million curies (assuming the official estimate of a 20% release fraction is correct)

1931–34	US Advisory Committee on X-Ray and Radium Protection (precursor to the National Council on Radiation Protection and Measurements) adopts X-ray "tolerance dose" of 0.1 roentgen *per day*.
1940–41	US Advisory Committee proposes but does not implement, lowering the X-ray tolerance dose to 0.02 roentgen *per day*
1942	U. of Chicago Metallurgical Laboratory adopts a "maximum permissible exposure" standard of 0.1 roentgen *per day*. Becomes standard for entire Manhattan Project.
1954	Atomic Energy Commission adopts National Bureau of Standards recommended dose limit of 5 rem *per year*. Sets additional limits for internal exposures at 15 rem per year for most organs.
1959	Dose limit for workers remains 5 rem per year. AEC also adopts dose limits for the public equal to one-tenth of those allowed for workers: 0.5 rem for external exposure; and 1.5 rem for most organs for internal exposure
late 1980s –1990	Department of Energy adopts dose limit for the public of 100 millirem (0.1 rem) per year; dose limit for workers remains 5 rem per year. A new model for calculation of internal doses to workers is adopted, the "*committed effective dose equivalent*." (See main article.)
1991	International Committee for Radiological Protection recommends worker dose limit be reduced to 2 rem per year. Recommendation is not adopted by DOE.

NOTE: For external radiation sources, roentgen and rem are considered to be equivalent.

Sources: 1934: AC 1940–45, and High Noon of Atomic Energy (Berkeley: University of California Press, 1987). Appendix A, pp. 193–96; 1954: US Atomic Energy Commission, AEC Manual, 124 and 12 (Paper 0822, Vol. 0008, Part 0, of AEC 0822-0); 1959: 25 AFC Feb. 29, 1959, 30-31; 1959: National Bureau of Standards, NBS Maximum Permissible Amounts of Radioactivity in the Human Body and Maximum Permissible Concentrations in Air and Water, Handbook 52, (Washington: US Dept. of Commerce, March 23, 1959); 1959: NBS, Maximum Permissible Body Burdens and Maximum Permissible Concentrations Resulting from Exposure to Contaminated Air and Handbook 69 (Washington: US Dept. of Commerce, June 5, 1959, p. 5); late 1980s–1990: US Dept. of Energy, Office of Environmental Safety and Health, Order DOE 5400.5; 1990: DOE Proposed Rule; 1991: International Commission on Radiological Protection, 1990 Recommendations of the International Commission on Radiological Protection, ICRP Publication 60, Annals of the ICRP, Vol. 21, No. 1-3 (Oxford: New York: Pergamon Press, 1991), p. 72, para. 9.2.2.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

IEER Releases New Report on "Clean-up" of Nuclear Weapons Complex

More than half a century of nuclear weapons production in the United States has created tens of millions of cubic meters of long-lived radioactive waste, decommissioning problems associated with thousands of contaminated facilities, and environmental problems involving contaminated land and water. The production of 70,000 nuclear warheads and bombs would have resulted in a problem of environmental remediation and waste management in any case. But the neglect and mismanagement of radioactive and toxic wastes have created problems that are far more costly than they might have been; some appear to be intractable with current technology.

IEER's newly released report, *Cleaning the Cold War Mess*, looks at the problem of environmental remediation and waste management of the nuclear weapons complex through case studies of three rather different problems, each important in its own way: a) transuranic waste management; b) high-level waste tank farms at Hanford; and c) radium- and thorium-contaminated waste at Fernald. It also outlines alternatives that could be considered in reforming the environmental management program of DOE. The main findings of this report and a summary of recommendations are given below.

Main Findings

1. Nuclear weapons production and associated activities have created tens of millions of cubic meters of dangerous wastes and roughly two billion cubic meters of contaminated soil and water.

2. Since 1989, DOE has made considerable progress in characterizing many of the crucial problems of environmental remediation and waste management in the nuclear weapons complex, but much remains to be done.

3. DOE is proceeding with the most expensive environmental program in history without national remediation standards to govern and guide the process.

4. Despite about $40 billion dollars in expenditures since 1989, DOE does not have a sound direction, plan, priorities, or implementation strategy for dealing with remediation and waste management problems. Institutional factors are the single most crucial element in DOE's failure to achieve a sound direction.

The principal institutional problems that we have identified are:

- an attachment to Cold War technologies related to weapons research, development, testing, and production
- a tendency toward "monumentalism"—that is, rushing into big projects without proper preparatory scientific and engineering work (this tendency perhaps deriving from a desire to also maximize the flow of funds into the weapons complex)
- a lack of sound internal scientific and technical peer review that actually matters in decision-making, or in approval and implementation of large projects, and a corresponding tendency to ignore inconvenient extra-departmental advice
- a tendency to approve large budget increases for contractors without thorough engineering-based reviews of the problems that led to the budget changes
- a failure to learn lessons from past mistakes
- an attachment to the Yucca Mountain and Waste Isolation Pilot Project (WIPP) repository programs out of institutional, legal, political, and financial inertia even though these are compromising a much larger effort to remediate the weapons complex, manage long-lived highly-radioactive wastes, and develop a scientifically sound long-term high-level waste management program
- a lack of independent regulation of DOE's nuclear activities.

5. The U.S. waste classification system is an unsound basis for implementing waste management or environmental remediation decisions. (See SDA Vol. 6 No. 1.)

6. DOE is not holding contractors sufficiently accountable for project mismanagement and poor technical decisions.

7. A number of problems cannot be satisfactorily solved with presently available technology. Sound research and development and careful project planning will be needed over a long period.

Main Recommendations

The most important single reform that is needed is institutional in nature. DOE can make internal reforms at once. It should:

- create a project review structure for large projects that is both technical and financial in scope
- create a standing advisory committee to review projects from early stages through implementation both as regards their technical aspects and the reasonableness of budgets from an engineering standpoint. The majority of members on this committee should be free of conflicts of interest in regard to contracting with DOE or its contractors.
- reinstate the practice of issuing Annual Baseline Environmental Management Reports, and make them more complete by including all sites, whether

See Report, page 16

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Milk, from page 3

country would result in fallout spreading over most of the country. In a 1948 memo, an Air Force meteorologist advised the committee assigned to finding a test site that "Because the United States is predominantly under the influence of westerly winds, it seems obvious that the eastern coast areas of the United States may provide a suitable site."[12] But the site was located in the west, where the proximity to the weapons laboratories would allow for acceleration of the weapons program.

Doses Avoidable

Iodine 131 is a relatively short-lived radionuclide with a half life of 8 days. (See Centerfold for more information.) Therefore, radioactivity levels in contaminated milk would have decreased significantly several weeks after the time of detonation, making most of the iodine-131 doses to the public avoidable. Contaminated milk could have been dumped or diverted from the market and used for products such as dried milk, butter or cheese, which take longer to process and would allow time for the radioiodine to decay. But the government made no such provisions, though they were aware as early as 1953 of the "milk pathway," the primary route of exposure for iodine-131 in humans. Warnings about iodine-131 in milk were also issued at the 1955 United Nations Conference on Peaceful Uses of Atomic Energy, where researchers suggested that the then-allowable air concentration limits for iodine-131 were ten thousand times too high and should be lowered:

> This limit should be reduced by four orders of magnitude to assure radiation safety for grazing animals. Approximately the same reduction is required for the safety of humans eating large quantities of fresh garden produce and drinking milk from cows grazing on iodine 131-contaminated pasture.[13]

An Oxford University delegation to the conference stressed that "human beings whose diet consists largely of milk, notably infants . . . because of their youth may be considered super-susceptible to the effects of radiation."[14] The advice of the UK delegates, while ignored by the AEC, was heeded by British officials in 1957 when, after a reactor accident that resulted in a release of 16,000 to 27,000 curies of iodine-131, ordered that milk within a 200-square mile area around the plant be dumped as a health precaution.

But even in the early 1960s, when the milk pathway was widely understood, the US government refused to acknowledge the risk of iodine-131 contamination or take measures to reduce it. In 1962 officials in Utah and Minnesota diverted possibly contaminated milk from the market when iodine levels exceeded radiation guidelines set by the Federal Radiation Council (FRC). In response, the FRC, whose members included the chairman of the AEC and the Secretary of Defense, declared that they did "not recommend such actions" and that such "countermeasures may have a net adverse rather than favorable effect on the public well-being."[15] Further, the FRC made the remarkable determination that their own radiation guidelines should not be applied to fallout without further detailed studies because "any possible health risk which may be associated with exposures even many times above the guide levels would not result in a *detectable* increase in the incidence of disease"[16] (emphasis added). Since thyroid cancers can develop many years after radiation exposure and are therefore not immediately detectable, this reassurance was highly misleading.

While the public was not warned to refrain from milk consumption and was continually reassured that fallout posed no danger, the AEC was providing advance notice of tests, including "forecasts of contaminated areas based on meteorological data"[17] to the National Association of Photographic Manufacturers. This was done so that they could "anticipate local contamination and take preventive action"[18] to protect photographic film from being ruined by radiation exposure. The warning to the photographic industry began in 1951 the first year of testing in Nevada—as a result of the Eastman Kodak Company's threat to sue the AEC over damaged film from nuclear fallout. The warnings continued throughout the atmospheric testing program but were not extended to the public.

Other Doses from Fallout

The United Nations Scientific Committee on the Effects of Atomic Radiation estimates that globally, iodine 131 doses comprise only about 2% of the overall radiation dose from weapons testing (dose integration time to the year 2000).[19] Ninety-eight percent of the dose is from other radionuclides. These calculations do not take hot spots into account, which may increase the relative share of iodine 131 dose. In addition, in areas of high precipitation both in the US and in other countries, hot spots probably resulted in high concentrations of other radionuclides besides iodine-131. Further work is needed to clarify which populations were most affected by testing throughout the world. Soviet and Chinese testing could have affected populations in Alaska, for example, and there may be incidences of hot spots in the Pacific, including Hawaii, from French, British, and US Pacific area testing. There is also evidence from the NCI study that hot spots occurred in Canada and may have occurred in northern Mexico from Nevada tests.

A thorough assessment of the effects of all nuclear testing—not just US tests—is needed so that those at risk of high doses can receive proper screening. Soviet tests, for example,

See Milk, page 12

Milk, *from page 11*

had a larger total fission yield than US tests (110.9 megatons compared to 72.1 megatons), and the combined fission yield of Chinese, British and French tests was 54.2 megatons. IEER estimates that only a small fraction of the cesium-137 in the soil in the eastern United States is due to fallout from detonations at the Nevada Test Site. In light of the NCI findings, we make the following recommendations:

■ An international study should be funded to carry out a global assessment of the effects of nuclear weapons testing and should follow a process that is open to the general public.

■ France, Britain, China and the former Soviet Union should make public all their data on fallout.

■ Further study should be conducted to assess the risk of cancer and other thyroid disorders from radiation doses.

■ The US government should provide thyroid screening for those who were children at the time of atmospheric testing living in high fallout areas in the United States. The Agency for Toxic Substances and Disease Registry has suggested screening for those who received a cumulative dose of 10 rad or more while they were age 15 or younger.[20]

■ The results of the NCI study should be made widely available to the public in a format that is accessible and understandable so that those who may be at risk can receive proper screening in a manner that reduces risk of disease.

This article is based on an article that appeared in the November December issue of The Bulletin of the Atomic Scientists, *entitled "Worse Than We Knew." It is available on the web at* "www.bullatomsci.org," *and on IEER's webpage,* "http://www.ieer.org/latest/iodnart.html."

The full text of NCI's study can be found on the web at "http://www.rex.nci.nih.gov/massmedia/Fallout/contents.html."

1 Howard L. Andrews, "Residual Radioactivity Associated With the Testing of Nuclear Devices Within the Continental Limits of the United States," September 13, 1955, pp. 7-8, supplement to the report of The Committee to Study the Nevada Proving Grounds.

2 A rad is a unit of absorbed dose of radiation, equivalent to the deposition of 100 ergs of energy per gram of tissue. According to NCI, two rad is about equal to the radiation dose from 5 mammograms. (See table in Centerfold.)

3 E.B. Lewis, "Aspects of Somatic Effects of Fallout Radiation," statement in *Fallout From Nuclear Weapons Tests, Hearings Before the Special Subcommittee on Radiation of the Joint Committee on Atomic Energy, Congress of the United States, Eighty-Sixth Congress, First Session on Fallout from Nuclear Weapons Tests, May 5, 6, 7, and 8, 1959,* (Washington: U.S. Government Printing Office, 1959), Vol. 2, p. 1552; and Merril Eisenbud and Thomas Gesell, *Environmental Radioactivity From Natural, Industrial and Military Sources,* Fourth Edition, (San Diego: Academic Press, 1997), p. 312.

4 Elaine Ron, et al., "Thyroid Cancer after Exposure to External Radiation: A Pooled Analysis of Seven Studies," *Radiation Research,* vol. 141, 1995, pp. 259.

5 Iodine-131 decays through beta radiation. Radiation risk for exposure from external gamma radiation is considered to be about the same as that from internal beta radiation. The theoretical reason for this equivalency is that damage to tissue from radiation exposure is not produced by the gamma photons that deliver the energy but by the electrons which are liberated as a result of the ionization caused by the photons. Therefore, in the case of internal iodine-131 doses compared to external X-ray doses, it does not matter if the photon originates externally or internally. "Once a photon liberates an electron, the subsequent events depend only on the properties of the electron and not on the gamma photon that liberated it." Jacob Shapiro, *Radiation Protection, A Guide for Scientists and Physicians,* Third Edition, (Cambridge: Harvard University Press, 1990), p. 22. Of course, in practice, some of the details of the ways in which electrons and photons of various energies transfer energy to living cells can create differences in biological effect.

6 National Cancer Institute Press Release, "Questions and Answers on the NCI Fallout Report," August 1, 1997, pp. 2-3.

7 Ibid, p. 3.

8 Jan Beyea, "Fallout exposures from US weapons tests: health effects other than thyroid cancer," Testimony before the Senate Appropriations Committee on Labor, Health and Human Services and Education, October 1, 1997.

9 National Cancer Institute Press Release, July 25, 1997, p. 1.

10 "Executive Summary, National Cancer Institute Study Estimating Thyroid Doses of I-131 Received by Americans From Nevada Atmospheric Nuclear Bomb Tests," p. 4. (Released in National Cancer Institute Press Packet, August 1, 1997.)

11 NCI, Interim Final, Table Total/D, "Estimates of per capita average (geometric means; GM) individual thyroid doses, associated uncertainties (geometric standard deviations, GSD), and populations in each county of the contiguous U.S. resulting from all tests," pp. 1-51. (Released in NCI Press Packet, August 1, 1997.)

12 Colonel B.G. Holzman, USAF, Staff Meteorologist, memorandum to Admiral Parsons, "Subject: Site for Atomic Bomb Experiments," April 21, 1948. Annex A to US Commanding Lieutenant General J.E. Hull, memorandum to the US Army Chief of Staff, "Subject: Location of Proving Ground for Atomic Weapons," p. 13. [The site suggested was coastal North Carolina. It is important to note that testing in this region would also have caused significant problems, but the suggestion of the site indicates an awareness that testing in the west would cause widespread fallout.]

13 R.C. Thompson, H.M. Parker, and H.A. Kornberg (General Electric Company), "Validity of Maximum Permissible Standards for Internal Exposure," in *Proceedings of the International Conference on the Peaceful Uses of Atomic Energy,* Vol. 13, Legal, Administrative, Health and Safety Aspects of Large-Scale Use of Nuclear Energy (New York: United Nations, 1956), 1956, Vol. 13, p. 205.

14 A.C. Chamberlain, J.F. Loutit, R.P. Martin, and R. Scott Russell, (Atomic Energy Research Establishment, Harwell; Medical Research Council and Department of Agriculture, University of Oxford), "The Behaviour of I-131, Sr-89 and Sr-90 in Certain Agricultural Food Chains," in United Nations, 1956, Vol. 13, p. 360.

15 Federal Radiation Council Press Release, "Federal Radiation Council Position on Current Fallout Levels," September 17, 1962, pp. 1, 3.

16 Ibid, p. 2.

17 US Atomic Energy Commission, *Twenty-first Semiannual Report of the Atomic Energy Commission,* (Washington: US Government Printing Office, January, 1957), p. 211.

18 U.S. Atomic Energy Commission, "Report by the Director of Military Application, Summary of Relations between the AEC and the Photographic Industry Regarding Radioactive Contamination from Atomic Weapon Tests, from January through December 1951," January 17, 1952, p. 8.

19 IEER and International Physicians for the Prevention of Nuclear War, *Radioactive Heaven and Earth,* (New York: Apex Press, 1991), p. 37. Figures are based on whole body committed effective dose equivalent.

20 Robert F. Spengler, ed., "Hanford Medical Monitoring Program: Background Consideration Document and ATSDR Decision," publication number PB97-[illegible], (Atlanta: US Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry), July 1997, p. 17.

Errata

In SDA Vol. 6 No. 1 (on radioactive waste management), the entry in the "Radioactivity" column of the "Depleted Uranium" row on the table appearing on pages 10-11 should read "0.2." In that same table, the entry in the "Regulatory Status" column of the "Uranium Mill Tailings" row should read "UMTRA and Uranium Mill Tailings Radiation Control Act."

In **SDA Vol. 5 No. 4** (on MOX), lines 9 and 10 of the middle column of page 2 should read, ". . . between 8 to 10 million gallons of liquid waste . . ." Our thanks to James C. Warf of Los Angeles, CA for pointing out this error. *You win $25!* **This is a standing offer to SDA readers!** IEER will award $25 to the first person sending in a correction of arithmetic errors appearing in SDA, as well as our gratitude for keeping us on our toes!

Dear Arjun:

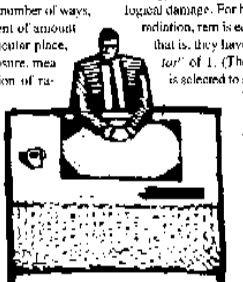
What's the difference between a rad, a rem, and a roentgen?

—Mixed-up in Margaritaville

Dear Mixed-Up:

In the 1960s in the United States, individuals who were deeply involved with the so-called counter-culture were sometimes referred to as *radical*, or "*rad*" for short. There were also individuals who didn't want to rock the boat too much, but still liked to be associated with the counter-culture, who were called "*rem*," short for "regularly enlightened mainstreamers." Everyone else was considered by the rad and rem to be part of the "rank and file," which was later shortened to "*roentgen* file," after a particularly mainstream leader of the time, Hans Roentgen.

But unbeknownst to these radicals, *rad, rem* and *roentgen* had already been used as units to express doses from radiation exposure. Radiation dose is calculated in a number of ways, including measurement of amount of radiation at a particular place, measurement of exposure, measurement of absorption of radioactivity, and of relative effect of that absorption on different organs or types of tissue. Dose calculations take into account the type of radiation involved (alpha, beta, gamma, or neutrons). Radiation doses can also be expressed in standard international units, sieverts or grays (one sievert equals 100 rem, one gray equals 100 rad).


Hans Roentgen, Mainstream Guy

A ***rad***, or "radiation absorbed dose," is a unit of *absorbed* dose equivalent to the deposition of 100 ergs of energy per gram of tissue. (See Centerfold for more on rad and ergs.) Since a rad measures deposition of energy *per gram of tissue*, a 2-rad dose to a certain organ, like the thyroid (which weighs roughly 20 grams), reflects a very different total deposition of energy than does a 2-rad dose to the entire body (typical weights range from 40,000 to 100,000 grams).

A ***rem***, or "radiation equivalent man," is a unit of absorbed dose that takes into account the relative biological damage caused by the various ways that ionizing radiation deposits its energy in tissue (known as the Relative Biological Effectiveness, or RBE). In general the larger the amount of energy absorbed, the larger the biological damage. For beta and gamma radiation, rem is equivalent to rad; that is, they have a "*quality factor*" of 1. (The quality factor is selected to approximate the RBE as it relates to overall risk, and is used in regulatory practice to convert radiation dose measured by energy deposited to radiation dose measured in terms of biological damage.) For alpha radiation, which involves heavy particles, much more damage is done per unit of energy deposited, increasing the ratio between damage to tissue and energy deposited. The currently accepted quality factor for alpha radiation is 20, but may change as more is learned about damage due to ionizing radiation. Neutron radiation has a varying quality factor between 5 and 20, depending on neutron energy. Rem is the unit used to express regulatory limits for radiation exposures.

A ***roentgen*** (abbreviated "R" and pronounced "rent-gen") measures gamma and beta radiation dose based on the amount of ionization in the air. It is the common form of calibration of radiation measuring instruments because the beta and gamma radiation ionize air inside the instrument, creating electrically charged particles which can be measured by creating an electric current in the instrument. A roentgen is a unit of radiation dose that causes an ionization charge equal to 2.58×10^{-4} (0.000258) coulombs per kilogram of air.* Because it measures ionization in air and not in tissue, there is no exact, fixed correspondence between roentgen and rad, but an approximate equivalence is that one roentgen equals 0.93 rad for non-bony biological tissue. Since the uncertainties in dose calculation are typically far larger than 7 percent, one roentgen is often considered about equal to one rad, for convenience.

* A coulomb is a unit of electrical charge. The charge of an electron is 1.6×10^{-19} coulombs.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

It Pays to Increase Your Jargon Power

by Dr. Egghead

1. body burden

a. The strain felt by writers when they have written introductory and closing paragraphs, but still have to write the rest of an essay.

b. What diet pill companies want people to believe they have.

c. What you feel when you get the bill from the auto body shop.

d. The amount of a radioactive material deposited in the body at a given point in time (in units of mass or radioactivity).

2. whole body counter

a. A specially-designed surface in diners where customers can eat while lying down.

b. Someone not content to do just a headcount.

c. A hospital employee whose job it is to count how many whole bodies come out of the operating-room.

d. A chamber equipped with instruments to measure gamma radiation being emitted from anywhere in the body.

3. ALARA

a. The younger, lesser-known sister of Evita.

b. Name of a failed apple harvesting company.

c. Acting in the manner of Ra.

d. Acronym for "As Low As Reasonable Achievable." Usually "ALARA Principle," which dictates that radioactivity released to the environment and radiation doses be not merely in compliance with regulations, but further reduced below the allowable limits, given the technologies and financial resources available.

4. effective dose equivalent

a. The number of naps taken during the day by a nuclear plant operator working night shifts to effectively enable him or her to stay awake on the job.

b. The dose delivered by a placebo that works as intended.

c. What a swig of whiskey was back in the days before anesthesia.

d. A dose estimate that takes into account the combined effects of internal and external radiation, the selective uptake and distribution of radionuclides, and their varying effects on different organs. The effective dose equivalent is calculated by multiplying the dose to an individual organ, such as the lung, by a weighting factor which addresses the likelihood of a cancer mortality from radiation exposure to that particular organ.

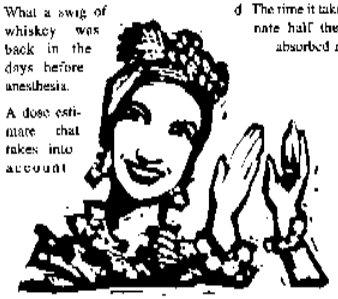
5. biological half-life

a. The time it takes for half a room of biology students to fall asleep.

b. The portion of a soccer player's life spent playing halfback.

c. The time it takes for half a log to decay.

d. The time it takes the body to eliminate half the mass of a given absorbed radionuclide.



ALARA

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

ATOMIC PUZZLER

Gamma dosing on the job . . .

Back in the late 1980s, when Dr. Egghead's trusty sleuthing dog Gamma was just a pup, the Department of Energy began using a method of worker dose calculation referred to as the "committed effective dose equivalent." Even then, Gamma was interested in such things and would entertain himself by calculating effective dose equivalents for workers. (Always the workhound, that Gamma.) He recently fetched his old records and was hoping for some help in completing some unfinished dose estimates. Note that Gamma was at that time learning the Standard International units of becquerels and sieverts, and so was converting from rems and picocuries to sievert and becquerels. His notes are reprinted below, paw prints, conversions, and all, except for the final dose calculation:

- A worker is exposed to an annual average concentration of uranium 238 of 27 picocuries per cubic meter of air—or 1 becquerel per cubic meter of air.
- The worker breathes 9.6 m^3 (cubic meters) of air on each working shift (8 hours) and works 200 shifts per year.
- The dose conversion factor for the lung is 9.84×10^{-4} rem per picocurie—or 2.66×10^{-4} sieverts per becquerel. (Gamma converted rems to sieverts by dividing by 100. He then multiplied the result by 27 because there are 27 picocuries per becquerel. Try it!)
- The weighting factor for the lung is 0.12.
- Assuming no other organ is affected, what is this worker's dose in rem? (Note: This dose is called the "committed effective dose equivalent." See main article.) Round to 2 decimal points. What is the committed effective dose equivalent in sieverts?

Hint: The dose conversion factor is used to convert radiation intake into dose. The weighting factor converts the lung dose into the effective dose equivalent.

Gamma the puppy calculating worker doses.

Send us your answers via fax (301-270-3029), e-mail (ieer@ieer.org), or regular mail (IEER 6935 Laurel Ave., Suite 204, Takoma Park, MD 20912), postmarked by **Dec. 19, 1997.** IEER will award 25 prizes of $10 each to people who send in a solution to the puzzle (by the deadline), right or wrong. There is one $25 prize for a correct entry, to be drawn at random if more than one correct answer is submitted.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Report *from page 10*

closed or operational.

Such internal reforms are unlikely to solve the entrenched problems that we have discussed above. We recommend that President Clinton appoint a commission on Institutional Reform of Environmental Remediation and Waste Management. The commission should hold hearings around the country and make definitive recommendations within a six- to twelve-month period.

Whatever the reform chosen, general technical principles will need to be adopted and reforms implemented to restructure the environmental management program. Specifically, the government should:

1. *Create a new, national, environmentally-protective system of radioactive waste classification* according to longevity and specific activity, so that comparable hazards are managed comparably.

2. *Coordinate waste management and environmental remediation* and make reduction of short-term risks compatible with minimizing long-term risks.

3. *Approach remediation with independently enforced, national, health-based clean-up and waste management standards,* including specific provisions to protect groundwater resources and mandatory guidelines to keep doses as low as reasonably achievable (ALARA) both for workers and for off-site populations. The ALARA guideline for releasing sites for unrestricted use should be to remediate to background levels, if reasonable, or else to keep doses to under 2 millirem per year (which is the British ALARA guideline).

4. *Suspend the politically expedient Yucca Mountain and WIPP repository programs and put in place a scientifically sound program of long term high level waste management,* including repository research, subseabed disposal research, and research on materials to contain radioactivity that are analogous to natural materials that can last for millions of years.

5. *Provide funds and technical support to communities that have residual contamination* so that they can monitor the environment and keep themselves informed. Such funds are needed to protect communities against future known risks and also against risks due to inadequate characterization or present incomplete understanding of risks. The size of the fund should depend on the size and character of the residual radioactive and non-radioactive hazardous contamination of land, remaining structures, surface waters, river beds, and groundwater, as well as the total amount of radioactivity and non-radioactive hazardous material left in disposal areas on site.

6. *Manage non-radioactive toxic components of wastes in ways that do not seriously compromise management of radioactive components.*

7. *Stabilize waste so as to greatly reduce or eliminate the most serious environmental and health threats* and store it on site while sound long-term management strategies are developed.

8. *Provide the states, Indian tribes, and the public (with special emphasis on the affected communities and workers) with timely information* so that they can participate effectively in decision making.

To order a copy of the full 300-page report, see the publication information box on p. 7.

The Institute for Energy and Environmental Research
6935 Laurel Avenue, Suite 204
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80 February 20, 1998

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COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

The Portsmouth Daily Times
Friday, September 20, 1996
Page A9

Cylinder plug damaged at Lockheed Martin plant

By Martin Poston
Times Staff Writer

The U.S. Department of Energy reported that there was a small release of material at Lockheed Martin Energy Systems in Piketon as a result of a damaged cylinder plug on a 14-ton cylinder, which contained about 16 pounds of uranium-238.

The cylinder plug was replaced, and a precautionary environmental sampling was taken.

Officials at the plant said that a worker was operating a vehicle to move cylinders in a storage yard, when he accidentally struck a cylinder plug on a cylinder that contained uranium hexafluoride. There were no injuries in the accident, and the cylinder contained no enriched uranium.

As a precautionary measure, traffic on the perimeter road of the plant was rerouted for a brief period between the north and west access roads.

Feb-25-98 10:05A PORTS Environ Info Ctr 614 947-4950 P.05

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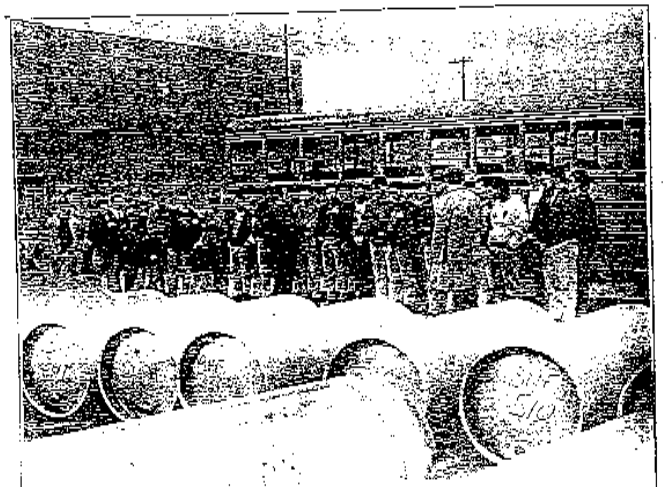
The Waverly News Watchman
April 6, 1993
Page 6
5,900 (Tues. & Thurs.)



Students tour A-plant

Students from the Vern Riffe Joint Vocational School's electricity class were given a tour of the U.S. Department of Energy's Portsmouth Gaseous Diffusion Plant near Piketon, March 11.

The [illegible] toured the plant's Maintenance and stores facility, where [illegible] as the plant [illegible]

[illegible] $45,000 [illegible] electrical power [illegible]

[illegible] the switchyard are rated at $25,000 [illegible] transformers [illegible]

[illegible] 12,500 [illegible] used for [illegible]

[illegible] Martin Marietta Services Inc. manages the plant under contract to the [illegible]

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

MILITARY TOXICS PROJECT

[illegible]
471 Main Street, 2nd Floor
Lewiston, ME 04240

phone: (207)783-3061
fax: (207)783-3066
e-mail: mtp@igc.apc.org

February 4, 1998

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Press is a member group of Military Toxics Project

Charles E. Bradley, Jr.
U.S. Department of Energy
Office of Nuclear Energy, Science and Technology
19901 Germantown Road
Germantown, MD 20874

Dear Mr. Bradley

Secretary Pena recently held a press conference in Washington D.C. to tout his Openess Initiative. We hope that this willingness to be open includes efforts to be more inclusive in DoE's outreach to impacted, or potentially impacted communities.

Specifically of concern to the Military Toxics Project and the Indigenous Environmental Network is the **Draft Programmatic Environmental Impact Statement For Alternative Strategies For The Long-Term Management And Use Of Depleted Uranium Hexafluoride.**

We believe that all of the strategies that proposed have serious environmental justice concerns and potential impacts to communities that you have not adequately reached with the draft PEIS. We also believe that the meetings that the DoE has held in the past, as well as the ones that are beginning on February 19, 1998 in Paducah, are not properly reaching people who are or may be impacted by decisions that your agency will be making regarding this long-term plan for the use of this dangerous material.

Keeping with the spirit and intent of **President Clinton's Executive Order on Environmental Justice**, and Secretary Pena's **Openess Initiative**, we feel that it would be reasonable to request that the DoE initiate roundtable meetings, much like the **Federal Facilities Restoration Dialogue meetings**. We believe that it is necessary and just to bring in grassroots leaders from community, labor and environmental justice groups to further discuss the implications of strategies that have been proposed.

We further request that the comment period be extended to six months to give these folks the opportunity to meet with you, in addition to the hearings that are taken place now, as well as the opportunity to obtain expert technical advice regarding the impact of the various different strategies.

Please respond to our request in writing. We will be happy to suggest participants for a roundtable discussion.

Sincerely,

Cathy Lemar — Cathy Lemar, Director, Military Toxics Project
Tom G — Tom Goldtooth, Director, Indigenous Environmental Network
Dan Fahey — Dan Fahey, Swords To Plowshares

cc: Energy Secretary Federico Pena

MTP is a project of the Tides Center

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COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

1124 Meneguz Road
Niskayuna, NY 12309-1315
(518) 377-8202

June 29, 1997

NY Times Bureau
Attention: Mr. Matthew L. Wald
1627 I Street NW
Washington, DC 20006

Dear Mr. Wald:

I am writing to you regarding an article you published in the NY times on March 14, 1997. The title of the article is, "Danger From Uranium Waste Grows as Government Considers Its Fate." Midway through the article you say, "But there was never enough thought given to the final use of the uranium-238, and the leftovers have accumulated like raisin bran with all the raisins picked out. But this leftover is still slightly radioactive because a little of the uranium-235 remains." This statement that the depleted uranium in the storage cylinders at Piketon, Ohio is only slightly radioactive unfortunately is not true. Contrary to public perception, the uranium-235 isotope plays only a very minor role in the radioactivity of either natural uranium or depleted uranium.

I am a retired physicist who worked at the Knolls Atomic Power Laboratory from 1955 to 1983 in Schenectady, NY. On the 26th of June I testified before Congressman Christopher Shays' Sub-Committee on Human Resources concerning the use of depleted uranium munitions during the Gulf War and its potential as one of the causes of Gulf War Illness, also called Gulf War syndrome. On the panel with me was Dr. Asaf Durakovic, former Chief of Nuclear Medicine Service, Wilmington, DE, Veterans Affairs Medical Center. Dr. Durakovic is an internationally recognized expert on the internal contamination of radioisotopes. A copy of his testimony is attached, in which he states that "DU is still very radiotoxic..."

I would like to illustrate for you the physics reality underlying Durakovic's statement. In Table I I have listed the isotopic compositions of natural uranium and depleted uranium. Using these values I have computed the disintegrations per second of each isotope in one gram of uranium. The results are given in Table II.

Table I. Isotopic composition of natural and depleted uranium in atom percent. The isotopic compositions for uranium-234 (U-234), uranium-235 (U-235) and uranium-238 (U-238) were measured in highly sensitive and accurate mass spectrometers at the Knolls Atomic Power Laboratory, Schenectady, NY.

	U-234	U-235	U-238
Natural Uranium	0.0055	0.7198	99.2749
Depleted Uranium	0.0008	0.2015	99.7947

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Table II. The number of nuclear transformations (disintegrations) per second for each isotope in 1-gram of natural uranium and in 1-gram of depleted uranium. These are the alpha particle activities only.

	U-234	U-235	U-238
Natural Uranium	12380	565	12260
Depleted Uranium	1788	160	12325

Theoretically, the disintegration rates of U-234 and U-238 in natural uranium should be identical, because the U-234 is in secular equilibrium with its parent isotope, U-238, the first isotope in the long uranium decay chain. The slight difference results from using only two significant figures in reporting the 0.0055% and small errors in measuring its abundance by mass spectrometry. From Table II we see that the U-235 activity in natural uranium is 565/(12380 + 565 + 12260) = 0.022, or only 2.2% of the alpha particle activity in natural uranium. Similarly, the U-235 activity in depleted uranium is 160/(1788 + 160 + 12325) = 0.011, or only 1.1% of the alpha particle activity in depleted uranium. Clearly, U-235 contributes little to the total alpha particle radioactivity of each kind of uranium.

But this is not even half of the story about the radioactivity of depleted uranium. U-238 decays into thorium-234 (Th-234); thorium-234 decays into protactinium-234 (Pa-234); and protactinium-234 decays into U-234, etc. down the long uranium decay chain. The thorium and protactinium emit energetic beta particles and gamma rays; both have short half lives and therefore are in secular equilibrium with U-238, i.e. all three isotopes are decaying at the same rate. See Table III.

Table III. Disintegrations per second in 1-gram of natural uranium and in 1-gram of depleted uranium for U-238, Th-234 and Pa-234 in secular equilibrium with each other. Half lives used: U-238 = 4.47 billion years; Th-234 = 24.10 days; Pa-234 = 1.17 minutes, 6.69 hours (two decay pathways).

	U-238	-->	Th-234	-->	Pa-234
Natural Uranium	12260		12260		12260
Depleted Uranium	12325		12325		12325

Note that in depleted uranium the U-238 and its decay progeny are decaying at slightly higher rates than the corresponding isotopes in natural uranium. This is because 0.5% of the U-235 in natural uranium has been removed, as is shown in Table I.

You could not have gotten your statement about the low radioactivity of depleted uranium in storage at Piketon, Ohio from any scientific publication, therefore I assume that someone told you this. Whoever it was, he or she did you a great disservice, because it is so far off the mark that it damages your credibility in the scientific community. Furthermore, Dr. Durakovic's testimony indicates how easily micrometer aerosol particles of uranium can be inhaled and pass from the lung into the blood stream, from whence they can go anywhere in the body. This makes internalized depleted uranium particles (or any other kind of uranium) extremely dangerous to health. Furthermore, it is well known that the 2.23 million electron volt beta particles (fast electrons) from

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Pa-234 have a range of 0.5-inch in water. Our bodies are at least 75% water and have an average density close to that of water, therefore one of these fast electrons can penetrate the same distance in body tissue. This means that each Pa-234 beta particle can traverse more than 500 body cells, potentially damaging DNA molecules in the nuclei of cells. A sufficient number of these hits eventually will cause cancer.

I urge you to show this letter to someone you trust, a person with a scientific background who understands the physics of radioactive decay chains and can make independent calculations of the results I show in Tables I through III.

For the latest background information available on the depleted uranium munitions issue and its possible link to Gulf War illnesses, obtain a copy of the recently published book, *Metal of Dishonor*. A copy can be obtained from the International Action Center (Sara Flounders/Frank Alexander: Tel: 212-633-6646; Fax: 212-633-2889). It contains a chapter by me entitled, "DU Spread and Contamination of Gulf War Veterans and Others." I submitted it as my written testimony before the Congressional Sub-Committee on Human Resources. Dr. Durakovic can be reached at Tel: 301-681-8258; Fax: 302-633-5490.

A final comment: When are you folks at the New York Times going to stop letting Bill Mesler at *The Nation* run circles around you, scooping you at every turn about the growing scandal surrounding depleted uranium and its use in the Gulf War, and how it is now suspected of causing some of the illnesses being experienced by sick veterans? For example, I testified to the Sub-Committee that in 1979 my colleagues and I at the Knolls Atomic Power Laboratory had measured depleted uranium emissions in air filters exposed at the Knolls site and documented the measurements in a 1980 report. The contamination was coming from the National Lead Industries plant outside Albany, NY, 10 miles east of the Knolls site. We also measured the airborne depleted uranium emissions at another site 26 miles NW of the NL plant. I stated that I had given a copy of my report to the Sub-Committee. Yet, after my testimony, an Army colonel testified that because uranium is dense and heavy, they had measured that it falls to the ground close to a struck vehicle. When Chairman Shays challenged him about my 26 mile fallout statement, the colonel had no answer. At the conclusion of all the testimony, another Army colonel from the Armed Forces Radiobiology Research Institute (AFRRI) made the following statement, "I want to go on record that it is AFRRI's position that depleted uranium is not dangerous." Incredible!

Sincerely,

Leonard A. Dietz

Attachment

Copy to: Philip Shenon, NY Times, 1627 I Street NW, Washington, DC 20006.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

TOUCHING BASES

Newsletter of the
Military Toxics Project
First Quarter 1997

National Grassroots Networking Toward Pollution Prevention and Environmental Justice

How Depleted Uranium Effects Each of Us

The Department of Defense (DoD) has known since at least 1980 that human exposure to depleted uranium (DU) could result in serious, long-term health disorders. Yet, it refuses to acknowledge publicly the growing list of maladies exhibited by veterans and public citizens alike who have come in contact with this substance.

As investigations heat up concerning Gulf War Syndrome and the many horrible chemicals to which soldiers were exposed in the Persian Gulf, DU is noticeably absent from public discussion. The US Government appears to be burying the story in the sands of the Middle East.

Some opponents of DU manufacturing have characterized the radioactive material as the "Agent Orange" of the 90's, citing the far-reaching, negative effects that DU has on human health and the environment throughout its entire life-cycle. DU harms not only troops and rescue workers on the battlefield, but also the communities near uranium mines, the workers who process uranium and manufacture DU weapons, the communities whose land is contaminated by DU weapons testing and warfare, and the communities who ultimately serve as DU waste repositories.

This issue of *TOUCHING BASES* describes many of the slices of the DU pie. It is MTP's hope that when the DoD finally admits to the severity of the DU crisis, it will address each of these important areas, and provide full disclosure about others we may have missed.

In This Issue....

Message from MTP's Director

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Gulf War Vets Feel the Effects of DU
Indigenous Communities
Exposure in the Workplace
Local Communities
Cleaning Needs for DU
Recent Concerns from Japan
Global Gen

Wisconsin Community Rejects Army Proposal
US Destruction of Philippines Bases Lingers on
Toxic Incinerator Update
Georgia Legislature Votes to Delay Construction
of Chemical Weapons Incinerator
EPA Rules on Chemical and
Conventional Munitions

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Touching Bases
Newsletter of the Military Toxics Project
First Quarter - 1997

Touching Bases is published periodically by the Military Toxics Project (MTP). MTP is a national network of groups working to clean up military pollution, safeguard the transportation of hazardous materials, and advance pollution prevention at US Department of Defense installations. MTP encourages the translation, reprinting and dissemination of information contained in this newsletter provided that credit is given to *Touching Bases*, Military Toxics Project, First Quarter, 1997.

Guest Editors - Heather Spalding, Mike Hyde

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The Military Toxics Project is a project of the Tides Center

The Curry Print Shop printed this issue of Touching Bases, using non bleached paper and soy-based inks.

A Message From MTP's Director

As we come into Spring, there is a lot of activity in the MTP office, as well as in MTP campaigns. We are glad that we have the opportunity to work with all of you and look forward to continuing that relationship.

This issue of *Touching Bases* is long overdue. All of us are excited about the new look and all the good news that is being reported by all of you. This issue is dedicated to the problems associated with Depleted Uranium (DU). What we hope to do is to show the *full picture* of DU -- from cradle to grave -- and the many lives it has affected. We hope that after you read the information provided, you will get as angry as we are that, thanks to Uncle Sam, these weapons still are being produced, tested, used and disposed of in this country and in others. The Pentagon would prefer that we all just go away and leave this particular subject alone. But, the continued production, testing and use of these weapons has the potential to affect the health of many generations to come. We are going to bring together each piece of the DU pie, so that readers will have the total picture. We hope that you get mad enough to let your Congressional Representatives know what you think of DU munitions.

MTP also is gearing up for Board Elections once again. This is the time to get in your nominations for at-large elections. For members of MTP network campaigns, it is time to start thinking of what member in your network you want to have representing your concerns on the MTP Board. Nomination ballots will be mailed out soon to all network members.

This summer, MTP will hold its annual Board Meeting, which will be open to all MTP members and allies. At this meeting, the Executive Committee will be elected. This will also be the first meeting that new board members will be attending.

Finally, we are so proud of those of you out on the *front lines* in communities, workplaces and veterans organizations that have done so much for so many. Keep up the good work!

Cathy Lomar
Executive Director

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

What Is Depleted Uranium?

The *Handbook of Chemistry and Physics* states, "Uranium is a silvery metal, which is pyrophoric [i.e., capable of igniting spontaneously] when finely divided. It has fourteen isotopes, all of which are radioactive." Naturally existing uranium refined from ore is made up largely of U-238, a relatively stable isotope of the element, from which the highly fissionable isotope U-235 is extracted for nuclear weapons and power uses. After the U-235 is partially extracted (reduced from approximately .7% to .2% of the natural uranium), the remainder is misleadingly called "depleted uranium." It still can be used for nuclear weapons and energy programs by being transformed into plutonium in a breeder reactor, and it is still radioactive and toxic. Recent studies indicate there is no threshold level of radiation below which an exposed person is safe from radiation damage, and though DU is less radioactive than U-235 or plutonium, it remains an extremely harmful substance with the chemically toxic properties of many heavy metals.

Because of uranium's extreme density, DU can be used to make munitions and armor of great density. The penetrators made with DU have great range and velocity -- velocity that gives them an ability to penetrate most kinds of armor (including otherwise virtually impenetrable DU armor, as Gulf War friendly fire casualties demonstrated.

DU burns on impact, spreading into the atmosphere and creating a small-scale fallout of aerosolized uranium particles which can be inhaled or ingested from the air or by contact with contaminated materials and sites. The particles can travel anywhere that dust goes.

Gulf War Vets Feel the Effects of DU

by Dan Fahey, Swords to Plowshares

Armor-piercing projectiles and tank armor made of DU proved highly effective in their first combat test during Operation Desert Storm. However, military commanders blatantly ignored the serious health and environmental impacts of shooting bullets made of radioactive waste. As a result, tens of thousands of soldiers and civilians were exposed to more than 600,000 pounds of DU contamination, which still remains on Gulf War battlefields. Though the proliferation of DU weapons since the Gulf War threatens to accelerate the spread of DU around the world, the impacts of DU weapons can be prevented if action is taken now.

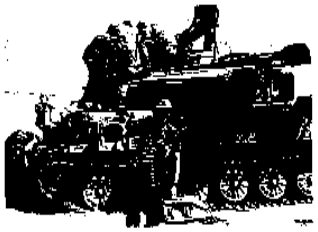


PHOTO COURTESY OF CHRIS KORNKVEN. GULF WAR VET EXPOSED TO DU PARTICLES

When a DU round strikes a target, up to 70% of the round burns, scattering radioactive and chemically toxic dust in and around the target. DU poses its greatest danger to human health when its dust is inhaled or ingested. An Army report on DU completed six months *before* Desert Storm noted that "aerosol DU exposures to soldiers on the battlefield could be significant with potential radiological and toxicological affects." The same report also stated that "short term effects of high doses can result in death, while long term effects of low doses have been implicated in cancer." Despite these warnings, military officials failed to inform soldiers about the use and dangers of DU weapons during Operation Desert Storm.

During and after the ground war, tens of thousands of soldiers climbed on and entered destroyed vehicles -- many of which were covered in uranium dust -- to look for hiding Iraqi soldiers, to remove any usable equipment, or just to examine the shattered hulks. It was not until a week after the cease fire ending Desert Storm

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

that a message was sent to Army commanders warning that "any system struck by a DU penetrator can be assumed to be contaminated with DU." Yet, even after this message was sent, information about the presence and dangers of DU contamination was never passed on to soldiers in the field.

A 1993 General Accounting Office report, aptly titled *Army Not Adequately Prepared to Deal with Depleted Uranium Contamination*, revealed that even the soldiers of the 144th Supply Company of the National Guard, who were tasked with recovering US vehicles contaminated by DU in friendly fire incidents, were never told of "the existence of DU contamination or radiation hazards," and that they worked on contaminated vehicles for several weeks "without any protective gear."

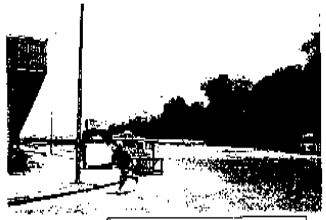
Mark Panzera, who served an active tour of duty for nine months with the 144th Supply Company, reported that more than twenty soldiers worked for five months at the King Khalid Military Camp in Saudi Arabia, cleaning tanks contaminated with radioactive dust. For the first month and a half, the soldiers had no idea that they were dealing with radioactive dust.

In March 1991, the Pentagon sent civilians to the camp to take measurements of the radioactivity. Dressed in full protective gear with rubber gloves, respirators, dosimeters and Geiger counters, the civilians went about their work. After two weeks, they concluded that the soldiers had been exposed to ionizing radiation.

The soldiers got no relief, when their commanding officer ordered them back to work with no additional protective equipment.

When GAO investigators inquired about the widespread lack of awareness among US troops about the use and dangers of DU munitions, Army officials stated that "DU protective methods can be ignored during combat and other life-threatening situations because DU-related health risks are greatly outweighed by the risks of combat." This line of military logic was also used to justify exposing soldiers and civilians to poisonous herbicides such as Agent Orange and radiation from atomic testing and fallout.

In July 1991, a fire broke out at a US Army Base at Doha, Kuwait. Nearly $40 million in equipment and ammunition was destroyed, including 860 DU tank rounds and four fully loaded Abrams tanks. The 860 tank rounds destroyed represented more than 7,000 pounds of highly toxic, radioactive uranium that was spread around the Doha base and ejected into the atmosphere during more than 4 hours of explosions.



Explosion at the U.S. Army base at Doha, Kuwait on July 11, 1991
Photo courtesy of Michael Flynn

At the time of the fire, nearly 3,000 troops were at the base. After the fires burned themselves out, explosive safety personnel returned to identify and clear out unexploded ordinance, followed by other soldiers detailed to clean the area. Soldiers approached burned DU armored tanks, carried debris and shrapnel with their bare hands, inhaled the toxic DU dust -- and never knew it. Soldiers involved in the cleanup of the fire area were not provided any radiation protection equipment, and no contamination cleanup of areas was apparently done.

Several of the National Guardsmen exposed to DU in Saudi Arabia have developed serious health disorders since Desert Storm. Symptoms include headaches, cold sweats, hypertension, numbness in the extremeties, diarrhea, insomnia, bronchitis and renal disorders. Some have had children with birth defects.

Because troops were exposed to many potentially hazardous substances in the Gulf War, it is difficult to determine how much of a role DU had to play in the cumulative health disorders of ailing soldiers. However, Dr. Asaf Durakovic, one of the military's top nuclear contamination experts, recently stated: "Every atom of uranium ingested in a human body is a cancer and a potential genetic hazard."

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COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Dr. Durakovic treated two dozen of the soldiers from the 144th Division who cleaned the DU-contaminated tanks in Saudi Arabia. He accuses the Department of Veterans Affairs of terminating his position with the VA, and harassing him "for pursuing the proper medical management of veterans exposed to depleted uranium." He also claims that medical records of the soldiers he had examined have mysteriously disappeared, an allegation the VA firmly denies.

Since the Gulf War, the Pentagon has downplayed the dangers of DU and the significance of DU exposures in the Gulf War because it does not want to draw negative attention to a prized weapon system. The Department of Veterans Affairs (VA) has accepted the Pentagon's assurances obediently, and denied testing and treatment to other veterans suffering from kidney problems and cancers which may be related to DU exposure. Both the Pentagon and VA have expressed, in writing, a desire to avoid the costs of medical care and disability payments for veterans who develop DU-related health problems.

Dan Fahey works closely with sick Gulf War Veterans as the Legal Assistant for Swords to Ploughshares, a San Francisco-based non-profit organization which helps war veterans meet their basic needs. Representing Veterans for Peace, Mr. Fahey also serves on MTP's Board of Directors. He recently released a report entitled** The Silence is Deafening: A Report on Exposures of Persian Gulf War Veterans and Others to Depleted Uranium Munitions, which is available from MTP headquarters. ***For more information about Gulf War Veterans' illnesses, contact Swords to Ploughshares at 995 Market Street, 3rd Floor, San Francisco, CA 94103. Phone: 415-247-8777.

The Military Toxics Project organizes activities of the Depleted Uranium Citizens' Network. On November 12, 1994, in Jonesborough, Tennessee, the DU Citizens' Network adopted the following mission statement:

In response to the latest form of military radioactive pollution, the mission of the Depleted Uranium Citizen's Network is to provide outreach and unite people affected by the production, testing, and use of depleted uranium for military purposes; and to demand cleanup, health care, compensation and the end of depleted uranium munitions use worldwide to help ensure the survival of future generations.

For more information about DU weapons and efforts to help Gulf War veterans and civilians impacted by DU, contact:

Depleted Uranium Citizens' Network, Military Toxics Project, 471 Main Street, 2nd Floor, Lewiston, Maine 04240.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Going to the Source:
How Uranium Mining Destroys Indigenous Communities

By Philippa Winkler, Desert Concerns

Ajanat, the Rainbow Serpent, sleeps in the earth guarding those elemental powers that lie outside of mankind's control. Any attempt made to steal those underworld powers will disturb the serpent and bring destruction and death upon the Earth. -- An Indigenous Peoples' Belief, Australia

When evaluating the need for different materials in modern-day life, it is imperative to go to the beginning of a product's life-cycle. For DU, the life-cycle begins with uranium mining, often on Indigenous lands.

Uranium is mined in many countries around the world, with Australia, Canada, Kazakhstan, Namibia, Niger, Russia, south Africa, the US, and Uzbekistan leading world production. US uranium mining began in earnest in New Mexico, right after World War II, when the US government realized the capabilities of the metal.

Uranium mining in the desert Southwest, has left open and permanent scars on the land, which many indigenous communities hold sacred. Pollution from the mining has resulted in an epidemic of cancer cases.

Since the 1970s, tourism has exploded in the American Southwest. The rivers, washes and canyons, the sandstone and shale, the mesas and the spectacular red "cathedral" rocks are familiar to us from countless magazine photographs, advertisements, and films. But, no tourist brochure mentions the following scenarios:

> Since World War II, the Navajo Nation and developers of uranium mines have been engaged in a continuous power struggle. The Navajo Nation has called for an international ban on uranium mining, while the uranium industry has fought such resistance. A moratorium on uranium mining on Navajo lands has been in effect since 1983.
>
> Of more than 2000 Navajo uranium miners who worked in the Four Corners (Northeast Arizona, Northwest New Mexico, Southeast Utah, and Southwest Colorado) mines from 1947 to 1971, most have died of lung cancer and other sicknesses linked to radiation exposure. Yet, only fifty Navajo widows have been compensated under the 1990 Radiation Exposure Compensation Act.
>
> Cancer clusters have been found in Indigenous Peoples -- especially among children and the elderly -- living downwind and downstream of uranium mines.
>
> In one community, at Shiprock, New Mexico, the Special Olympics Games take place annually because of the high number of deformed children.
>
> Church Rock, New Mexico, part of the Checkerboard Area of the Eastern Navajo Agency, was the site of a 1979 radioactive waste spill, the largest in US history.
>
> Church Rock is one of the communities targeted by Hydro Resources, Inc., of Dallas, Texas, for involvement in the construction and operation of two uranium mines and related processing plants in the Checkerboard Area. This is the equivalent of recommissioning the nuclear power plant at Three Mile Island.
>
> From 1946 to 1968, more than 13 million tons of uranium ore were mined on the Navajo reservation to make atomic bombs. More than a thousand abandoned, yet highly radioactive, mines have not been cleaned up or reclaimed.
>
> Despite evidence that cancer is ravaging the Navajo communities, the US Government has routinely denied funding for a complete epidemiological study. According to Arizona Department of Health Physiologist Al Goodman, "the highest birth defect rate in the state -- equal to seven times the national average -- was in the Cameron-Gray Mountain area of the Navajo Reservation north of Flagstaff. The area is pockmarked by numerous open pit uranium mines."

In the mid-eighties, the Federal Government began efforts to remove Indigenous Peoples from their ancestral homes in the mineral-rich land of Northwest Arizona. The government intended to mine coal and uranium for further industrial and military uses.

In 1993, the World Uranium Hearings convened in Salzburg, Austria to call for worldwide protection of indigenous peoples and lands, and the end to nuclear technology. Despite all these efforts, Navajo communities face continual threats. Yet the struggle of indigenous communities continues.

The Havasupai People, who live at the south rim of the Grand Canyon in Colorado, are currently fighting uranium mine developments, while the Navajo are struggling against planned uranium mining operations in New Mexico.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Philippa Winkler works for Desert Concerns, a project of the World Survival Foundation. The group examines the health effects of uranium mines of the Southwestern US and uranium battlefields of the Middle East. Contact Desert Concerns at PO Box 1145, Clarkdale, Arizona, 86324. Phone: 520-634-4327.

Activists Raising Funds For New Video on DU

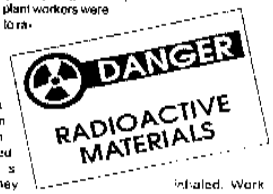
Three organizations, including Desert Concerns, World Survival Foundation, and Southwest Indigenous Uranium Forum, seek funding for a 30-minute documentary on the environmental and human health hazards of uranium mining and depleted uranium. The video will address the entire life-cycle of depleted uranium, and is provisionally titled, *Radioactive Mines – Radioactive Bullets*. If you would like to contribute to this effort, or assist in fundraising for this important resource, please contact Daniel Robicheau or Philippa Winkler at Desert Concerns, PO Box 1145, Clarkdale, Arizona 86324. Phone: 520-634-4327.

DU Exposure in the Workplace

One of the manufacturers of DU is Aerojet, formerly TNS, Inc., located in Jonesborough, Tennessee. In 1981, employees walked out of their work place, in protest of hazardous working conditions.

The plant uses DU to produce armor-piercing projectiles primarily for the US Air Force. Prior to the employee walk-out, the US Department of Energy had been sending a powdery substance known as *green salt* to the contractor in 55-gallon drums. The green salt was actually uranium tetraflouride which was used to manufacture DU.

At virtually every stage of the production process, plant workers were exposed to radioactive substances, often in the form of contaminated dusts which they inhaled. Workers moved the drums from the warehouse to the plant foundry with a forklift. Often, the forklift pierced the drums, spilling green salt onto the plant floor. When the workers tried to clean up the mess with shovels and brooms, they dispersed it into the air. The weighing and blending stages further spread the hazardous substance around the plant, and onto employees. The exhaust system did little to vent the dust and fumes away from the workers who complained of having green salt in their ears, nostrils and mouths. Workers also described violent furnace blow-outs which expelled contaminated material into the workplace.



Many employees began to complain of discharging black mucus from their noses, having chronic nose bleeds, lower back pain and difficulty in urinating. TNS refused to acknowledge that DU was potentially responsible for the health problems, despite their own records indicating airborne contamination in the plant.

In 1980, more than 8% of the workforce sustained whole body doses of radiation ten times as great as the average exposure for workers in the nuclear industry nationwide.

After the workers' walkout, employee exposure to radiation declined significantly. The plant upgraded the blending and weighing equipment to remote-controlled devices, disposed of the old equipment in a landfill, and installed a new dust collector.

The Oil, Chemical & Atomic Workers International Union (OCAW) represented roughly 100 TNS employees in a 1994 legal suit in the United States Court of Appeals. Although the workers won their suit, the company challenged the ruling, and it was overturned. Since then, OCAW has appealed and is awaiting a final decision.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

DU Weapons Threaten Local Communities

by Judy Scotnicki

In 1994, the American public learned that the U.S. government had secretly exposed to radiation its own citizens including pregnant women, teenagers, sick people, atomic plant workers, military and civilian populations - all without their consent during a period from the 1940's to the early 1970's.

Now in the 1990's another involuntary human radiation experiment begun years ago during the Cold Wars continues. It is the production, manufacture, development, testing and use of depleted uranium as a military weapon. In the Persian Gulf War the depleted uranium projectile, a weapon made from the nuclear fuel enrichment cycle, was used for the first time. Even though this uranium metal weapon is highly toxic, both chemically and radiologically, it is currently classified as a conventional weapon.

The Army Environmental Policy Institute (AEPI) **"Health and Environmental Consequences of Depleted Uranium Use in the U.S. Army: Technical Report"** of almost 200 pages does not really tell us much about the health and environmental consequences of DU use. There are no long-term health studies of DU production or manufacturing workers and their offspring. Nor are there health studies of residential populations that have been exposed to radiation from aerosol or ingested DU from DU production, manufacturing or testing. There are no health studies of Gulf War Veterans who were exposed to DU through inhalation or ingestion, and there are no studies of these veterans' children born after the Gulf War. How then can there be the following finding in the AEPI report Executive Summary:

> *"After an exhaustive review of weapons systems containing DU, AEPI concluded that the Army has done an excellent job attending to the environmental and health impact of these systems."*

The AEPI report reports specific section on the effects of DU on the environment consists of three paragraphs on pages 145 - 146. In these, only two sources are cited on the effects of DU on plant life. One, Hanson and Miera in 1978, (almost 30 years ago), concluded that in DU contaminated soil most injury occured in the roots of plants. In the other study at Eglin Air Force Base, Florida in 1989, 25 vegetation samples were collected and yucca roots were found to have "the highest apparent radiation concentrations." Is this a scientific basis for concluding what DU's impact is on plant life in the environment? In the report, there is very limited and superficial discussion of the effects of DU on animal life. An ongoing monitoring of plants and animals should be integral to assessing the effects of DU on the environment.

There are 50 different sites in the United States where DU has been produced, developed, manufactured tested and stored. A major shortcoming of the AEPI report is the lack of consideration given to the health and environmental consequences on the adults and children at the 50 sites.

In Concord, Massachusetts, near Nuclear Metals, Inc. (NMI), there are two middle schools and one elementary school. NMI has been a manufacturing site using uranium metals for 37 years. It is currently one of the two manufacturers in the U.S. of the DU penetrator.

Citizens' Research and Environmental Watch (CREW) has found DU contaminated soil as far away as nine-tenths of a mile from NMI. Among the contaminated areas on NMI's 46.4 acre site is an unlined pit that has 400,000 pounds of uranium wastes which are leaching and migrating.

The State of Massachusetts has designated the NMI property as a Superfund site.

A November 1984 internal memo from the Nuclear Regulatory Commission states, "*migration [of the uranium plume in the groundwater under NMI] might have already reached the site boundry, or at any rate will reach it soon at the projected rate of movement in [bedrock fissures].*

NMI is but one example of contamination, on and off site, caused by the U.S. Army's use of DU that is not revealed in the AEPI report. How many other examples similar to NMI can be found at the other 49 sites? And what about their nearby neighborhoods, schools, public lands and waterways?

And what of the health of all the people living near those sites? In August 1995, CREW researcher Bill Smith completed a statistical study of cancer in Concord. Using the Massachusetts Cancer Registry data available (1982-1990), Smith found that Concord had a higher incidence of six types of cancer relative to state averages. Concord had the second highest incidence of thyroid cancer in the state, nearly two and a half times the state average. The reason for this higher incidence of cancer is not known.

For further information, contact: CREW, 52 Prairie Street Concord, MA 01742. (508)369-7146

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

TOXIC SHOTS HEARD ROUND THE WORLD

Radioactive Weapons and Waste in Concord

Sunday, April 27, 1997
3:00 p.m.
First Parish Church
20 Lexington Road
Concord Center, MA

Panelists from Massachusetts, New York, Tennessee and Louisiana will discuss:

* The hazards of radioactive contamination from the manufacture of the depleted uranium penetrator at Nuclear Metals Inc. in Concord, MA and at other sites in the US.

* Clean-up of the toxic and radioactive wastes generated by DU.

* Gulf War veterans' exposure to DU contamination.

Co-sponsored by Grassroots Actions for Peace and the Social Action Council of First Parish Church. Supported in part by the Military Toxics Project Community Exchange Program.

Recent Concerns from Japan

The latest DU weapons incident to hit the news happened on an uninhabited island in Japan in late 1995 and early 1996. The US Marine Corps publicly stated that it accidentally fired 1,520 DU bullets on the island of Tori Shima near Okinawa. While the rounds had been labelled "armor-piercing," they were not specifically marked "depleted uranium."

While the Marine Corps apologized to Japan for firing the rounds and cleaned up 192 of the bullets, it downplayed the likihood that any health or environmental threat remained in the area.

Dan Boyd, a US Air Force spokesman in Japan told Reuter news service that the amount of radiation released on Tori Shima was "absolutely insignificant," and likened it to that of early television sets.

Yet, Japanese officials, citizens and local fishermen are skeptical. Last month, a staffer for a Japanese Parliament member contacted the MTP office asking for information on DU as they try to determine the extent of environmental contamination on and around Tori Shima.

While the incident on Tori Shima raises concerns about how US military use of DU threatens Japanese communities, it is important to keep the situation in perspective. During Operation Desert Storm, when DU bullets were first introduced, US forces fired 940,000 small-caliber and 4,000 large-caliber DU rounds in combat. Six years after the war, none of the more than 600,000 pounds of DU has been cleaned up, and no apologies have been issued to exposed Gulf War veterans or the populations of Kuwait and Iraq who live amidst this contamination. A classified United Kingdom Atomic Energy Authority report warned in 1991 that depleted uranium contamination on Gulf War battlefields could cause 500,000 deaths among soldiers and civilians.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

A Global Ban on DU The Only Solution

By Chris Larson, Patriots for Peace

The first international conference on DU was held at the United Nations (UN) in New York City on September 12, 1996. People from around the world crowded into the standing-room-only hall to learn about the complex DU issue and initiate a global ban on DU weapons through public education.

One conference participant raised the following question: "What would you do if you owned a portion of the US nuclear waste?" The answer, "Essentially, each of us does." Virtually all of us are taxpaying citizens on the grid (using electricity via nuclear power) and thereby own a portion of the waste created. As shareholders in the nuclear waste crisis, each of us has a responsibility to stop the use of waste uranium for further destruction, and to demand environmentally safe and renewable power supplies.

Conference keynote speaker and former US Attorney General Ramsey Clark stressed the need to create a worldwide ban against the use of DU, and many other speakers described their personal experiences with DU. Native Americans, war veterans, scientists and activists all agreed that DU has no place in modern society.

International efforts to curtail the DU problem were evident throughout the forum. Dr. Jay Gould, former Environmental Protection Agency Science Advisory Board member, announced a "tooth fairy" grant that he had received from the United Methodist Church to analyze New England children's baby teeth for proof of DU exposure. A London physician distributed DU fact sheets to the UN delegations. Kenk van der Keur, a Dutch participant, presented information on LAKA, a data collection and research center in the Netherlands that gathers and shares information on nuclear energy issues internationally with interested parties. A film crew from Japan Broadcasting Corporation attended the conference and developed a 50 minute documentary on DU.

Conference participants pondered a Thomas Jefferson decree that citizens hold their government accountable for its actions, and considered a model for constructive, patriotic participation to address the DU problem. The model contains the following three levels of awareness: personal understanding and conviction; interpersonal cooperation, and omni-personal respect for the Commons, or the life-sustaining ecosystem we all share.

Many people at the conference characterized the mainstream media as a major obstacle to accurate information about the DU crisis, and agreed to develop alternative information sources for public education. Conference-goers stressed the importance of seeking alternative news and information sources, and encouraged others to join the **Military Toxic Project's DU Citizen's Network**, which works to ensure that prompt, accurate information about DU is disseminated by grassroots organizations. Participants gathered more than $1600 to begin a comprehensive DU book that will be written in lay terminology.

Nuclear physicist Dr. Michio Kaku, delivered perhaps the most inspiring statement of the conference when he proclaimed, "There is one power stronger than plutonium, the power of educated people."

MTP's DU Citizens' Network currently is developing a resolution for global action on DU. The Network seeks to strengthen an August 1996 UN resolution which urges all States to "curb production and spread of weapons of mass destruction or with indiscriminate effect, in particular nuclear weapons, chemical weapons, fuel-air bombs, napalm, cluster bombs, biological weaponry and weaponry containing depleted uranium." The stronger resolution would ban, not just curb, the production and spread of DU weapons.

Patriots for Peace based in [illegible] has written a paper entitled, De[illegible] Tragedy of the Commons, which ex[illegible] and exposure risks of DU, and [illegible] of justice model discussed at the [illegible] a reprint of this report, contact Ms. [illegible] Gainesville, FL 32579-5092.

Dan Fahey and Chris Larson at the September IAC conference on DU

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Metal of Dishonor: How the Pentagon Radiates Soldiers & Civilians With DU Weapons. **Published by the International Action Center (IAC),** with selections by Dr. Rosalie Bertell, Dr. Helen Caldicott, Ramsey Clark, Dr. Leonard Dietz, Pat Broudy, Carol Picou, Dan Fahey, Dolores Lymburner, Dr. Michio Kaku, Manuel Pino, and Dr. Victor Sidel. Focuses on the environmental and health effects of depleted uranium. Book and companion video to be released in late April 1997. $12.95 plus $4.00 shipping and handling for the first copy. $1.00 for each additional copy. Available at discounted bulk rates for organizing, educational, or fundraising use by community organizations. The companion video - 45 minutes. $20.00 for individuals, $40.00 for institutions plus $4.00 shipping and handling for first copy, $1.00 for each additional copy. All mail orders must be pre-paid. Send check or money order to:

IAC, 39 West 14th Street, Room 206, New York, NY 10011. Phone: 212-633-6646. Fax: 212-633-2889.

Project CENSORED Honors MTP For DU Research

MTP's Depleted Uranium Citizen's Network report, **"Radioactive Battlefields of the 1990s: A Response to the Army's Unreleased Report on Depleted Uranium Weaponry,"** took honors as the ninth most "censored" or "under-reported" story of 1996. Project Censored, based at Sonoma State University in California, identified twenty-fiveissues to be reviewed in the organization's annual yearbook. Of those issues, the top ten ranked stories will become the primary focus of public discussion on more than 125 radio and television talk shows during the spring and summer. MTP will receive a small cash award from Project Censored for its efforts to educate the public about the environmental and health threats of DU.

Creating Needs for DU

By Dolly Lymburner

National Organizer, MTP's DU Citizens' Network

Depleted uranium has been licensed for a new use by the Idaho National Engineering Laboratory (INEL) as containers for spent nuclear fuel.

The US Department of Energy currently has an estimated 555,000 metric tons of DU that it is trying to dispose of or use. The production of containers for spent nuclear fuel will use large quantities of DU. Originally, the plan was to convert DU into a metal, but this was considered very costly. A cheaper course evaluated by INEL was using a DU rock-like aggregate as an ingredient in concrete. This material is called "DUCRETETM". INEL has completed initial testing and Lockheed Martin Idaho Technologies Company is obtaining patents here in the U.S. and in other countries.

DUCRETETM will replace the concrete and steel casts currently being developed. According to INEL, DU, because of its density, will better shield radiation from spent fuel. They also state that these new casts will be thinner and lighter in weight, making handling and transportation at the storage sites easier.

Teton Technologies, Inc. has formed a partnership with Nuclear Metals, Inc (NMI) to further develop the process and marketing strategy. Initial production will be at NMI's facilities in Barnwell, South Carolina with production starting this year.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

ONCE AROUND THE BASES

Wisconsin Community Rejects Army Base Conversion Plan

By Laura Olah, Citizens for Safe Water Around Badger

Environmentalists, local government officials, and regulatory agencies alike rejected a recent Army base conversion proposal in Wisconsin.

At issue is the **Badger Army Ammunition Plant (BAAP)**, a defunct 7,400-acre facility which has been on stand-by since 1975. BAAP has become the focus of a county-wide battle to preserve the area's rural quality of life, its endangered natural resources, and its local economic health.

Opposition to the reindustrialization plan, spearheaded by Citizens for Safe Water Around Badger (CSWAB), arose in response to a September 18, 1996 announcement by Olin Corporation and the US Army to initiate an aggressive marketing scheme which would bring the pulp and paper industry; varnish, paint and lacquer manufacturers; ethanol and cosmetics industries; and nitrogenous fertilizer plants to BAAP by 1997.

BAAP identified the target industries in a Strategic Planning Process which excluded nearby communities, local town, village and county boards, planning and zoning authorities, and other stakeholders. Through a nine-month planning process -- costing 275,000 taxpayer dollars -- BAAP hosted no public meetings.

The reindustrialization proposal is the result of the 1992 Armament Retooling and Support Act (ARMS). The ARMS initiative encourages private firms to use Army ammunition facilities (specifically government-owned, contractor-operated facilities) for commercial purposes. The US Government authorized ARMS to create jobs at facilities like Virginia's Radford Army Ammunition Plant, where a recent lay-off resulted in the loss of thousands of positions. Opponents of the BAAP conversion proposal noted that, by contrast, BAAP had not had a significant job loss since the mid-1970s, and today employs only about 100 people.

Under the ARMS program, the Department of Defense makes contracts available to private industry for one or more years. Companies receive *Facilities Use Contracts* to develop and implement a reuse plan and, in return, receive part of the rent from new industries brought on-site. At BAAP, the operating contractor is Olin Corporation.

One of the objectives of the ARMS program is to perpetuate Badger and other Army ammunition plants as military facilities, avoiding closure and allowing deferral of cleanup efforts. This tactic contradicts a February 20, 1997 report from the Government Accounting Office which concludes that BAAP and three other military plants could be eliminated because alternative sources exist to provide the capabilities that these plants provide.

In the Community around Badger, there is a strong sentiment that the ARMS program is neither applicable nor appropriate for the BAAP facility and Sauk County. A flat labor market, housing shortages, overflowing schools, and other stressed infrastructure are all signs that additional development in the area is not warranted. Community members maintain that other possible uses for the site have not yet been evaluated. The other options may, in fact, provide much greater benefits to the Community than reindustrialization.

One of the assets cited by the Strategic Plan is open, currently undeveloped land. Local residents are very concerned that reindustrialization may promote uncontrolled development of agricultural lands within the plant for new industry. Contrary to statements in the Strategic Plan, there is a decline in available farmland in Sauk County, which is reflected by local farmland preservation ordinances. Moreover, the value of farmland and small farms is highly prized in the area.

BAAP itself lies primarily on the terrain of the former Sauk Prairie, a bioregion which hosts remnants of many diverse ecosystems including prairie, oak savanna, dry forest, southern hardwood swamp and sandy meadow.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

ONCE AROUND THE BASES

The base is also home to a wide variety of animal species including some that have been classified as rare, endangered and threatened. BAAP is surrounded by the Baraboo Range -- a National Natural Landmark. Composed of quartzite, the hardest rock on Earth, it covers 144,000 acres in parts of Sauk and Columbia counties. The 25-mile Range extends from Rock Springs in the West to just west of the Interstate highway in adjoining Columbia County in the East. It stands as high as 799 feet above the Wisconsin River and is one of the largest and most ancient rock outcrops in North America.

The Range includes 55,000 acres of forest -- the largest tract of southern upland forest remaining in an ecoregion which covers 40,000,000 acres in parts of five states (central Minnesota through southern Wisconsin, northeastern Iowa, northern Illinois, and northwestern Indiana.) Although the Range covers less than 0.5% of this area, it supports 68% of all breeding bird species, 44% of all mammal species, and 37% of all reptile species found in the ecoregion. This ecoregion is home to more than 18,000 species of plants and animals, including 135 species of breeding birds alone. Seventy-seven of these plant and animal species are rare or imperiled in Wisconsin, and 25 are on the State or Federal lists of threatened or endangered species.

Reindustrialization of the region has met broad opposition at local, state, national and federal levels.

The Town of Merrimac, the Village of Merrimac, the Town of Sumpter, the Town of Honey Creek, the Town of Spring Green, and Sauk County all have passed resolutions opposing the proposed conversion plan. Local business organizations, including the Baraboo Economic Development Council, have drafted resolutions opposing BAAP's proposal citing unfair competition from new industries coming into the plant which would be exempt from real estate and property taxes. The Sauk Prairie School District Administration also has written to the Army objecting to the negative financial impact on the district.

At least sixteen environmental groups, including the Rural Alliance for Military Accountability, the Sierra Club, the Madison Audubon Society, the Aldo Leopold Chapter of the Society for Conservation Biology, the Baraboo Range Preservation Association, and several chapters of Physicians for Social Responsibility have co-signed a letter opposing the proposed reindustrialization.

The Wisconsin Department of Natural resources, the US Department of Interior, and the US Environmental Protection Agency all have written letters forewarning potentially negative primary and secondary impacts on the adjacent Baraboo Range ecosystem. The Ferry Bluff Eagle Council, a non-profit organization whose mission is to protect wintering American Bald Eagles, has documented serious concerns about the potential harm to this endangered species and its habitat.

In response to the proposed reindustrialization of BAAP, CSWAB hosted a series of four public meetings to encourage and solicit community input and consensus. Public meetings averaged 60 participants. CSWAB has collected more than 600 signatures from local residents opposing reindustrialization.

CSWAB has called for the closure of BAAP, citing that maintenance of the plant -- although out of operation since the 1970s -- costs taxpayers millions of dollars each year. In 1991 alone, maintenance costs exceeded $17 million. Built in 1942 in response to World War II, the BAAP production facilities are obsolete and would require more than $119 million in upgrades to meet current state and federal environmental standards. Environmental damage continues to plague the facility -- since 1975, there have been more than 56 chemical spills and incidents.

Environmental cleanup of the Badger plant, operating intermittently since 1942, is expected to exceed $250 million. Of the 40 contaminated military sites in Wisconsin, the Defense Environmental Restoration Agency has cited BAAP as the most contaminated -- 32 areas within the plant are polluted with high levels of solvents, toxic metals and explosive wastes. Groundwater beneath the plant is saturated with cancer-causing chemicals, including carbon tetrachloride, trichloroethylene and dinitrotoluenes. An area know as the Propellant Burning Grounds is the source of a three-mile long plume of contaminated groundwater that has migrated several miles offsite, polluting private drinking water wells in its path and dumping into the Wisconsin River.

CSWAB was organized in 1990 when the community learned that private drinking water wells near BAAP were polluted with high levels of cancer-causing chemicals. The founders believed that community involvement could have prevented this tragedy and consequently organized CSWAB both to empower and to protect nearby residents and plant workers from further harm. For more information, contact CSWAB at E12529 Weigand's Bay South, Merrimac, Wisconsin. Phone: (608) 643-3124; Fax: (608) 643-0005; Alternate Fax: (608) 643-2662; Email: olah@speagle.com.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

ONCE AROUND THE BASES

PHILIPPINES

Toxic Threat at Former US Bases in the Philippines Lingers On

By Myrla Baldonado

Almost five years have passed since the US Military agreed to terminate operations at Subic and Clark Bases in the Philippines. Despite findings of a 1992 report from the US General Accounting Office which stated that "the costs for environmental cleanup and restoration could approach Superfund proportions," there has been no comprehensive investigation nor clean-up.

To date, the US Government's only act regarding the bases is the release of incomplete Drawdown Reports which were supposed to have been turned over to the Philippines Governments prior to the pullout.

During President Clinton's official visit to the Philippines in 1994, base clean-up advocates managed to put the issue on the discussion agenda, despite the reluctance of both governments to touch the issue.

At a joint press conference of Presidents Ramos and Clinton at Malacanang, President Clinton was asked about the toxic contamination at the former Clark Air Base and Subic Naval Station, his Government's offer of financial and technical assistance, and his willingness to accept the moral and financial responsibility for any necessary cleanup.

President Clinton responded by stating that the U.S. was "continuing to work with the Philippine government on this and will continue to do so." He added, "it is very important not to let the general policy pronouncements or the rhetoric outrun the facts we have on the case, so we decided we should focus on finding the facts now, and when we find them, deal then with the facts as they are."

A few months later, the Philippine Health Department asked for a consultant from the US Center for Disease Control (CDC) to help test the drinking water of wells in an area inside Clark that used to be a motor pool. The official response was that the agency adhered to a US State Department policy of "no responsibility," and that they would send a technical person if the Philippine Government could pay for his transportation and per diem.

During the November APEC Summit in Manila, delegates of the 1996 International Forum on US Military Toxics and Bases Clean-up lobbied for the inclusion of the toxics problem in the bilateral talks between the two governments. As a result, former Secretary of State Warren Christopher and Philippine Foreign Affairs Secretary Domingo Siazon discussed the matter. Secretary Christopher assured US willingness to help with the clean-up, but a quick follow-up by supporters in Washington, DC revealed that the State Department would not confirm what Mr. Christopher said, nor admit knowing anything about it.

The current policy of the US Department of Defense (DoD) requires host countries to demonstrate "imminent and substantial danger" at former overseas bases used by the US Military before it provides further assistance. The People's Task Force for Bases Clean-up, with headquarters in Manila, is targeting DoD's reckless scheme, hoping to shift the burden of proof back to the entity that created the mess in the first place.

The requirement to technically demonstrate imminent and substantial threat is beyond the capacity of the Philippines and many other Third World countries. Thus, the US must responsibly assist its former host countries with the task of meeting this requirement.

Myrla Baldonado is the coordinator of the People's Task Force for Bases Clean-up in Manila. For more information about the ongoing campaign to fight US military pollution in the Philippines, contact the group at: Room 511, J & T Building, 3894 R. Magsaysay Boulevard, Sta. Mesa, Manila, PHILIPPINES. Phone/Fax: 632-716-1084. Email: mbaldonado@igc.apc.org. The US Working Group for Philippine Bases Cleanup is assisting the Task Force, and can be reached at: PO box 5644, Hercules, CA 94547. Phone/Fax: 510-799-2551.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

ONCE AROUND THE BASES

Chemical Weapons

Activists Call For Permanent Shutdown of Tooele Incinerator

The Kentucky based Chemical Weapons Working Group (CWWG), the Sierra Club and the Vietnam Veterans of America Foundation have joined forces and filed suit in Federal Court to permanently close the chemical weapons incinerator in Tooele County, Utah.

The US Army owns the Tooele facility, while the defense contractor EG&G Defense Materials, Inc. operates it.

The controversial incinerator has suspended operations six times since it opened in August 1996. The latest shutdown occurred in late January, when lethal nerve agent leaked inside the plant to areas often occupied by unprotected workers and visitors.

According to an Army "Unusual Occurrence Report," air pressure adjustments being made to stabilize flame strength in the liquid agent incinerator resulted in agent leaking into two observation corridors. Personnel donned gas masks and evacuated the building. Utah state officials asked the Army to close the facility until they determined the cause of the problem and corrected it.

"Yet another dangerous incident illustrates this plant's defective design, poor operating procedures, and lack of safety culture," said Craig Williams, national spokesman for the CWWG. "Instead of suggesting that the plant should be closed for a couple of days, the State should protect the workers and local residents by suspending the Army's permit until a safe approach can be implemented."

Craig Williams, Sierra Foremichan, Peter Hille of the Chemical Weapons Working Group

Since a trial-burn in July 1996, two former employees of the Tooele incinerator have come forward with evidence of numerous major safety and environmental problems at the plant. The new evidence supports charges made by Steve Jones, the plant's former chief Safety Officer, who EG&G fired in 1994 for refusing to approve the plant's level of safety and environmental compliance.

Former General Plant Manager Gary Miller, also fired for raising concerns about incineration operations, likens the safety mind-set at the Tooele facility to that which preceded the Three Mile Island and Challenger disasters.

On January 8, 1997, former plant employee John R. Hall made public similar accusations and filed a wrongful termination suit against EG&G with the Department of Labor. Mr. Hall claims retaliation and eventual termination due to raising concerns about the incinerator's safety and environmental compliance.

An estimated 180 million Americans live downwind of proposed chemical weapons incinerators, and face the risk of agent contamination.

The Pentagon admits that small amounts of the kinds of nerve agent that may have contributed to Gulf War illnesses are emitted in smokestack exhaust at the Tooele incinerator, yet it claims that the amounts are so low that citizens downwind should not be concerned.

Gulf War illnesses researcher, Howard Urnovitz, Ph.D., a leadingresearcher on immune system damage caused by low-level chemical agent exposure said, "Study after study indicates that there is a link between low-level exposure to chemical agents and chronic health problems. There is no proven acceptable level of exposure to these chemicals."

Due to public opposition to incineration, cost overruns, and technical problems at facilities in the Pacific and Utah, the Army announced its recommendation to abandon incineration in Maryland and Indiana to pursue non-incineration technologies. Through the 1997 Defense Appropriations Act, the US Congress has funded and mandated demonstration of safer, non-incineration technologies for assembled munitions, such as those stored in Utah.

"The CWWG advocates the use of alternative technologies," said Mr. Williams. "The Army has demonstrated effective use of such technologies in Maryland and Indiana, so there is no excuse not to do the same in Utah and at all chemicals weapons storage sites."

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

As this issue of *Touching Bases* goes to press, the Tooele chemical weapons incinerator is back up and running, and the Oregon Environmental Quality Commission has issued a permit to begin constructing a similar facility in that state. The CWWG remains committed to shutting down all chemical weapons incinerators, and preventing the permitting of all new chemical weapons incineration facilities.

Georgia Lagislators Stall Construction of Alabama Incinerator

In February, the Georgia House of Representatives passed a unanimous resolution calling for a federal hearing on Pentagon plans to build a chemical weapons incinerator in Anniston, Alabama. The proposed facility would be located less than two miles from a school in the community.

The resolution, H.R. 174, includes the following language, which other communities may wish to use when fighting permitting of chemical weapons incinerators:

Urging the Georgia congressional delegation to urge Congress to request the Environmental Protection Agency to hold public hearings in northwest Georgia; and for other purposes.

Whereas, the Alabama Department of Environmental Management, the United States Army, and Westinghouse plan to construct a chemical weapons incinerator in Anniston, Alabama; and

Whereas, the operation of such a facility has the potential to affect the air quality, health, quality of life, and economy of the residents of northwest and west central Georgia; and

Whereas, other states, including Maryland, Indiana, and Kentucky, have passed legislation precluding the construction of such a facility within their boundaries; and

Whereas, nonincineration and chemical neutralization methods are being studied by the United States Army which may prove to be safer alternatives for the destruction of chemical weapons; and

Whereas, Georgia residents have expressed concern about the construction of such a facility because of toxins that might be released into the air and harmful economic repercussions

NOW, THEREFORE, BE IT RESOLVED BY THE GENERAL ASSEMBLY OF GEORGIA that the members of this body urge the Georgia congressional delegation to encourage Congress to take steps to initiate public hearings conducted by the Environmental Protection Agency in northwest Georgia prior to the construction and operation of the chemical weapons incinerator in Anniston, Alabama

BE IT FURTHER RESOLVED that the Clerk of the House of Representatives is authorized and directed to transmit an appropriate copy of this resolution to the members of the Georgia congressional delegation.

For more information about the incineration of chemical weapons, contact: Chemical Weapons Working Group, PO Box 467, Berea, Kentucky 40403. Phone: 606-986-7565. Fax: 606-986-2695.

MTP To Sue EPA Over Munitions Rule

On February 13, the US Environmental Protection Agency (EPA) released its final ruling clarifying when conventional and chemical military munitions become a hazardous waste under the Resource Conservation and Recovery Act (RCRA). After reviewing the Rule, the Military Toxics Project (MTP) decided to sue EPA.

Attorney Rena Steinzor, with the University of Maryland Environmental Law Clinic in Baltimore, Maryland, is representing MTP.

Members of MTP's Conventional Munitions Network who reviewed the Rule were outraged by EPA's failure to promulgate legislation that "shall assure protection of human health and the environment," as the directive from Congress clearly states.

"The EPA has proposed that the DoD regulate itself," stated Laura Olah, MTP member and Director of Citizens for Safe Water Around Badger, in Wisconsin. "The EPA has failed to meet its obligation as defined by law, and has let down both communities and Congress by proposing self-regulation."

On December 3, 1995, the Conventional Munitions Network adopted a position on EPA's proposed rule. EPA failed to address most of the concerns that the Network raised more than two years ago.

While States and Tribal Governments will retain their right to adopt and enforce more stringent requirements than those adopted nationally, EPA's final rule:

allows the DoD to determine whether to do anything about the environmental damage caused by munitions scattered over hundreds of thousands of acres of active military ranges;

postpones action on unexploded ordnance and explosive wastes on closed and transferred ranges in part because the DoD has not yet issued its range rule currently under development; and

flagrantly disregards the environmental and cultural impact of military munitions activities on indigenous lands, communities of color, and poor rural communities.

In December, 1994, MTP testified before the National Environmental Justice Advisory Committee (NEJAC) on how the proposed rule did not follow the Presidential Executive Order on Environmental Justice in Minority Populations and Low-Income Populations.

"Our review of problems associated with military facilities suggests that military munitions activities heavily impact many communities of color, other poor, rural communities, and particularly the lands of Native Americans, Native Alaskans, and Native Hawaiians," stated Al Larson, Sr. who represents the Indigenous Environmental Network (IEN) from Chickaloon Village, Alaska. "EPA Administrator Carol Browner signed the final document that fails to protect the health and way of life of my people."

In February, 1994, MTP filed a *Notice of Intent to File Suit of EPA Failure to Act*, and subsequently sued the EPA because it was in violation of the Federal Facilities Compliance Act, which amended the Solid Waste Disposal Act, in which Congress required that the EPA Administrator propose the Munitions Rule by April 1993. MTP brought legal action against the Administrator of the EPA for failure to perform a non-discretionary duty imposed by Congress. MTP filed a consent decree in the US Court of Appeals for the District of Columbia.

MTP has decided to do a special reprint of citizens' testimonies submitted to EPA more than a year ago regarding the EPA's ruling on when conventional and chemical weapons become hazardous waste. In light of the recent ruling which effectively allows the Department of Defense to regulate itself, it is clearly that EPA ignored the valid concerns of these and many other citizens. The testimonies reprinted below were originally submitted to the Environmental Protection Agency's Resource Conservation and Recovery Act (RCRA) Docket #F-94-MMP-FFFFF.

From Mary Grisco, Chair, Military Accountability Committee, Sierra Club, Alaska Chapter -- January 8, 1995

...We of the Alaska Chapter of the Sierra Club, 1200 Alaskans, add our voice of strong concern about the proposed rule on military munitions. We know that if adopted in its current form particularly with the options that allow increased self-regulation by the Department of Defense, our public health will be endangered and our environment more damaged...

...Ft. Richardson, within the Anchorage municipal area, has been "training" at Eagle River flats for years -- exploding munitions that were killing migratory waterfowl and impairing water quality and recreational hunter safety. We spent many years forcing the US Fish and Wildlife Service to force the Army to comply with environmental standards. Only recently did the Army finally announce that it is working to protect our water and wildlife. Ft. Greeley, outside of Fairbanks contains many unexploded ordnance as well as storage areas of unidentified weapons. Neighbors complain of headaches and nausea and wildlife (their subsistence) tasting "funny." Ft. Greeley continues training while issuing statements that public health is not being threatened.

These two small examples of the way the Department of Defense conducts business throughout our state lead us to support the critique of the proposed rule adopted by the Military Toxics Project's Conventional Munitions Network. In the Federal Facilities Compliance Act, Congress clearly legislated that the military cannot be allowed to regulate itself. External oversight, including the constitutional right of states to set more stringent standards than those established nationally, are basic for protecting our health and environment. The growing partnership of regulatory agencies and public stakeholders that is emerging in the cleanup of federal facilities requires that the military not be allowed to continue its cold war "announce and defend" mentality. We are the owners of these facilities and expect a level playing field for decision making...

From Bruce K. Gagnon, State Coordinator, Florida Coalition for Peace & Justice -- December 14, 1995

...We write to express our deep concern and outrage that the EPA is even considering allowing the Pentagon to regulate themselves in your proposed rule on military munitions.

We have several munitions impact ranges and disposal sites in our state and know that the military has a poor record of maintaining the health and safety standards at these locations.

In Florida, where our water table is so vulnerable, we are sure that allowing the military to "do as they please" will endanger our drinking water quality as toxic wastes from munitions leaks into the acquifer.

The Pentagon should not be allowed to regulate itself under any circumstance. If the EPA won't stand up to protect the American people than who will?

External oversight, from the EPA and the states must be strengthened, not diminished.

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Please make it known that our organization demands that the final rule preserves the intent of Congress to fully protect our communities. EPA should not back down to the Pentagon for one moment...

From Grace Bukowski, Military Land and Airspace Program Director, Rural Alliance for Military Accountability (RAMA), Reno, Nevada -- January 12, 1996

Today, Nevada hosts 20% of our nations military lands (over 4 million acres) including the largest military installation in the western hemisphere, Nellis Air Force Base. The Hawthorne Army Weapons Depot is the site of our nation's largest munitions stockpile nationally. Nevada also hosts the Department of Energy Nevada Test Site, and Fallon Naval Air Station...

...The Defense Department should not be rewarded for their contamination of public lands and Indian lands. Nevada has experienced first hand the hazards associated with off-range bomb contamination of publi and Indian lands. Currently, 25,000 acres of public lands surrounding bombing ranges at Naval Air Station Fallon are closed to the public. Five thousand six hundred acres of the Walker River Paiute Reservation are contaminated with live munitions. Instead of cleaning up the land, the Navy is trying to take it over and the proposed rule would allow it. We note that Naval officials knew of this contamination for over a decade and failed to notify the State of Nevada or the Walker River Paiute Tribe

The Defense Department view that withdrawal is the only solution to their careless contamination of public lands, is a bygone concept. We consider rewarding mismanagement a very serious policy issue. The off-range ordnance problem is wholly the Defense Department's doing and the magnitude of the problems points to a record of decades of careless mismanagement of public lands. To [illegible] to use withdrawal of these lands is from the public domain as the only solution to contamination exacerbates the known problem. The proposed rule would permit, with EPA blessing, the deliberate contamination of public lands. How will the Defense Department acquire lands in the future? The answer is simple: illegally bomb the perspective lands then request a withdrawal for public health and safety protection...

From Suzanne Marshall, Chair, SAFE (Serving Alabama's Future Environment) -- January 2, 1996

I am writing as Chair of SAFE -- Serving Alabama's Future Environment, an organization of citizens in Alabama who work to end toxic pollution, especially military toxics generated by Fort McClellan and the Anniston Army Depot. We are very concerned about the proposed rule on the military munitions and how it will impact the US chemical weapons disposal program since we are a site targeted for a nerve gas incinerator. We also have weapons testing ranges and non-stockpile chemical weapons at Fort McClellan, which was recently added to the base closure list. Our comment is:

States, such as Alabama, that have chemical weapons stockpiles must keep their right to make and enforce laws regarding chemical weapons disposal that are stricter than federal laws. The incineration of chemical weapons is not acceptable to people in Alabama because it is an unsafe, unproven, out-dated, dioxin-producing technology. The proposed rule could stop our state from passing the stringent, necessary laws to regulate the disposal of chemical weapons and protect the health and safety of our communities...

. We advocate the research and development of closed-loop treatment and disposal technologies for chemical weapons and other munitions. The DOD has agreed to look into some of the alternatives. The EPA rule should reflect the need for the development of innovative, citizen approved disposal technologies

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

We support cooperation among the DOD, the EPA, and the public in creating good solutions to military munitions disposal problems. We know that the best solutions come when all affected groups -- especially citizens near disposal sites -- take part in making decisions

We wholeheartedly support the critique of the proposed rule adopted by the Military Toxics Project's Conventional Munitions Network of December 3, 1995. In the Federal Facilities Compliance Act, congress decided that the military should not be permitted to regulated itself -very obvious, fair, and logical decision. We believe that external oversight, including citizen participation, and state ability to pass tougher laws than those passed nationally, are crucially important if we are truly going to protect the health of people and the environment.

We hope that the final rule will coincide with the intent of Congress -- that the Army should not regulate itself -- and that we can all work together to clean up our world...

Resources

All resources listed below are available from the national headquarters of the Military Toxics Project unless otherwise noted. Checks should be made payable to "Tides Center/Military Toxics Project." California residents should add 8.5% sales tax.

Covering the Map: A Survey of Military Pollution Sites in the United States. Co-published by Physicians for Social Responsibility and The Military Toxics Project. May 1993. 116 pp. $15.00.

Fighting Military Toxics: A Citizen's Organizing Manual. Published by the Military Toxics Project. January 1991. 48 pp. $10.00.

Citizen's Guide to Military Base Cleanup & Conversion. Co-published by The Center for Economic Conversion and The Military Toxics Project. 1993. 75 pp. $15.00

Chemical Weapons Disposal and Environmental Justice. Published by the Kentucky Environmental Foundation. 33 pp. Free. Contact Kentucky Environmental Foundation, PO Box 467, Berea, KY 40403. Phone: 606-986-7565.

Smoking Guns: The Environmental, Economic and Cultural Impacts from Conventional Munitions. A fact sheet published by the Military Toxics Project. 2 pp. $1.00.

Depleted Uranium: A Tragedy of the Commons. Written by Christina E. Larson, Department of Psychology, University of West Florida. Published in *Peace and Conflict: Journal of Peace Psychology*, 2(3), 217-232, 1996. Lawrence Erlbaum Associates, Inc. Requests for reprints should be sent to Christina Larson, PO Box 1092, Shalimar, FL 32579-5092.

Friendly Fire: The Link Between Depleted Uranium Munitions and Human Health Risks. Co-published by The New Mexico Progressive Alliance for Community Empowerment (NACE) and The National Depleted Uranium Citizens' Network of The Military Toxics Project (MTP). Second Edition, March 1995. 12 pp. $5.00.

Radioactive Battlefields of the 1990s: The United States Army's Use of Depleted Uranium and its Consequences for Human Health and the Environment. Published by the Military Toxics Project's Depleted Uranium Citizens' Network. January 16, 1996. 7 pp. $5.00.

The Silence is Deafening: A Report on Exposures of Persian Gulf War Veterans and Others to Depleted Uranium Munitions. Written and published by Dan Fahey of Swords to Plowshares. February 20, 1997. 19 pp. 415-247-5777

Angels Don't Play This HAARP: Advances in Tesla Technology. By Jeane Manning and Dr. Nick Begich. This book looks at the Pentagon's $30 million HAARP (High frequency Active Auroral Research Program) which is designed to beam more than 4.7 gigawatts (billion watts) of radiated power into the ionosphere. The authors explain how HAARP could not only lead to a new class of military weapons, but also manipulate global weather patterns; damage the earth's ecosystem; knock out electronic communications; and change human moods and mental states. Published by Earthpulse Press. 1995. 233 pp. $14.95. Available from Dr. Nick Begich, PO Box 201393, Anchorage, Alaska, 99520. To order by VISA or Master Card, call 907-249-9111.

Deadlines for Submissions to 1997 issues of *Touching Bases*.

Second Quarter - May 16
Third Quarter - August 8
Fourth Quarter - November 7

Direct all submissions to:
Military Toxics Project
471 Main Street
Lewiston, ME 04240
Fax: 207-783-5096
Email: mtp@tgc.org

COMMENTOR NO. 80: PORTSMOUTH-PIKETON RESIDENTS FOR ENVIRONMENTAL SAFETY AND SECURITY (CONT'D.) MCDERMOTT, OHIO

Coming Soon!!

MILITARY TOXICS PROJECT'S

Homepage

The Military Toxics Project is pleased to announce it's upcoming World Wide Web Home-page. Visitors will be able to access such information as recent publications, highlights and feature stories from our newsletter and links to other related organizations on the Web. MTP welcomes e-mail of concerns, suggestions and comments.

Military Toxics Project
471 Main St. 2nd Floor
Lewiston, Me. 04240

COMMENTOR NO. 81: STARMET IDAHO FALLS, IDAHO

STARMET

EIS Comments on Technology Development Needs for Depleted Uranium Metal Applications

Prepared by
W. J. Quapp
April 29, 1998

1. Introduction

These comments are prepared to identify the required research in depleted uranium production that must be funded by the DOE to reduce the production cost. Without such cost reduction, some applications, while technically feasible, will never be economic compared to alternative metal options such as steel, lead, and copper. As will be discussed later, the performance advantage of depleted uranium metal must be very high to overcome the high product cost of metallic uranium components. This paper identifies some opportunities and offers suggestions for reducing the economic penalty of using metallic depleted uranium 81-1

2. Background

Depleted uranium metal is a unique material. It is slightly radioactive and, thus, possession and use are regulated for all but the smallest quantities. Depleted uranium and its alloys have the undesirable attribute of being easily oxidized at room temperature and machine turnings are pyrophoric. The property of depleted uranium which makes it use most desirable is its high density (18.95 g/cm^3). The high-density characteristic can be used in selected applications such as radiation shielding and counterweights to provide superior product performance. But the radioactive baggage factor require management as a radioactive material.

In shielding applications, depleted uranium provides an efficient gamma shielding material and can allow designers to create smaller and frequently lighter shielded casks. This is particularly important in transportation casks where shipment weight or size restrictions cannot be met with alternative materials such as steel and lead. In counterweight applications, the high density allows for the manufacture of heavy components occupying a small volume. Depleted uranium aircraft counterweights have been used on military and commercial wide body jets for over thirty years but recently the industry has been shifting to tungsten because of the radioactive stigma of depleted uranium and the counterweight maintenance requirements.

The primary direct performance competitor to depleted uranium for both shielding and aircraft counter-weight applications is tungsten with a density of 19.3 g/cm^3. The main advantage of tungsten is its non radioactive attribute. Its disadvantage is both cost and fabrication difficulties. However, there are also several other metallic alternatives to depleted uranium in applications where space is not a critical premium – industrial equipment such as forklifts and excavators. Most commonly, these alternatives are steel, lead, and, occasionally, copper with densities of 7.87, 11.35, 8.96 gm/cm^3, respectively. Heavy concrete with steel chips is used in excavator counterweights.

COMMENTOR NO. 81: STARMET (CONT'D.)
IDAHO FALLS, IDAHO

STARMET

3. Metallic Uranium Applications

2.1 Radiation Shielding Applications

Depleted uranium is an excellent gamma shield having 2.4 times the density of steel and 1.7 times the density of lead. Depleted uranium offers a significant advantage over lead in transportation casks during the postulated fire accident scenario due to its much higher melting point – 1135°C compared to 327°C. Depleted uranium offers advantages over steel in radiation attenuation in proportion to its density efficiency for spent fuel shielding applications. For some specific isotopes (specific photon energies), uranium is much more efficient than the density ratio alone would imply. However, depleted uranium alloys have never been established as an ASME code material so that no structural credit for depleted uranium is given by the NRC in cask applications regulated under 10CFR Part71. Consequently, the surrounding steel, which is also required to preclude oxygen from reaching the depleted uranium, must provide the structural requirements even though some depleted uranium alloys have very high strength and toughness

81-2

Given that selected depleted uranium alloys have been used by the US Army for penetrators and tank armor, it appears that that there is ample precedent for using depleted uranium metal in high technology and demanding applications where corrosion protection can be assured.

3.2 Counterweight Applications

As stated previously, aircraft counterweights have been in use in wide-body aircraft for about 30 years. These counterweights are generally very small and are used to adjust the center of gravity and to balance loads on various aircraft components. Modern aircraft design techniques have reduced the need for counterweights. In addition, some aircraft owners are switching to tungsten to avoid issues associated with radioactive materiel. For example, Japan prohibits any aircraft using depleted uranium counterweights. Consequently, this market is relatively stagnant and little future use is projected.

Other potential counterweight applications include equipment such as fork lifts which require massive (several ton) counter weights to balance lifting loads. This market does not currently exist but if economic issues could be overcome (as well as regulatory and public acceptance issues), a large market might develop. One promoter of this application has sugested major warehouse cost savings and forklift safety improvements associated with forklifts using depleted uranium counterweights. The claimed cost savings come from more compact warehouses. The safety benefits come from a lower center of gravity. If all forklift production was converted to using depleted uranium counterweights, the entire inventory of depleted uranium could be consumed in a few years.

81-3

However, regulatory and public acceptance issues aside, the major barrier to commercial depleted uranium counterweight use is the cost of production. This is addressed in the next section

COMMENTOR NO. 81: STARMET (CONT'D.)
IDAHO FALLS, IDAHO

STARMET

4. Depleted Uranium Metal Production Costs

3.1 Current Production Costs

The method used commercially for uranium metal production is the Ames process. In this process, UF_6 is reacted with hydrogen to produce UF_4 or "greensalt" and HF. In a separate step, the greensalt is mixed with magnesium metal chips and is ignited in a graphite lined retort (a high temperature chemical reactor) at about 800°C. The magnesium reduces the UF_4 to uranium metal and forms MgF_2. This solid phase reaction liberates tremendous heat and the entire mass of uranium and MgF_2 become molten. Due to density differences, the U metal liquid phase separates by gravity from the MgF_2 salt to form a "derby" which takes the shape of the crucible. After this material is cooled, the uranium metal derby is manually separated from the MgF_2 salt. The MgF_2 salt is disposed as a radioactive waste as it typically contains 1% to 2% uranium by weight. The metal is then cleaned and alloyed, as required, in a vacuum casting furnace. The metal is then shaped via extrusion, rolling or casting into its product form.

The Starmet CMI facility in Barnwell, SC, is the only remaining commercial US producer that manufactures uranium metal from UF_6. Some DOE conversion capability exists at the Y-12 and Los Alamos weapons facilities. Starmet CMI uses the Ames process. This facility has converted UF_6 to metal since 1983 for use by the US Army (as well as the British and French) for depleted uranium penetrators. The UF_6 to UF_4 capability was added in about 1987. These are the same processes that were employed at the DOE Fernald site prior to its shutdown.

81-4

Uranium derbies are shipped from Starmet CMI in South Carolina to the Starmet facility in Concord, MA, for alloying, casting and forming into products. After alloying, the uranium is cast into either ingots or slabs. Ingots to be used for penetrators are extruded into rods for subsequent machining operations. Starmet also casts slabs that are sent to the DOE INEEL facility in Idaho for use in fabricating armor for the Abrahms tank. These uranium slabs are fabricated at the Concord facility in vacuum melters from scrap uranium being recycled from prior operations at the INEEL facility.

The biggest non-regulatory impediment to the use of depleted uranium metal in commercial applications is the high cost of converting from UF_6 to uranium metal. In a survey performed for DOE in 1993 by Technics Corporation, the cost was identified to be about $11.70 per kg-U ($5.30 per lb-U) for conversion of UF_6 to metal and casting into a shape. Any forming or machining cost was additional and was priced at $4.40 to $22 per kg-U. Some cost reductions could be forecast through larger conversion facilities but these would not be expected to be sufficient to dramatically reduce the costs below those cited.

3.2 Market Production Cost Requirements

In a recent meeting between Starmet personnel and a Japanese forklift manufacturer, the manufacturer stated that the counterweight must not cost more than its steel equivalent. Thus,

COMMENTOR NO. 81: STARMET (CONT'D.)
IDAHO FALLS, IDAHO

STARMET

unless the performance advantage of forklifts designed with uranium counterweights justifies the higher costs, none will be sold unless the cost of uranium metal production is reduced.

3.3 Cost Reduction Opportunities

3.3.1 Continuous Metallothermic Reduction

This process was developed at Oak Ridge National Laboratory in support of the AVLIS Enrichment process that uses a uranium-iron eutectic as feed material. The process uses a bath of molten magnesium into which uranium tetrachloride is injected. The magnesium reduces the uranium tetrachloride and forms magnesium chloride that can be recycled to recover the magnesium. The molten uranium is alloyed with iron during this process to reduce the melting point from 1135 C to about 700 C. This reduces the uranium vapor pressure and simplifies subsequent operations. The potential cost reduction for this process, compared to the AVLIS process, is not known due to proprietary restrictions associated with the AVLIS technology. **81-5**

Conceptually, this process might be adapted to uranium hexafluoride however, the process has not yet been successfully demonstrated at production scale. Furthermore, the advantages of using the eutectic mixture for AVLIS would probably be unavailable for counterweight applications since the metallurgical properties of the uranium-iron alloy are very poor. During cooling, shrinkage cracks develop and the alloy is very brittle at room temperature. By casting the alloy in a steel sheath, these metallurgical property deficiencies might be made irrelevant.

3.3.2 Direct Plasma Conversion of UF_6 to Uranium Metal

Technology Description

This technology was conceived at the INEEL as a possible method for a lower cost production of uranium metal from UF_6. Conceptually, the process operates as shown in Figure 1. The UF_6 is injected as a gas into the center of a hydrogen-rich plasma operating at about 5000°C. At this temperature, the UF_6 dissociates to Umetal and elemental fluorine. The fluorine combines with the hydrogen to form HF. As the gas exits the plasma reactor, it must be cooled rapidly to avoid the back reaction of HF with U. At the exit of the reactor, the gas (HF and unreacted H_2) with the entrained Umetal vapor enters a cyclone where the cooled metal particles are separated from the gas stream. The system operates with excess hydrogen and to maximize conversion of the fluorine to HF. This excess hydrogen must be separated from the HF gas and recycled. **81-6**

Advantages of this direct conversion approach must be contrasted with the traditional method for uranium metal production – the Ames process. The INEEL plasma conversion process consumes only hydrogen and liberates only anhydrous HF and H_2 as byproducts. The H_2 is extracted from the HF and recycled. The HF gas is comparably easy to purify of uranium using filtration techniques. The metal formed from this process is nanometer sized particles that are very pyrophoric. A method must be developed to solidify the uranium particles into an ingot before exposure to air

COMMENTOR NO. 81: STARMET (CONT'D.)
IDAHO FALLS, IDAHO

STARMET

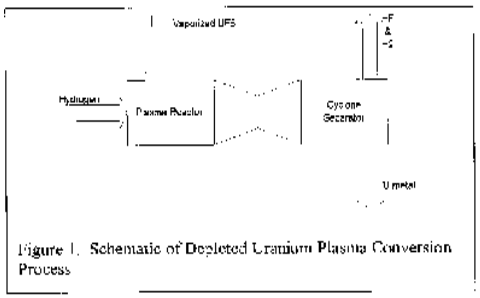


Figure 1. Schematic of Depleted Uranium Plasma Conversion Process

In all past uranium metal production operations, because of the relatively small production, the HF was captured in a scrubber to form aqueous HF that was subsequently reacted with CaOH to form CaF_2 and water. The water was evaporated and the CaF_2 was disposed as a radioactive waste. The greensalt reduction reaction to produce uranium metal consumes magnesium and produces MgF_2 as a radioactive by-product waste. Method to separate the uranium contamination from the MgF_2 have been considered but not deployed.

The INEEL process was successfully demonstrated at the small bench scale under a program funded by DOE EM 50 in 1994. The major challenge with the plasma reduction process is associated with the design and maintenance of a plasma reactor operating at such high temperature. INEEL researchers identified methods for designing such plasma reactors but further demonstration was beyond the scope of the funded program **81-6 (Con't.)**

Estimated Cost Savings

After the proof-of-concept, bench scale test was successfully completed, an engineering conceptual design was performed for INEEL by Morrison Knudsen to estimate the total lifecycle cost of this approach. In summary, this report identified that a reasonably sized facility could produce uranium metal at about $3.00 per kg-U. This compares to estimated commercial costs from the Ames process of about $8.80 per kg-U.

To achieve this production cost reduction, substantial research support will be required and probably at least ten years of effort will be needed before large-scale production could be achieved

5. Conclusions

Applications for depleted uranium metal have been identified. These applications include radiation shields and industrial counterweights.

Barriers to using radiation shielding applications are minimal as numerous precedents have been set for use in transportation casks. Barriers to industrial counterweight applications are institutional and economic. The institutional barriers are public acceptance and legal possession limits. Such regulatory barriers may be resolvable, as the real toxic health effects of depleted **81-7**

COMMENTOR NO. 81: STARMET (CONT'D.) IDAHO FALLS, IDAHO

STARMET

uranium are less than for lead. The radiation issues from depleted uranium are miniscule provided the material is not ingested into the lungs. Resolution of public acceptance issues are difficult to predict but in an industrial setting, but they must be solved.

Thus, the largest barrier to the use of depleted uranium metal is production costs. Unless the forklift industry can sell the concept of substantially increased performance for the depleted uranium counterweight forklift designs, then the counterweight must have a similar cost to a steel counterweight. With steel casting costing in the range of $1.54 per kg versus uranium casting costing over $12 per kg, it is clear that reduced manufacturing costs are needed for commercial applications.

The direct plasma conversion of UF_6 to uranium metal offers significant cost reduction potential but will require substantial research investment to demonstrate commercial feasibility. Even then, assuming success and that the economics are as predicted, the estimated costs are still over a factor of two greater than a cast steel counterweight. **81-7**

Consequently, wide scale application would be contingent upon either 1.) justifying to forklift buyers that the increased performance of a forklift with depleted uranium counterweights justifies a higher price, or 2.) alternatively, DOE could subsidize the conversion cost to neutralize the cost differential as a preferred action to managing the UF_6 for disposal. If the direct plasma conversion process were successful, the DOE subsidy would be less that the currently expected disposal costs – assuming the counterweights remained continuously in commerce and ultimately did not require disposal.

In summary, large scale industrial use of depleted uranium metal in applications such as counterweights will require development of a lower cost production technology for economic deployment. The INEEL process is one potential process which comes close to the needed production cost point.

6

COMMENTOR NO. 82: STATE OF OHIO, LIEUTENANT GOVERNOR, HOLLISTER, NANCY P. COLUMBUS, OHIO

STATE OF OHIO
OFFICE OF THE LIEUTENANT GOVERNOR
COLUMBUS, OHIO 43215

NANCY P. HOLLISTER
LIEUTENANT GOVERNOR

May 7, 1998

The Honorable Federico Peña
Secretary
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

RE: "Draft PEIS for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafloride," DOE/EIS-0269 dated 12/97.

Dear Secretary Peña:

Thank you for the opportunity to comment upon the draft PEIS pertaining to future management plans for depleted uranium hexafloride (DUF6) being stored at the Portsmouth Gaseous Diffusion Plant in Southeastern Ohio. As a lifelong resident of Appalachian Ohio who has represented the area in a number of roles and as someone who has been closely involved with other issues regarding Portsmouth, my primary concerns are the safety, economy and environment of the region.

With this in mind, I support the near-term conversion of the significant stockpile of DUF6 to U308 at the Portsmouth plant. Under "normal" circumstances, one would wait until a market for a given product develops before engaging in such an activity. However, the DUF6 is stored in canisters of somewhat questionable integrity, and for which funding for long-term maintenance is noted in the PEIS as "uncertain." Thus, converting the DUF6 to a "safer" product as soon as possible is the more prudent option. **82-1**

Assuming that conversion is chosen as the preferred option, USDOE should carefully reassess the status of these cylinders and the practicality (safety) of transporting them through the region to a central conversion site. The deteriorating condition of the cylinders may make on-site conversion at each plant a safer, preferred alternative. On-site conversion may also serve to maintain employment in each region. **82-2**

DOE should work with Congress now to ensure that funds presently accrued by the US Enrichment Corporation to offset DUF6 conversion are maintained for that specific purpose, and to lay the groundwork for the on-site conversion efforts. **82-3**

COMMENTOR NO. 82: STATE OF OHIO, LIEUTENANT GOVERNOR, HOLLISTER, NANCY P. (CONT'D.) COLUMBUS, OHIO

The Hon. F. Peña 2 May 7 1998

My comments are intended to augment and support those filed on this matter by Governor George Voinovich and Ohio EPA Director Donald Schregardus, and are included by reference herein. Once again, thank you for the opportunity to comment.

Sincerely,

Nancy P. Hollister
Lieutenant Governor

xc: G. Voinovich, Governor
D. Schregardous, OEPA
C. Bradley, Jr., USDOE
J. Hall, USDOE
W. Timbers, USEC

COMMENTOR NO. 83: MILLER, JANE E. MURPHYSBORO, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874 April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 80,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **83-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **83-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **83-3**

If cylinders are going to be transported for conversion, then the risks transportation needs to be considered carefully. This would require many thousands of shipments. Many of the older cylinders may not be capable of being lifted or loaded for transportation. Some may not be able to be heated to be emptied. All of these problems could significantly increase the cost. The DOE needs to be more up-front about the real dollar costs of this problem. **83-4**

Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **83-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **83-6**

Thank you for considering these comments.

Sincerely,

Jane E. Miller
[illegible] Pine St
Murphysboro, IL 62966-1340

COMMENTOR NO. 84: BAILEY, SUSAN
NASHVILLE, TENNESSEE

Dear Mr Bradley
I saw deadlines listed as Apr. 1 '93 & April 1 '97. Since Nashville's tornado recently slowed the clean, I hope April '97 was accurate.

Comments on PEIS for Alternative Strategies for the Long Term Management & Use of Depleted UF_6:

I am concerned that the draft PEIS does not include the alternative of disposing of depleted uranium per the rules of 40 CFR 191. Long-term storage of uranium poses serious risks which make the no action alternative & the new containers (for long term storage) option inappropriate & unacceptable. The waste classification of depleted uranium should be re-examined & should be put in the same category as transuranic waste. The scientific basis for this concern was well-documented in the comments of the Institute for Energy & Environmental Research. 84-1

Susan Bailey
211 37th Ave N
Apt B9
Nashville TN 37209

COMMENTOR NO. 85: CAVAZOS, ALBERTO, SGT.
ADDRESS UNKNOWN

Forward Header
Subject: DUF6 Web Site Comments
Author: <web@bugs (Internet developers)> Date: 4/29/98 5:46 AM

Date Sent: 4/29/98

***** Comments:

MY QUESTION IS, IF SOME ONE COMES IS EXPOSED TO DEPLETED URANIUM ,WHAT ARE SOME OF THE SYMPTOMS??? I AM CURIOUS TO KNOW I READ AN ARTICLE IN THE ARMY TIMES, RECENTLY AND ALSO I SERVED IN THE PERSIAN GULF WAR FROM 901216 TO 910427. ..THANKS IF YOU CAN PROVIDE THAT INFO. IF NOT, THANKS ANYWAY AND HAVE A GOOD DAY!! 85-1

Name: ALBERTO CAVAZOS SGT
Organization: US ARMY
emailAddress: ALBRTO@HOTMAIL.COM

COMMENTOR NO. 86: RUSTIN, FRANK; RUSTIN, RUTH & CASTEEL, NATHAN
BROOKPORT, ILLINOIS

Charles Bradley
US DOE (NE-40)
19901 Germantown Rd.
Germantown, MD 20874

April 13, 1998

Dear Mr. Bradley,

These are the comments of the undersigned on the Depleted Uranium cylinders DPEIS. There are some 50,000 plus cylinders of the DUF6 containing from 10 to 14 tons of material apiece currently stored in the three sites, Paducah, Portsmouth, and Oak Ridge.

The scope of the DPEIS is inadequate to cover the activities required to deal with the cylinders. Implementing either of the conversion alternatives will trigger a series of events which will have to take place in order to complete the conversion. These include building factories to do the conversion and for cleaning the highly radioactive residues out of the emptied cylinders. The DUF6 will have to be defluorinated, which is a highly dangerous activity. The converted material and the empty cylinders will have to disposed or stored, as will the hydrogen fluoride which is separated from the DUF6. **86-1**

These activities are all connected actions which require a hard look in combination with the ongoing cleanup activities at the three facilities where the cylinders are stored - Paducah, Portsmouth, and Oak Ridge. There are clearly cumulative effects from these proposals and projects which are not adequately addressed in the draft. **86-2**

Although the largest majority of cylinders, some 40,000, are at Paducah, they are inadequately stacked and stored presently. These are vulnerable to the high seismic risk at Paducah from the New Madrid fault. Because it will be decades or longer before this material can be converted, the risks from earthquake damage go greater as time goes on. Any conversion facilities planned for Paducah have to fully consider the earthquake potential at Paducah, and any construction of conversion facilities at Paducah would have to be made to an earthquake standard. The extra costs of this need to be disclosed. **86-3**

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Although it appears that the best alternative is converting the material from the reactive UF 6 form to the more stable uranium oxide form, the DPEIS doesn't give enough information for the commentors to decide where the best place for conversion would be and the best methods. **86-5**

Finally, it seems ill-advised to continue to fill more cylinders daily with more DUF6 while this huge problem of disposal continues to accumulate. If the nuclear industry cannot manufacture its product without creating such huge amounts of toxic waste, it should strongly consider ceasing production. **86-6**

Thank you for considering these comments.

Sincerely,

Ruth Rustin

Frank Rustin

Nathan Casteel

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON
NASHVILLE, TENNESSEE

STATE OF TENNESSEE

DON SUNDQUIST
GOVERNOR

May 1, 1998

Mr. Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S Department of Energy
19901 Germantown Road
Germantown MD 20874-1290

Dear Mr. Bradley:
As the Governor's Lead Contact for State of Tennessee's National Environmental Policy Act (NEPA) reviews, I am providing comments in response to the "**Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride," DOE/EIS-0269**. The attached comments from state agencies represent the complete and official response of the State of Tennessee.

We prefer conversion of the entire inventory of stored Uranium Hexafluoride (UF_6) material which is recommended by the proposed alternative, however, the time line presented for the proposed alternative is unduly long considering the questionable condition of the stored inventory and potential health and environmental risks associated with leakage. As Governor Sundquist emphasized in his joint letter with the Governors of Kentucky and Ohio, the State of Tennessee urges the DOE to "consider the immediate conversion" of UF_6. The proposed alternative will provide the most rapid reduction of hazard to the environment and public if the time line for conversion is shortened. This recommendation applies only to the current scope of alternatives presented. **87-1**

Up to this point the DOE has not fully funded the proper storage, inspection, testing and maintenance of stored cylinders of material nor does the PEIS address this pressing need for funding. Previous DOE documents have underscored its importance. Current inventories, however, remain in improper storage conditions and inspections of these inventories are limited. Improperly stored cylinders are at risk to natural catastrophes such as earthquakes and tornadoes. In order to fully assess the hazards associated with long-term storage versus conversion of UF_6, the DOE must address these funding concerns in the PEIS. **87-2**

State Capitol, Nashville, Tennessee 37243-0001
Telephone No. (615) 741-2001

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

Mr. Charles E. Bradley, Jr.
Page 2
05/01/98

Beyond the condition of stored cylinders, issues concerning the handling of cylinders for transport have been insufficiently addressed or neglected in the PEIS. DOE's inspection of stored cylinders has been limited raising the concern that breaches in corroded cylinders may exist. Handling such corroded cylinders as well as cylinders that have been overfilled or cylinders containing "heel" materials --conditions which do not meet Department of Transportation's specifications for transport --will require costly training of personnel to repackage materials. The DOE cannot adequately assess alternatives for long-term management of stored inventory without realistically assessing these hazards and costs in the PEIS. *87-3*

We further request that the PEIS address the Inventory of the United States Enrichment Corporation (USEC) which may come into DOE possession. Omission of this significant inventory represents an incomplete analysis. *87-4*

In addition to these general comments, I request that the enclosed comments be given your full consideration. As always, your timely consideration of the interests of the State of Tennessee is appreciated. If you have any questions, please contact our staff policy analyst at (615)532-4968 (fax 615-532-0740).

Sincerely,

Justin P. Wilson
Deputy to the Governor for Policy

JPW:emw

Attachments

cc: Mr. Milton H. Hamilton, Jr., Commissioner
Mr. Rick Sinclair, Deputy Commissioner
Mr. James Hall, US Dept of Energy
Mr. Tom Winston, Ohio Environmental Protection Agency
Mr. Tuss Taylor, Kentucky Department of Environmental Protection
NEPA coordination file/Mr. Dodd Galbreath
NEPA contacts

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
DOE OVERSIGHT DIVISION
761 EMORY VALLEY ROAD
OAK RIDGE, TENNESSEE 37830-7072

April 21, 1998

Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
US Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Dear Mr. Bradley

Document Review: "Programmatic Environmental Impact Statement (PEIS) for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride," DOE/EIS-0269, December, 1997.

The Tennessee Department of Environment and Conservation, DOE Oversight Division (TDEC/DOE-O) has reviewed the subject PEIS in accordance with the requirements of the National Environmental Policy Act (NEPA) and associative regulations of 40 CFR 1500-1508 and 10 CFR 1021.

After review, the Division would like to express its support of the preferred alternative of converting uranium hexafluoride to oxide and/or metal. Tennessee has joined with Kentucky and Ohio in challenging DOE to begin the conversion immediately and complete the conversion by 2018. The PEIS has not properly addressed the need to provide adequate funding for the safe maintenance of the cylinder yards and implement requirements that protect the workers, public, and environment at and adjacent to the sites. *87-1 (Con't.)*

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

Charles E. Bradley, Jr.
April 21, 1998
Page Two

Additional comments, for DOE's consideration in preparation of the Final Programmatic Environmental Impact Statement, are attached

If you have any questions regarding the Division's review, please contact John Owsley or Jim Harless at (423) 481-0995.

Sincerely

Earl C. Leming
Director

el381.99

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

Tennessee Department of Environment and Conservation /DOE Oversight Division

Comments on Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride, DOE/EIS-0269, December, 1997

General Comments:

The State agrees with the preferred alternative as stated in Section 2.5, Page 2-54 of converting uranium hexafluoride to oxide and/or metal. Given, however, the numerous reports that cast doubts on the integrity of uranium hexafluoride cylinders and their environmental safety, the State, as shown in a recent letter from the Governors to Secretary Peña on the same subject, would prefer that fabrication and conversion facilities be sought as early as possible and not wait until the year 2005 as stated in the PEIS. *87-1 (Con't.)*

In order for Tennessee to effectively evaluate the potential impacts of the preferred alternative, the PEIS must provide information on the location of the sites where conversion might occur and how waste and materials generated from this process will be managed. *87-5*

More than 50% of the cylinders were not constructed to Department of Transportation (DOT) specifications. After thirty years in storage, a much higher percentage of the cylinders may not meet DOT specifications for transportation purposes and may need to be overpacked if they are moved for processing. Also, deteriorated cylinders may require cold extraction of the contents. The personnel needed to handle the cylinders will need to be trained for extreme conditions. The costs of recruiting and training appropriate personnel for the duration of the processing operations will have to be factored in the cost-benefit analysis *87-3 (Con't.)*

Funding must be addressed in the PEIS to provide for regulatory compliance and the continued storage of cylinders, including the heel and smaller cylinders. The "Draft Preliminary Report-DOE Independent UF6 Cylinder Assessment Team" dated 03-25-92, still in draft form, states the primary issues with cylinder management is funding to properly store, inspect, and maintain. Site visits by the State in July 1997, confirmed that funding has not been fully appropriated to maintain the yards or the cylinders. *87-2 (Con't.)*

The Draft PEIS fails to address two major issues. The first is the treatment, recycling, or reuse of Uranium Hexafluoride (UF_6) in a timely manner. The second issue is the final safe disposition of the "heels" component of the UF_6 cylinders, containing a high energy (gamma emitting) RCRA mixed waste like material. The Division estimates there to be 120 million pounds of this material in cylinders stored on the Oak Ridge Reservation. Of paramount concern under the No Action or Long-Term Storage alternatives, is the slow migration of the "heel" material into the groundwater/surface water and the release of UF_6 into the air, due to the corrosion and failure of the cylinders. The Draft PEIS is unclear on the criteria used for hazard modeling. The PEIS must identify the "worst-case" cylinder conditions and explicitly use this information in the hazard modeling descriptions. The PEIS must describe the modeling parameters such as total wall area found to be less than minimum thickness, age of the cylinder, manufacturing requirements (ASME or other design/construction), denting/bulging, and if the cylinder is in an "overfilled" condition. *87-6*

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

These conditions then must be coupled with the natural phenomenon hazards in determining the risk. The PEIS must accurately identify the cylinder population with these conditions.

The PEIS does not address storage and maintenance of the overfilled cylinders. The K-25 site has determined there are approximately 2300 14-ton and two 10-ton cylinders that contain more UF6 than is allowed for off-site shipment by DOT regulations. Although the cylinders are determined to be overfilled for transportation, they also must be properly evaluated for long-term handling and storage. *87-7*

The document does not address potential waste issues arising out of leaks (breach or rupture) in the cylinders and/or leaks caused by the handling of the cylinders. Prolonged storage of the UF_6 in outdoor yards can and has been shown to cause corrosion events. The products of corrosion include radioactive and hazardous wastes. In so far as the products of corrosion are not collected and recycled, they are wastes. With age, the probability of corrosion and external breach for the cylinders increases. Thus leakage from the long-term storage of Uranium Hexafluoride cylinders could result in hazardous waste violations and non-compliance with applicable DOE Orders. *87-8*

The PEIS has not presented supporting evidence that mines, shallow earthen trenches, and other underground sites are suitable for long-term storage. The State cannot continue to rely on "later determinations," "future treatments," or other vague options for storage and/or disposal. DOE has failed to approve long-term storage and disposal sites for other materials/wastes thus the State could expect the same lengthy time period for decision making on UF6. Placing any of the UF6 material for long-term storage or disposal in shallow earthen structures, below ground vaults, and/or underground mines should not be an alternative consideration. *87-9*

United States Enrichment Corporation (USEC) since its privatization, has produced about 8000 cylinders (now reported to be upwards of 10,000) and is estimated to be currently producing 2 to 4 cylinders daily. The exact number of cylinders in question must be identified in the PEIS. The ownership of these cylinders has yet to be determined. The decision regarding USEC's 8000 cylinders should be made now, not as described in a "future Memorandum of Agreement between the USEC and the Office of Management and Budget." If the 8000-10,000 cylinders were considered part of DOE's inventory, it would represent a significant increase in total cylinder inventory. *87-4 (Con't.)*

A long-term strategy for DUF6 must include DOE's entire cylinder inventory, including heel and small cylinders as well as the 10,000+ cylinders of DUF6 generated by the USEC since 1993. The USEC cylinders will revert to DOE ownership upon privatization of USEC. DOE might consider partnering with the future owner of USEC in a long-term strategy for managing and converting DUF6 in order to avoid redundancy of efforts, so long as the partnering does not slow progress toward conversion. An estimated $480 million has been accrued by USEC since 1993 in order to offset the cost of future conversion of the DUF6 generated. DOE should take steps now to ensure that this fund is not diverted into the federal treasury for an unrelated use.

The PEIS must give a clear definition for "heel" and list the word in the definition section. *87-10*

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Specific Comments:

Page S-3, Section S.1.1, Background
"Under the current management plan, if alternative uses for the depleted uranium have not been found to be feasible by approximately the year 2010, steps would then be taken to convert the UF_6 to triuranium octaoxide (U_3O_8) beginning in the year 2020." Conversion to an oxide should be completed by 2018 whether the material has a useful purpose or not. *87-1 (Con't.)*

Page S-6, Section S.2, Description of Alternatives
This section describes an alternative for "long-term" management. DOE has defined long-term in previous NEPA documents as storage for up to 50 years. This document does not identify any time frame in its definitions. The continued storage of these cylinders under the No Action alternative has already reached the long-term storage definition. *87-11*

Page S-8, Table S.1
The No Action and Long-Term Storage alternatives state *"...cylinders would be subject to a comprehensive monitoring and maintenance program..."* Describe how this program differs from those already proposed. The document *"Draft Preliminary Report-DOE Independent UF6 Cylinder Assessment Team,"* dated 03-25-92, made specific observations and recommendations for UF6 cylinder management, but is still in draft form. DOE has proposed many plans, but has failed to appropriate the funding to fully carry out those plans. The PEIS must take into consideration historical management plans and DOE's failure to fund or comply with its own requirements. *87-2 (Con't.)*

DOE continues to state there is to be maintenance and monitoring plans, but the PEIS state that funding is questionable for some cylinder activities, such as coating. Current cylinder conditions leave no question that funding has been less than adequate. DOE must take aggressive action to ensure whatever alternative is selected and there will be no reduction or elimination of necessary maintenance and inspection activities due to lack of funding.

Page S-13, Section S.3.3, K-25 Site on the Oak Ridge Reservation
"Which consists of three major facilities..." The K-25 site contains more than three storage yards. *87-12*

Page S-32, Section S.4.1
"...exposures of workers and members of the public to radiation and chemicals were estimated to be within applicable public health standards and regulations during normal facility operations." The K-25 facility is no longer in normal operation status, and yet poses a significant gamma exposure risk to members of the public and to "reindustrialization workers." The Division has recorded the annual radiation dose (by method of thermoluminescent dosimetry monitoring) at the fences of K-1066-K Yard to be 1240 mrem, E Yard to be 950 mrem, and J Yard to be 260 mrem. Members of the public have access to the fence line at the K-1066-K area. The Division questions the methods DOE used for the estimated radiation exposures of "workers and members of the public." *87-13*

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Page S-38, Section S.4.5, Water and Soil

"...(based on the U. S. Environmental Protection Agency (EPA) proposed maximum contaminant level (MCL) of 20 ug/l for drinking water, and on the EPA health-based guideline of 230 ug/g for residential soil)." This is not the spirit or the letter of environmental and nuclear regulatory limits and the laws that codify these regulations. The spirit or the letter of environmental and nuclear regulatory limits and the laws is to minimize contaminant migration at its earliest and most effective point. **87-14**

Page S-42, Section S.5, DOE's Preferred Alternative

The State supports DOE's Preferred Alternative of simultaneously implementing both use as uranium oxide and use as uranium metal as described in this section. Disposal as Oxide should be retained as an option as these uses progress, since it may be necessary to pursue the disposal options for some of the material. **87-15**

Page 1-5, paragraph 2, Section 1.1, Background Information

The Division concurs "The DOE has responsibility for continued management of the depleted UF_6 cylinders generated by DOE and stored at the Paducah, Portsmouth, and K-25 sites." However, the proposed time table does not adequately address the safety and environmental concerns of the State of Tennessee. It has been estimated that there are an additional 12 undiscovered breached cylinders in the inventory, in addition to 7 already identified, and that the number may be as high as 200. Since some cylinders (with approximately 3 curies per cylinder) have experienced a 1/3 to 1/2 wall thickness loss due to corrosion, the continued storage of cylinders does not seem prudent or reasonable. The timetable should be accelerated to convert the UF_6 to triuranium octaoxide (U_3O_8) as soon as possible. The U_3O_8 or metal form of depleted uranium represents "safe" storage of depleted uranium. **87-2 (Con't.)**

Pages 2-54 and 2-55, Section 2.5, DOE's Preferred Alternative

"...(1) continuing the safe, effective management of the cylinders and (2) beginning conversion of the depleted UF_6 into depleted uranium oxide and/or metal products as uses for these products become available."

This document should address the safety concerns raised by the National Defense Facilities Nuclear Safety Board (DNFSB) in 1995 on the integrity of Uranium Hexafluoride Cylinders.

In its conclusions, DNFSB noted in 1995 *"DOE has stored depleted UF_6 in transportation cylinders for more than 40 years and may continue to store them for an additional 30 years. The analysis of the adequacy of the existing cylinders for use as storage systems over this extended time period has not been systematic and has not addressed all the pertinent concerns. Specifically, the following areas need further assessment:*
1. the potential for failure by accelerated corrosion mechanisms needs to be better characterized and then quantified;
2. the inspection program, used to characterize the condition of the cylinder population and monitor continued adequacy for storage, needs significant overhaul to achieve these purposes;
3. cylinder handling procedures need to be analyzed and then revised to incorporate precautions for handling degraded cylinders; and **87-16**

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4. the safety analyses for the cylinder storage yards need to be upgraded to: include insights gained through the above reviews; investigate the unique problems presented by a breach in the vapor space; investigate the hazards associated with moving degraded cylinders; and incorporate structural analyses of the cylinders." **87-16 (Con't.)**

The PEIS does not include the DFNSB report in its Reference section. In the absence of effective management reactions to these recommendations, storage of the cylinders in their present location and present condition may not be continued safely. Continued safety is questionable as the probability of loss of container integrity and external corrosion increase with time.

Also continued long-term storage of the cylinders is in conflict with the accelerated clean up program of DOE. The availability of skilled and trained workers for the extraction and treatment of UF_6 ten or twenty years beyond 2006 will be more expensive. If the present conditions of storage persist, a greater population of the containers will be structurally unsound and the risk of release by rupture will be compounded **87-17**

Page 3-42, Section 3.3.1, Cylinder Yards

"The four breached cylinders have been patched to restore their integrity, segregated from other cylinders in K- and E-yards, and placed under temporary awnings. No estimates of material loss are available for these cylinders."
Appendix B-2: Breached cylinders and material loss - conflicts with the statement above. The following information has been obtained from the *"Investigation of Breached Depleted UF6 Cylinders at the K-25 Site"* dated 10-94: **87-18**

Cylinder Number	Hole Diameter	Total Weight of Material Collected External to the Cylinder	Uranium Content of Material
101244	6 inch	Not Available	0.260
114951	8-12 inch width by 15-17 inch length	11.8 Kg	1.8 Kg
7953	9 inch	9.8 Kg	2.2 kg
116797	2 inch	----	----

Breach of the Cylinder 116797 is presumed to be mechanically induced cylinder breach and the reason for the absence of Uranium containing deposits. Estimated amount of UF_6 lost is 0-4 pounds for cylinder 116797 versus 17 pounds to greater than 109 pounds of estimated loss for Cylinder 114951.

Page 3-46, Chapter 3, Section 3.3.5.1, Surface Water

Monthly sampling plan does not include a means to identify contamination of the storage yards and run-off from the UF_6 material. The timing of the sampling with that objective should be immediately after a precipitation event, since Uranyl fluoride is extremely soluble in water. Thus the discussion of the results of the monthly sampling and the analyses is not relevant to the storage of UF_6 cylinders. **87-19**

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Pages 4-2 through 4-5, Section 4.2, Major Assessment Assumptions And Parameters
The reports from the Oak Ridge and Paducah assessment teams on the UF_6 Cylinders, 1992 and 1994 respectively, have noted many deficiencies with regard to cylinder integrity and thinning of walls due to internal and external corrosion. Corrosion has occurred to the extent that special training is required for personnel engaged in the monitoring of the cylinders. Also, the safety analysis performed on the cylinders is incomplete and does not include effects due to high winds, tornadoes, earth movements, and etc. Some of the cylinders have been reported to have thinning of the walls in the middle. Handling of such cylinders may be cause for concern. Under these circumstances, the No Action alternative will be a potentially hazardous alternative. *87-20*

In addition, the stated assessment period of forty years is in conflict with DOE's accelerated clean-up plan for K-25. While the cylinder storage yards have not been identified as hazardous waste sites, the fact that breached cylinders exist and have the potential to leak out toxic substances is of major concern to the State of Tennessee. While the release so far may not meet the reportable quantity requirements. DOE has a responsibility for any environmental impact due to the breaches. Also, there is the possibility that future leaks will be of a greater magnitude. In spite of known breached cylinders, DOE has not undertaken any action to determine the degree of contamination to the soil and to the water stemming from the breaches. *87-21*

Page 5-69, Section 5.5.1.1.2, General Public
"*...the total dose would be about 1 mrem, and the resulting chance of dying from a radiation-induced latent cancer would be less than 1 in 1 million.*" The risk of dying from a radiation-induced latent cancer associated with a total dose of 1 mrem is closer to 1 in 30,000. Please provide a citation or reasoning to support a 1 in 1 million radiation induced latent cancer risk. *87-22*

Page 5-72, Section 5.5.1.2.2, Accidents Involving Releases of Radiation or Chemicals
"*All doses would be considerably below the 25 rem maximum allowable dose specified in NRC regulations (10 CFR Part 76).*" The regulation with which 10 CFR 76 refers is 10 CFR 20, which is the regulation with the widest applicability "Standards for Protection Against Radiation." The 10 CFR 20 applies to all activities licensed by the NRC which encompasses all commercial uses of radioactive material. Part 20 provides extensive details on "subsets" of exposure such as hourly exposure and exposure of minors. For comparative purposes, Part 20 limits whole body dose to 5 rem for personnel in restricted areas and 0.5 rem for personnel in unrestricted areas. The term "unrestricted area" is usually interpreted to extend to the site boundary, but not beyond to the "environment." This interpretation keeps 10 CFR 20 from conflicting with 40 CFR 190. It also assumes that the licensee has at least some minimal control over the personnel exposed. *87-23*

The 40 CFR 190 regulates doses received by members of the general public in the "general environment" resulting from the nuclear fuel cycle. This is a different scope than 10 CFR 20 since 40 CFR 190 includes all processes and facilities in the nuclear fuel cycle (excluded is any dose due to occupational exposure as part of the nuclear fuel cycle). The "general environment" means the environment outside the boundary of the facility covered by the regulation. This keeps 40 CFR 190 from conflicting with 10 CFR 20. The whole body exposure limit specified by 40 CFR 190 is 25 mrem. The 25 rem "maximum allowable dose" is not really a "maximum allowable dose" at all, but rather, the dose at which notification to the NRC must be made. Section 20.403 states that "*Each licensee shall immediately report any events involving byproduct, source, or special nuclear material possessed by the licensee that may have caused or threatens to cause: (1) Exposure of the whole body of any individual to 25 rems or more...*"

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Page 5-76, Section 5.5.7, Waste Management
Generation of "1 m^3/yr of LLMW" seriously underestimates the "heels" component of the UF_6 cylinders containing a high energy (gamma emitting) RCRA mixed waste. The Division estimates there to be 120 million pounds of this material in cylinders stored on the Oak Ridge Reservation.. *87-24*

Page 5-108, paragraph 3, Section 5.8.2.1, Paducah Site
The Clean Air Act contains a Particulate Matter $_{2.5}$ ($PM_{2.5}$) standard. *87-25*

Page 5-108, paragraph 4, Section 5.8.2.1, Paducah Site
"*...cylinder breaches occurring at Paducah before the year 2020 could result in groundwater concentrations of uranium exceeding 20 μg/L*" is not provided for under the "Clean Water Act." *87-26*

Page 5-110, paragraph 3, Section 5.8.2.2, Portsmouth Site
The Clean Air Act contains a Particulate Matter $_{2.5}$ ($PM_{2.5}$) standard. *87-25 (Con't.)*

Page 5-110, paragraph 4, Section 5.8.2.2, Portsmouth Site
"*Uncontrolled corrosion until about 2050 before groundwater concentrations of uranium would approach 20 μg/L*" is not provided for under the Clean Water Act or Safe Drinking Water Act (SDWA). *87-26 (Con't.)*

Page 5-112, Paragraph 3, Section 5.8.2.4, Oak Ridge Reservation: K-25 Site
The Clean Air Act contains a Particulate Matter $_{2.5}$ ($PM_{2.5}$) standard *87-25 (Con't.)*

Page 5-112, Paragraph 5, Section 5.8.2.3, Oak Ridge Reservation: K-25 Site
"*Uncontrolled corrosion until about 2025 before groundwater concentrations of uranium would approach 20 μg/L*" is not provided for under the Clean Water Act or SDWA *87-26 (Con't.)*

Page 5-115, First bullet, Section 5.9, Mitigation
The Clean Air Act contains a Particulate Matter $_{2.5}$ ($PM_{2.5}$) standard *87-25 (Con't.)*

Page 5-115, Third bullet, Section 5.9, Mitigation
"*Future impacts on groundwater from failure of a disposal facility could be minimized by selection of a site in a dry environmental setting*" should be highlighted and recognized as a major siting factor. The same argument could be made for the storage of "awaiting conversion" cylinders, that are currently deteriorating and corroding. *87-27*

Page 5-119 and 5-120, Section 5.13, Pollution Protection And Waste Minimization
This section should address the "heels" component of the UF_6 cylinders. These heels contain a high energy (gamma emitting) RCRA like mixed waste. *87-6 (Con't.)*

Page 6-1, Section 6, Environmental, Occupational Safety, And Health Permits And Compliance Requirements
The Clean Water Act/SDWA should also be included as a "potential requirement." *87-28*

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STATE OF TENNESSEE
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April 30, 1996

Mr. Charles E. Bradley, Jr., Program Manager
Depleted Uranium Hexafluoride Management Program
Office of Facilities (NE 40)
Office of Nuclear Energy, Science and Technology
U.S. Dept. of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Re: PEIS for DOE's Long-Term Management of Depleted Uranium Hexafluoride

Dear Mr. Bradley:

The Division of Radiological Health has the following comments.

- The discussion of the statistical nature of the hazards posed by radiation exposure was a good addition to this report. **87-29**
- The PEIS document considers a number of different options for dealing with the Depleted Uranium Hexafluoride. Several of the options include the conversion of the material from UF_6 to either uranium oxide or uranium metal. In their analysis of this option, they always consider the conversion beginning in the year 2006. (PEIS 2-6, 2-9, 2-12, 2-15) This seems to be an unreasonably long time before starting conversion. Even considering that it will take time to decide what to do with the material, and to build the facilities if conversion is the chosen option, it does not seem that 10 years should be necessary before conversion can begin. **87-1 (Con't.)**
- Chapter 5 of the PEIS discusses the environmental impacts of the various alternatives. As support for the discussion several graphs are included. On page 5-20 a single graph compares the long term cancer risk (radiation risk) if the material is maintained as UF_6. Pages 5-37 and 5-39 compare the long term cancer risk (radiation risk) for conversion to an oxide and the probability of injury (non-radiation risk) if the material is converted to an oxide. While the report states that the chemical hazards of the material in its UF_6 form are greater than if it is converted to an oxide the omission of a graph showing the probability of injury if the material is maintained as UF_6 leads to an unbalanced representation of the hazards of these two options for the disposition of the material. Also, the combination of all non-radiation hazards as "risk of injury" is a misleading representation. **87-30**
- There are a number of questions about the characterization of the hazard from earthquakes at the Paducah, KY location. These questions are outlined in an attached memo from a State geologist. **87-35**

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- References to the usefulness of the depleted uranium in either its oxide or metallic forms are unsupported. The document states that changing circumstances have made the specific uses mentioned unlikely for the future and yet no other possible uses are adequately addressed. (PEIS 2-20) This makes the position that this material is a resource as opposed to a waste tentative at best. If there are realistic scenarios for the future use of this material, they should be presented in the PEIS. If there are no realistic future uses, then the material should be treated and disposed of as waste. **87-31**
- Recommendation number 15 of the Draft Preliminary Report – DOE Independent UF_6 Cylinder Assessment Team dated March 25, 1992, states "All cylinders in or near ground contact should be removed from those conditions, ... and ultrasonic wall thickness examinations be performed on all cylinders with significant corrosion to determine the amount of residual thickness remaining." At the time of the PEIS, it is mentioned that ultrasonic testing is now part of the cylinder maintenance. (PEIS 2-56) It is also stated, however, that "Because the ultrasonic tests are time-consuming and costly only a small portion of the entire inventory has been measured." (PEIS B-2) This is a problem for two reasons. First, it does not begin to meet the minimum of testing all cylinders with significant corrosion. Second, this brings doubt to statements such as "the cylinder breaches were assumed to go undetected for [at most] 4 years (the inspection interval for most cylinders)." (PEIS 2-5) The inspection for most of the cylinders consists only of a visual inspection. The visual inspection method, as described, does not appear to be adequate since many of the cylinders can not be seen on all sides and cylinders that are leaking may not be detected visually since the color of the paint matches the color of the leaking material exposed to air. **87-32**
- The PEIS states on page 4-3 that "While in storage at the three current storage sites, cylinders were assumed to be inspected and maintained in safe storage consistent with current management practices and plans." Based on the number of breaches detected, the rusting of the cylinders, the improper storage conditions and the documented lack of adequate surveillance of these cylinders, the assumption that material is in safe storage is only true when qualified by the phrase "consistent with current management practices and plans." Essentially DOE is defining their practices and procedures as safe. This allows them to say that a process is safe simply because it meets the standards of the procedure, not because an unbiased safety analysis has been performed. **87-33**
- Appendix G of the PEIS, table G.6 compares accident consequences associated with the long term storage of the material in different chemical forms. Why are the accidents considered differently for the different forms. For example, an earthquake or a tornado are considered under unlikely accidents for the uranium oxide but neither scenario is considered for the UF_6. A comparison of this type would seem to be most useful if it compares the same types of accidents. Another difference is that "unlikely accidents" for UF_6 are described as having a possible frequency of "1 in 10,000 to 1 in 1 million years," while under the uranium oxide option the "unlikely accident" is described as having a frequency of "1 in 100 years to 1 in 10,000 years." It is not clear why an "unlikely accident" would have a different probability associated with it for a different chemical composition? **87-34**

Sincerely

Michael H. Mobley
Director

COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

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MEMORANDUM

TO: Mike Mobley & Joelle Key, Div. of Rad. Health

FROM: Mike Hoyal, Asst. State Geologist

DATE: February 20, 1998

Subject: Draft DOE PEIS, Earthquake Hazard

Regarding the information you provided on the above referenced document, please refer to the attached information from the Center for Earthquake Research and Information (CERI), at Memphis University.

The draft PIES seems to not only down-play past seismic events but gives very little information on future potential events. By all accounts, the Paducah area is located in a high-risk area for major damage from earthquakes (see attached seismic risk map). In comparison, the Oak Ridge area is located in a moderate-risk area and experiences fewer and less severe earthquakes. The information presented by this document might be more accurate for the East Tennessee area but seems to be an understatement for the Paducah plant area. *87-35 (Con't.)*

The article on earthquake intensity gives a good explanation for how we can determine the extent of damage a seismic event can cause to manmade and natural objects in a particular place. The Modified Mercalli Scale describes intensities in physical terms that can be related by personal or observable results, thus more subjective. By contrast, the Richter Scale is a specific measurement of magnitude or energy released during an earthquake and is determined at the time of the event. While every earthquake can have many intensities, depending on distance from the epicenter, it can only have one measurement of magnitude. While magnitude measurements provide useful data for scientific research, including accurate comparison of *87-36*

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earthquakes, they give no specific information about the damage or other effects caused by an earthquake. *87-36 (Con't.)*

For specific information on the probability or frequency of significant seismic events, please refer to the CERI attachment.

Our Division has several publications available on earthquakes in Tennessee and both Ron Zurawski, Director, and Tom Hart, Geologist, are active in the Central U. S. Earthquake Consortium for this region.

If we can provide further service, please advise.

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The New Madrid Fault System

The greatest earthquake risk east of the Rocky Mountains is along the New Madrid fault system. Damaging earthquakes are much less frequent than in California, but when they do occur, the damage can be far greater, due to the underlying geology.

The New Madrid fault system, or the New Madrid seismic zone, is a series of faults beneath the continental crust in a weak spot known as the Reelfoot Rift. It cannot be seen on the surface. The fault system extends 150 miles southward from Cairo, Illinois through New Madrid and Caruthersville, Missouri, down through Blytheville, Arkansas to Marked Tree, Arkansas. It dips into Kentucky near Fulton and into Tennessee near Reelfoot Lake, and extends southeast to Dyersburg, Tennessee. It crosses five state lines, and crosses the Mississippi River in at least three places.

The great New Madrid earthquake of 1811-12 was a series of quakes that happened over a three-month period. The main shocks, the three largest earthquakes, were estimated to be greater than magnitude 8.0 Aftershocks included two events around magnitude 8.0, five magnitude 7.7, ten magnitude 5.3, and eighty-nine estimated at magnitude 4.3. The entire fault system is believed to have ruptured in this series of earthquakes. Aftershocks were felt in the region for more than a year. This was the largest release of seismic energy in the continental United States. The only other larger event was the Great Alaska Earthquake, in 1964

Earthquakes of 5.0 or less are also possible in many other parts of the central and eastern U.S. In addition to the New Madrid seismic zone (NMSZ), earthquakes of magnitude 5.0 and above have occurred at Charleston, South Carolina, and recent research suggests that the Wabash Valley fault system in Illinois and Indiana has produced large earthquakes.

The possibility of a great earthquake happening soon in the New Madrid seismic zone is small. Scientists believe that catastrophic events like those of the 1811-12 happen in the New Madrid region every 550-1200 years. THis means there is roughly a 0.3-1.0% probability of an event greater than magnitude 8.0 within the next 15 years, and a 2.7-4.0% probability within 50 years. Even though the probabilities are small, there is no reason to be complacent. for there have been other damaging earthquakes in the region since 1811 and 1812.

A major earthquake, magnitude 7.0 or greater happens every 254-500 years and has a probability of five to nine percent within the next fifteen years, and a nineteen to twenty nine percent within the next fifty years. An earthquake of this size would be felt throughout much of the central and eastern United States. Damage could amount to several billion dollars.

A damaging earthquake in this area, magnitude 6.0 or greater, happens every seventy to ninety years and has a probability of 40-63% within the next fifteen years, and 86 97% within the next one hundred and fifty years. An earthquake of this size would cause damage to older structures, especially those of masonry construction. There could be serious damage to many schools in the region.

The fault system is active averaging more than 200 earthquakes per year. Of these, eight to ten are large enough to be felt. There are approximately forty six earthquakes in the magnitude 2.0 range, and seven in the magnitude 3.0 range per year. (If your browser does not support HTML Table Tags, please use this link.)

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Magnitude	Expected Rate (yr)
4.0	14 months
5.0	10-12 yr
6.0	70-90 yr
7.0	254-500 yr
8.0	550-1200 yr

Magnitudes are determined by various methods The one of which most people are familiar, is the Richter Scale. The Richter Scale is a measure of energy released in an earthquake. It is determined by ground motion on seismograms. An earthquake has only one Richter magnitude.

What do the numbers on the Richter Scale tell us? Each unit of the Richter Scale is a tenfold increase in the relative size of an earthquake. A magnitude 6.0 is ten times the size of a magnitude 5.0, and one hundred times the size of a 4.0. But energy release is a different matter. Each unit up the Richter Scale is around a 32 times greater release of energy. A magnitude 6.0 releases 32 times more energy than a mangitude 5.0, and about one thousand times more energy than a magnitude 4.0

The amount of energy released in a small earthquake is not enough to prevent a large one from occurring. A million magnitude 2.0 earthquakes would release the same amount of energy as one magnitude 6.0 quake. 32,768 magnitude 2.0 earthquakes would release the same amount of energy as one magnitude 5.0

Of greatest concern in the near future, then , are the 6.0 to 6.5 events. Damaging earthquakes in this magnitude range are possible within the lifetimes of our children. Two have occurred since 1811-1812, one in 1843, and another in 1895.

Many things can be done to protect ourselves. Education, preparedness planning, and proper building construction are proven means to minimize the deaths, injuries, and economic losses due to earthquakes. Northern California and Armenia recently experienced 6.9-7.1 earthquakes.Northern California was prepared, Armenia was not. In northern California 62 people died and there were more than $6 billion in losses. In Armenia over 25,000 people died and losses were greater than $20 billion. The central United States is more prepared than Armenia, but not nearly as well prepared as northern California.

The choice is ours. We can get ready and reduce our losses, or we can do nothing, and suffer the full consequences of a damaging earthquake. We need to continue to plan, to build better buildings, and make sure that earthquake preparedness becomes a part of all our lives. We cannot prevent the coming of an earthquake, but we can reduce the effects.

To contact the manager: stevens@ccri.memphis.edu

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COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

Magnitude	Expected Rate (yr)
4.0	14 months
5.0	10-12 yr
6.0	70-90 yr
7.0	254-500 yr
8.0	550-1200 yr

Magnitudes are determined by various methods The one of which most people are familiar, is the Richter Scale. The Richter Scale is a measure of energy released in an earthquake. It is determined by ground motion on seismograms. An earthquake has only one Richter magnitude.

What do the numbers on the Richter Scale tell us? Each unit of the Richter Scale is a tenfold increase in the relative size of an earthquake. A magnitude 6.0 is ten times the size of a magnitude 5.0, and one hundred times the size of a 4.0. But energy release is a different matter. Each unit up the Richter Scale is around a 32 times greater release of energy. A magnitude 6.0 releases 32 times more energy than a magnitude 5.0, and about one thousand times more energy than a magnitude 4.0

The amount of energy released in a small earthquake is not enough to prevent a large one from occurring. A million magnitude 2.0 earthquakes would release the same amount of energy as one magnitude 6.0 quake. 32,768 magnitude 2.0 earthquakes would release the same amount of energy as one magnitude 5.0

Of greatest concern in the near future, then , are the 6.0 to 6.5 events. Damaging earthquakes in this magnitude range are possible within the lifetimes of our children. Two have occurred since 1811-1812, one in 1843, and another in 1895.

Many things can be done to protect ourselves. Education, preparedness planning, and proper building construction are proven means to minimize the deaths, injuries, and economic losses due to earthquakes. Northern California and Armenia recently experienced 6.9-7.1 earthquakes.Northern California was prepared, Armenia was not. In northern California 62 people died and there were more than $6 billion in losses. In Armenia over 25,000 people died and losses were greater than $20 billion. The central United States is more prepared than Armenia, but not nearly as well prepared as northern California.

The choice is ours. We can get ready and reduce our losses, or we can do nothing, and suffer the full consequences of a damaging earthquake. We need to continue to plan, to build better buildings, and make sure that earthquake preparedness becomes a part of all our lives. We cannot prevent the coming of an earthquake, but we can reduce the effects.

To contact the manager: stevens@cert.memphis.edu

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COMMENTOR NO. 87: STATE OF TENNESSEE, GOVERNOR SUNDQUIST, DON (CONT'D.) NASHVILLE, TENNESSEE

2

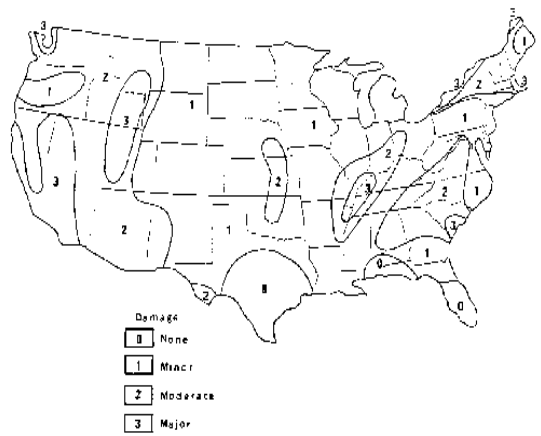

Figure 1. General seismic risk map of the United States. Note that much of Tennessee is in zone 2 or 3, where at least moderate damage is predicted. From Algermissen, Seismic risk studies in the U.S., Fourth world conference on earthquake engineering, January 14, 1969, Santiago, Chile.

CAUSES OF EARTHQUAKES

Most earthquakes are the result of shock waves created by the sudden release of slowly accumulated stress in rigid bedrock. This release of stress results in the rock's sliding along fractures, called *faults* by geologists. On either side of a fault the rock is offset. The sliding relieves the stress for a time, but continued stress accumulation often leads to recurrent sudden slippage on the fault, and more earthquakes are the result. It is for this reason that geologists are so concerned with accurately mapping fault locations, both old faults no longer active and those along which slippage has occurred in the recent geologic past. By studying the actual history of earthquakes along these faults, it may be possible to predict the likelihood of future earthquakes.

Throughout the world many earthquakes occur along precipitous sea coasts or actively rising mountains at the edges of continental plates. These plates are segments of the outer thin "shell", or crust, of the earth. The crust consists of several of these plates moving slowly apart, or sliding past, over, or under each other. It is along the boundaries of these plates that great amounts of energy are released. In earthquakes and volcanic activity. It is not surprising, then, that quakes are so common in California and other places (e.g., Japan) at plate edges along the borders of the Pacific Ocean.

One might ask, "Why should earthquakes occur in and near Tennessee, since we are obviously far from

COMMENTOR NO. 88: MILITARY TOXICS PROJECT
LEWISTON, MAINE

MILITARY TOXICS PROJECT

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April 15, 1998

Charles E. Bradley, Jr.
U.S. Dept. of Energy
19901 Germantown Road
Germantown, MD. 20874-1290

Dear Mr. Bradley,

Thank you for your response to our letter, regarding the Department of Energy's draft Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride. As per our phone conversation you agreed to meet with the Military Toxics Project and other interested parties to discuss the P.E.I.S., however DOE could not afford to foot the bill. The citizens and impacted communities we work with simply do not have the money to fly to Chicago or Washington, D.C. to meet. Therefore, I simply wish to have on record the Military Toxics Project's position regarding Depleted Uranium.

As you may know, the Military Toxics Project (MTP) is a non-profit grassroots organization. Our membership is made up of concerned citizens, community organizations, national organizations, physicians, scientists, veterans, environmental justice activists, labor and peace groups from around the country. MTP's mission is "to unite activists, organizations and communities in the struggle to clean up military pollution, safeguard the transportation of hazardous materials, and to advance the development and implementation of preventative-based solutions to the toxic and radioactive pollution caused by the United States military activities. MTP's mission is based on mutual respect and justice for all peoples, free from any form of discrimination or bias". 88-1

In 1992, the Military Toxic Project formed the Depleted Uranium Citizens Network. The Depleted Uranium Network provides outreach and education, uniting people affected by the mining, production, manufacturing, testing, sale and use of depleted uranium for military and commercial purposes; and to demand cleanup, health care, compensation and the end of depleted uranium munitions use worldwide to help ensure the survival of future generations.

recycled paper

COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

The Military Toxics Project adamantly opposes any use of the depleted uranium for military purposes such as in weaponry and munitions. First used in the Persian Gulf War in 1991, U.S. and British forces used depleted uranium as both armor piercing bullets and as tank armor. When uranium weapons burn, when they corrode, and when they are machined, uranium oxide dust is created. The U.S. Department of Defense estimates approximately 315 tons (630,000 pounds) of depleted uranium were fired in the Gulf. This firing resulted in the release of large amounts of DU dust which contaminated thousands of tanks, vehicles and land. 88-1 (Con't.)

Recently, the Military Toxics Project released a report with Swords to Plowshares and the National Gulf War Resource Center called the ***Depleted Uranium Case Narrative***. The report details how hundreds of thousands Gulf War Veterans may have been exposed to DU radioactive dust in the Gulf War. I have enclosed a copy for your review. 88-2

All too often we see industry and government with end of the pipe mentality, redefining waste as a product to be used. For example the paper industry's waste they call fertilizer and spread sludge on unsuspecting communities, further exposing citizens to toxics. Changing the medium doesn't necessarily reduce the risk. We hope the Department of Energy will start working towards more preventative based solutions in the future. 88-3

The task you are charged with now is to find the most safe and effective way to manage/use DU. When reviewing the comments for the Programmatic Environmental Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride, we hope you will weigh MTP's concerns on how DU is used. Dealing with the tremendous stockpiles of Depleted Uranium Hexaflouride is a monumental task. We wish you well and if you have any questions, please don't hesitate to call.

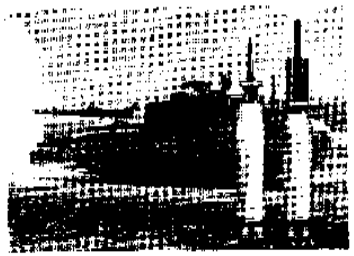
Sincerely,

Tara Thornton

Tara Thornton
National Organizer

COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

MILITARY TOXICS PROJECT



DEPLETED URANIUM:

AGENT ORANGE OF THE 90'S ANOTHER PENTAGON COVERUP

Military Toxics Project's
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COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

DEPLETED URANIUM WEAPONS
Threaten Nuclear Non-Proliferation Treaty

A Briefing Paper To The Delegations to the 1998 Non Proliferation Treaty Preparatory Committee

Governments concerned about the future of nuclear weapons must be alerted to the dangerous proliferation of a new class of radioactive weapons first used in warfare by U.S. aircraft and U.S. and British tanks in the Gulf War. These weapons are made from Depleted uranium (DU).[1] Depleted Uranium is a radioactive and chemically toxic nuclear waste product that has been manufactured into an armor-piercing projectile known as the depleted uranium penetrator. At least fourteen countries including the U.S., the United Kingdom, France, Russia, Greece, Turkey, Israel, Saudi Arabia, Bahrain, Egypt, Kuwait, Pakistan, Thailand, and Taiwan now have DU penetrators in their arsenal.[2] Other sources assert that the weaponry has proliferated to Iraq, Oman, Jordan, Abu Dhabi and the United Arab Emirates.

The U.S. Department of Defense estimates approximately 315 tons (630,000 pounds) of depleted uranium were fired in the Gulf in 1991. This firing resulted in the release of large amounts of DU dust which contaminated thousands of tanks, vehicles and land. Depleted uranium dust can be transported by wind or water and can enter the human body via wound contamination or injection (as in fragments), inhalation or ingestion. Depleted uranium has a half life of 4 1/2 billion years.

Among the short and long term health effects of inhaled or ingested depleted uranium particles are kidney and liver problems, immune system disfunction, reproductive problems, birth defects and cancers. A March 2, 1998 report released by Swords to Plowshares, the Military Toxics Project, and the U.S. National Gulf War Resource Center details how hundreds of thousand Gulf War veterans may have been exposed to DU radioactive dust in the Gulf War. The Depleted Uranium Case Narrative is available on the Internet at www.milloxproj.org.

Since the Gulf War battlefields remain contaminated with depleted uranium, the health of today's civilians, as well as that of future generations, is at risk. The United Nations Human Rights commission in Geneva has taken up the issue of depleted uranium weaponry through its Sub-Commission on Prevention of Discrimination and Protection of Minorities. The Sub-Commission adopted resolutions in 1996 and 1997 (resolution 1996/16 and 1997/36), which included depleted uranium weaponry among "weapons of mass or indiscriminate destruction", incompatible with international humanitarian or human rights law. In 1997 the U.N. appointed Mme. Clemencia Forero de Castellanos (Columbia) Rapporteur to take over the study of DU and other weapons of "mass or indiscriminate destruction". The report is due in the Sub-Commission 1998 summer session.

COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

Besides being a threat to human rights, DU weapons may impose on a nation a burden of health care costs and contamination of the environment that is expensive to address. In the United States, the price of clean up of 152,000 pounds of depleted uranium fragments and dust on 500 acres at Jefferson Proving Ground in Indiana has been estimated at $4 to $5 billion dollars.[3]

In addition to causing dire and costly health and environmental damage, depleted uranium can be modified to make an atomic bomb of plutonium 239. Depleted uranium penetrators purchased in sufficient quantities by any country could be disassembled and the DU diverted for breeding weapons grade plutonium in a nuclear power reactor that had been suitably adapted. Therefore, it is critical to the success of the Nuclear Non-Proliferation Treaty, that depleted uranium weapons be considered for their potential to become a plutonium bomb as well as their intrinsic capability of being "weapons of mass or indiscriminate destruction". Thus, depleted uranium weapons' development, production, stockpiling, testing, sale and or transfer, as well as use, must be banned.

[1] During the process of making fuel for nuclear weapons and nuclear power plants, the fissionable isotope Uranium 235 is separated from uranium. The remaining uranium, which is 99.8% uranium 238, is misleadingly called "depleted" uranium. As a result of more than fifty years of uranium enrichment, the U.S. Department of Energy currently maintains a stockpile in excess of 1.1 billion pounds radioactive uranium waste.

[2] The Depleted Uranium Case Narrative, by Dan Fahey, Swords to Plowshare, March 1996, p. 67. The report is available on the Internet at www.militaryproj.org, http://www.gulfweb.org/gwire, http://www.atom-usa.com/ or http://www.globalhelp.com/~karen/uw/. For copies call the Military Toxics Project in the USA at (207) 783-5091.

[3] Depleted Uranium Case Narrative, p.50.

This paper has been prepared by the Military Toxics Project. MTP is a national network of groups working to clean up military pollution, safeguard the transportation of hazardous materials, and advance pollution prevention at US Dept. of Defense installations. Through its Depleted Uranium Campaign, MTP provides outreach and unites people affected by the production, testing, and use of DU for military purposes; and demands cleanup, health care, compensation and the end of DU munitions use worldwide to help ensure the survival of future generations. For more information contact MTP at 60 Pine Street, Suite 2, Lewiston, ME. 04240, USA. Phone: (207)783-5091, Fax: (207)783-5096, E-mail: miltoxpr@lme.net, Website: www.miltoxproj.org.

COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

International Declaration on Depleted Uranium

Developed at the International Forum on Depleted Uranium held in Washington, DC on November 14 – 16, 1997.

In the spirit of universal harmony, with regard for the integrity for all peoples and nations, and for the perpetuity of safe and healthy environments and workplaces for ourselves and future generations;

Mindful that depleted uranium is the largest radioactive/hazardous waste of the nuclear enrichment process, and has accumulated in enormous quantities since the dawn of the nuclear age;

Concerned that depleted uranium is highly toxic and radioactive, with a half life of four and a half billion years, causing cancer, damage to internal organs (especially lung, kidney and bone), and birth defects;

Deeply concerned for the many people who are experiencing illnesses and medical problems because they are or have been knowingly or unknowingly exposed to depleted uranium;

Knowing that depleted uranium weaponry has proliferated throughout the world and that its use is incompatible with international law;

In response to the latest form of military radioactive pollution, namely weaponry made from depleted uranium which was used for the first time in warfare in Operation Desert Storm, which poses a threat to veterans, civilians, and future generations, citizens from the world community hereby agree to:

- **provide outreach and education, uniting people affected by the production, manufacture, testing, sale, and use of depleted uranium for military and commercial purpose**
- **pursue providing information and training for workers and soldiers regarding the hazards of depleted uranium exposure**
- **pursue the establishment of an independent international scientific and medical commission**
- **demand cleanup, health care, and compensation**
- **demand the end of the production and use of depleted uranium munitions worldwide.**

COMMENTOR NO. 88: MILITARY TOXICS PROJECT (CONT'D.)
LEWISTON, MAINE

PLEASE SEND ME MORE INFORMATION ABOUT THE MILITARY TOXICS PROJECT.....

NAME:_____

ADDRESS:_____

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_____ *I want to receive your newsletter Touching Base, my donation is enclosed.*

MTP RELIES ON GRASSROOTS SUPPORT. PLEASE SEND YOUR CONTRIBUTION TODAY!!!!! MAKE YOU CHECK PAYABLE TO:

MILITARY TOXICS PROJECT
471 MAIN ST. 2ND. FLOOR
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phone: (207) 783-5091
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e-mail: mtp@cdh.net
website: http://home.cdh.net/~mtp

MILITARY TOXICS PROJECT
471 Main St. 2nd. Floor
Lewiston, ME. 04240

MILITARY TOXICS PROJECT

"The mission of the Military Toxics Project is to unite activists, organizations, and communities in the struggle to clean up military pollution, safeguard the transportation of hazardous materials, and to advance the development and implementation of preventative-based solutions to the toxic and radioactive pollution caused by United States military activities. MTP's mission is based on mutual respect and justice for all peoples, free from any form of discrimination or bias."

ABOUT THE PROBLEM.....

The Department of Defense(DoD) is the nation's worst polluter. Continuing production, testing, and disposal of weapons threatens communities daily, yet the DoD has managed for the most part to escape existing environmental regulations and reporting. The closing of dozens of bases and other military cutbacks creates the opportunity to make a transition from a polluting military-dominant economy to sustainable peacetime endeavors. Public awareness and involvement are critical at this time, to ensure that communities know the extent of local pollution, facilities are adequately cleaned up, disposal methods are safe, and new military and civilian industry is pollution prevention oriented to protect the environment and public health.

ABOUT MTP.....

The Military Toxics Project(MTP) unites activists, organizations, and communities to remedy and prevent pollution created by the military. Over the last seven years, the MTP's effective combination of research and public awareness, organizing and technical assistance, and networking has led to a number of accomplishments.

These have included:

- creation of a powerful grassroots force.
- national issue networks involving over 130 groups from the U.S., Hawaii, and Alaska.
- publication of several major research reports detailing the extent of the DoD's toxic burden
- substantive policy actions by the DoD and the U.S. Congress.

The MTP has increased its impact by forming strong working relationships with other groups, including both community and national environmental organizations, and constituencies concerned about military toxics such as physicians, veterans, environmental justice activists, labor and peace groups.

The MTP will continue its work to raise public awareness about the DoD's toxic legacy; increase the effectiveness of local groups working on military toxic issues; build a multi-racial staff, leadership and program; and network groups to advance practices and policies on the national level which increases public knowledge and participation, hold the military accountable and promote safe, sustainable industry.

Its activities will include:

- **Organizing Assistance and Training** - on-site and phone consultation with grassroots groups: training; distribution of newsletter and organizing material.
- **Technical Assistance** - - Distribution of reports and fact sheets and other information specific to individual communities.
- **Networking** - - Continued facilitation of issue networks on base closure, depleted uranium, public participation and conventional munitions; implementation of a collaborative campaign focusing on issues that affect all groups.
- **Workshops, Conferences, and Meetings** - - Continues to organize and facilitate workshops around the country.
- **Multi-racial Effort** - - Increasing racial diversity on staff, among groups, and in the program work. MTP has a leadership development program which promotes diversity.

These activities will result in greater public awareness, more effective local leaders and groups, changes by the DoD, and other government agencies and the U.S. Congress.

COMMENTOR NO. 89: UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON, D.C.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 1, 1998

Dr. Carol Borgstrom
Director
Office of NEPA Policy and Assistance
Department of Energy
Washington, DC 20585

Dear Dr. Borgstrom:

As requested in your letter dated December 18, 1997, enclosed are the Nuclear Regulatory Commission staff comments on the Department of Energy's Draft "Programmatic Environmental Impact Statement for Alternative Strategies for the Long-term Management and Use of Depleted Uranium Hexafluoride." Please contact Priya Patel (301-415-5757) of my staff with any comments.

Sincerely,

Carl J. Paperiello, Director
Office of Nuclear Material Safety
and Safeguards

Enclosure: As stated

cc: Charles E. Bradley, Jr., DOE

COMMENTOR NO. 89: UNITED STATES NUCLEAR REGULATORY COMMISSION (CONT'D.) WASHINGTON, D.C.

U. S. NUCLEAR REGULATORY COMMISSION COMMENTS ON DOE/EIS-026, DRAFT "PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT FOR ALTERNATIVE STRATEGIES FOR THE LONG-TERM MANAGEMENT AND USE OF DEPLETED URANIUM HEXAFLUORIDE," (PEIS), dated December 1997.

Supporting Documents Reviewed:

UCRL-AR-124080, "DEPLETED URANIUM MANAGEMENT PROGRAM: THE ENGINEERING ANALYSIS REPORT FOR THE LONG-TERM MANAGEMENT OF DEPLETED URANIUM HEXAFLUORIDE," Rev. 2, Volumes 1 and 2, (EAR), dated May 1997.

UCRL-AR-127650, "COST ANALYSIS REPORT FOR THE LONG-TERM MANAGEMENT OF DEPLETED URANIUM HEXAFLUORIDE," (CAR), dated May 1997.

The purpose of the U.S. Department of Energy (DOE) programmatic environmental impact statement (PEIS) is to assess the potential impacts of alternative strategies for managing the depleted uranium hexafluoride at three DOE sites. DOE states that its preferred alternative is to use 100% of the uranium hexafluoride, either as uranium oxide, uranium metal, or both. The following are comments the Nuclear Regulatory Commission believes need to be addressed in the PEIS.

General Comments:

1. Assumption of Future Potential Use

While we agree that the use of UF_6 is desirable, we recommend that DOE include in the PEIS an alternative that addresses UF_6 for which no use can be found. The PEIS does not provide information indicating a market demand capable of consuming 100% of the depleted uranium (DU) inventory and notes that "potential uses that are capable of consuming a substantial fraction or all of the inventory . . . are not yet fully developed . . . ." In fact, very little of the material has been used in the decades over which it has been generated and it is not clear that all of it will be used in the future, as DOE has assumed in its preferred alternative. The existing management plan for depleted uranium described on page S-3 explicitly recognizes that future uses may not be found. In this regard, the Council on Environmental Quality (CEQ) recommends that an environmental impact statement (EIS) contain ". . .all reasonable alternatives. . . . Reasonable alternatives include those that are *practical or feasible* [emphasis in original text] from the technical and economic standpoint and using common sense, rather than simply *desirable* [emphasis in original text] from the standpoint of the applicant." ["Forty Most Frequently Asked Questions Concerning CEQ's NEPA Regulations," 46 FR 18027, March 23, 1981]. An alternative that recognizes that uses may not be found seems appropriate for the PEIS, given this CEQ guidance. **89-1**

Furthermore, CEQ recommends that existing management plans be included as alternatives in EISs. One of the two CEQ interpretations of the "no action" alternative is "no change" from current management direction, i.e., continuing with the present course of action. Under the current DOE management plan for UF_6, if alternative uses have not been found to be feasible

ENCLOSURE

COMMENTOR NO. 89: UNITED STATES NUCLEAR REGULATORY COMMISSION (CONT'D.) WASHINGTON, D.C.

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by approximately the year 2010, steps would be taken to convert the UF_6 to U_3O_8 beginning in the year 2020. The U_3O_8 would be safely stored until there was a determination that all or a portion of the depleted uranium was no longer needed. At that point, the U_3O_8 would be disposed of as low-level radioactive waste. Thus, our concern about future uses not developing as projected in the PEIS would be addressed by following this CEQ guidance.

Also, the discussion does not address regulatory and licensing requirements for the DU applications. It is recommended that (1) DOE identifies the likely market consumption of DU oxides and metals over the timeframe of the EIS, (2) DOE estimates the impacts from these potential DU uses, (3) DOE considers the potential of the converted DU materials becoming a waste, thus, requiring conversion into forms compatible with disposal, and (4) DOE evaluates the likely regulatory and licensing aspects of potential uses. *89-2*

In addition, DOE's assumption that all of the depleted uranium can be used in the future appears to mean that the UF_6 would be stored onsite as it is stored now, until uses actually develop. The PEIS states that conversion to metal or oxide would not begin until uses for these products become available, and that safe management of the cylinder inventory in accordance with existing practices would continue until all of it had been converted for use. Thus, if no significant uses were to develop, the PEIS would in effect be endorsing an alternative that continues to spend resources indefinitely on maintaining and monitoring the steel containers, to expose workers to radiation in performing these functions, and to put off a long-term plan for disposal. *89-3*

2. Additional Evaluation of Combination of Alternatives

While the combination of 50% use as uranium oxide and 50% use as uranium metal is evaluated in the PEIS, other combinations, assuming DU applications are not forthcoming, would be beneficial. One example would be to assume only 50% inventory use altogether and the remaining 50% requiring conversion to a more stable form and disposal. Again, this seems appropriate due to the uncertainty of inventory use. *89-4*

3. Ranking of the Alternatives

The summary of the results (page S-15 et seq) does not include a ranking of alternatives, and implies that all of the alternatives are acceptable, but that there is one "preferred alternative." DOE may wish to rank or identify those alternative(s) that appear more favorable than others based upon the analysis. DOE may also want to consider and mention if any of the proposed alternatives are precluded by the analysis. For example, page 5-84 mentions individual doses from groundwater ingestion of 100 mrem/yr from disposal in shallow earthen structures, far in excess of 10 CFR Part 61 standards of 25 mrem/yr. Page 5-84 also mentions a scenario for a hypothetical future resident living on the disposal site and receiving radiation doses as high as 10 rem/yr. These limitations should be included in the summary. *89-5*

4. Use of the Term "Uranium Oxides"

The PEIS generally combines all uranium oxide compounds, U_3O_8 and UO_2, under the title "uranium oxides" for consideration in the alternatives and strategies (see page S-6 et seq). *89-6*

COMMENTOR NO. 89: UNITED STATES NUCLEAR REGULATORY COMMISSION (CONT'D.) WASHINGTON, D.C.

3

This seems too all inclusive, as uranium oxides have significantly different chemical and physical properties that produce a wide range of environmental health and safety impacts. For example, U_3O_8 is a high porosity powder, with a low density and a significant respirable fraction. UO_2 powder is also porous, and can spontaneously ignite in air. On the other hand, when UO_2 is sintered, a process involving high temperatures to reduce porosity, increase density, and decrease volume, it has the highest density of the uranium oxides and is essentially pore free. The presence (or absence) of pores also has significant implications for the potential disposal of the material, either as a management option or as an end-use item; a denser, essentially pore free material would appear to be advantageous due to lower leaching potential. Thus, a dioxide material sintered to a lower density (i.e. 4-5 g/cm³) would not be expected to perform as well in a disposal environment as a uranium dioxide sintered to a high density (i.e. 9-10 g/cm³). It is recommended that more qualifiers are given to the term "uranium oxides," perhaps including low and high density as the principal discriminator. *89-6 (Con't.)*

5. Equivalent Bases and Life-Cycle Effects, the Cradle-to-Grave Approach

The text does not seem to incorporate a life-cycle approach to the different management alternatives and compare them on an equivalent basis (see pages S-7 et seq). For example, even if a market exists for potential uses of the depleted uranium (DU), at the end of the product's useful life it is still radioactive ($t_{1/2} = 4.5 \times 10^9$ years) and will require disposition. Thus, disposal would seem to be the logical endpoint for all of the alternative branches shown in Figure S-2, instead of only for the disposal as oxide alternative. Following the DU product from cradle to grave thereby influences the impacts and potentially the alternative(s) selected. It would seem that the 'manufacture and use' alternatives will ultimately result in impacts from the DU component; for example, the material (perhaps as itself or in a product) could be shipped to a disposal facility. Such potential impacts do not appear to be included in the analysis, and may even preclude some options or require additional conversion and conditioning. For example, without supporting analyses, it is unlikely that significant quantities of DU metal can meet the regulatory requirements of disposal sites due to high solubility and the formation of hydrides. Thus, pursuit of use as a metal option may require another conversion facility to convert the DU metal into a form compatible with disposal. In addition, the long-term storage alternative also appears to lack the realization of ultimate disposal in the future. The PEIS should consider and analyze the alternatives on an equivalent basis with the same/comparable endpoints and include life-cycle effects. *89-7*

Other examples of the need for equivalent bases include the oxide conversion routes, due to fundamental differences in the uranium oxide forms. One of the specific oxide conversion routes (gelation) appears to be manufacturing UO_2 with properties comparable to high density nuclear fuel. This process would be anticipated to have improved stability and related properties as compared to the other oxides. The gelation route detailed in the PEIS appears to include two plants - one for U_3O_8 production and one for dissolution/UO_2 production:

$$UF_6 \rightarrow U_3O_8 \rightarrow UO_2$$

COMMENTOR NO. 89: UNITED STATES NUCLEAR REGULATORY COMMISSION (CONT'D.) WASHINGTON, D.C.

4

This appears inconsistent with literature reports on the process which maintain that no production of U_3O_8 is necessary. The process described in the PEIS would cause double the impacts by performing a two step process when the same result is achievable in a one step conversion from $UF_6 \rightarrow UO_2$. *89-7 (Cont.)*

6. Results of the Analyses

Pages S-15 et seq summarize and compare the results of the impacts for the alternative management strategies. Some of these results seem inconsistent and are not intuitively obvious. For example, it is not clear why the use as uranium oxide results in higher impacts than the use as uranium metal (see pages S-20 and S-49) – the opposite would be anticipated. A more rigorous analysis of the assumptions made in the Engineering Analysis UCRL-AR-124080 is recommended (see specific comments #20). In V2, Section 6.11, Potential Shielding Applications, a large disparity is evident between the damage fractions assumed for uranium metal (1%) and those assumed for uranium dioxide(100%). Again, this seems questionable based on the pyrophoricity of uranium metal upon heating. Furthermore, the airborne release fractions are orders of magnitude lower than what is recommended in the DOE Accident Analysis Handbook 3010-94. These calculations should be examined more closely to confirm DOE's conclusion. *89-8*

Furthermore, it is unclear whether or not the disposal analyses include all of the potential long-term impacts and doses from uranium leaching from the disposal area. It is recommended that DOE consider greater consistency in the results and clarify the summary.

7. Waste Management

In Section S.4.8 on page S-40, waste management impacts are discussed. DOE should consider briefly highlighting the potential uranium content of the secondary streams (i.e. CaF_2, MgF_2), along with a brief assessment of acceptability for either reuse/nonradioactive disposal or disposal as radioactive waste. The uses and demands for the by-products of conversion (HF, CaF_2) should be explored and discussed. DOE should expand the discussion in the last paragraph about uranium disposal as low-level waste (LLW). *89-9*

Furthermore, the DOE may wish to cite the Louisiana Enrichment Services (LES) Final EIS (NUREG-1484) analysis. The NRC documents provide analyses supporting DU disposal as a LLW, but note that its disposal could require a mine or another means of "deep" (rather than near-surface) disposal. Similar to the conclusion drawn in the PEIS, the LES EIS determined near-surface disposal would cause exceedance of 10 CFR Part 61.41 requirements. Currently, no "deep" disposal sites exist, and all current LLW disposal sites (existing and planned) use near-surface facilities. *89-10*

8. DU Use as Spent Nuclear Fuel (SNF) Cask Shielding

DOE appears to be relying upon the potential future use of DU as SNF cask shielding for a large consumption of its DU inventory (see page S-43 and 1-8, and Volume 2 of the EAR, which *89-11*

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analyzes a DU cask manufacturing facility as the only use of DU). If this is indeed the case, DOE may wish to discuss it in more detail in the PEIS summary, and it should be noted that no currently licensed or planned SNF cask uses of DU.

9. Fate of DU SNF Cask Shielding

As currently written, the PEIS does not include a discussion of the eventual fate and potential impacts of the DU SNF cask after use (pages 2-14 and 2-15). Pages 5-55 and 5-65 mention that "no assumptions are made regarding the fate of the cask after use," and page 5-65 notes that disposal would amount to an additional 180,000 cubic meters (6.4 million cubic feet) of waste requiring disposal, with a (calculated) average specific gravity of 2.2. This does not seem inconsequential, particularly if a dedicated disposal facility is required and the impacts are estimated to be similar to disposal (e.g., page 5-63 et seq; exceeding 10 CFR Part 61.41 dose limits). Also, there are statements in the document that question if significant quantities of DU metal are suitable for disposal (e.g., last paragraph on page 2-21). Inclusion of a discussion about the disposition of the DU cask after use, and potential impacts, is recommended. *89-12*

10. Technology and Equipment Development

The PEIS encompasses numerous technologies that are at different stages of development, in terms of process, understanding, equipment, (potential) impacts, and uncertainties. For example, of the conversion, application, and disposal impacts discussed within the summary, none are practiced on any scale domestically, and only conversion to U_3O_8 is practiced on a large scale internationally, producing a low density product. Thus, there is only one direct analogy. DOE should consider including a technology discussion, with status and assessment, perhaps with either a time schedule or probability of success, for some of these technologies. For example, it seems like a significant extension of existing uranium dioxide sintering technology to take pellets from 100 te(U)/yr/line to 7,000 te(U)/yr/line. From the uranium dioxide technology perspective, microspheres (e.g., from gelation) may be the more mature technology because of the (potential) use of tube furnaces and pilot plant tests with equipment processing rates an order of magnitude larger. Similarly, a uranium dioxide/concrete cask approach appears to be a significantly easier technology to understand and scale than casting a 40 te(U) metal shield. *89-13*

11. Existing Facilities and Experience

There are obvious analogies with existing, commercial fuel cycle facilities, which process uranium hexafluoride into uranium dioxide (for nuclear fuel) and (to a lesser extent) uranium metal. On an international scale, Cogema has been converting UF_6 to U_3O_8, compressing it in steel containers, and storing the containers in metal reinforced seismic buildings since 1977 to avoid the hazards of storing UF_6. These facilities are already licensed by the appropriate regulatory agencies. The PEIS does not mention these facilities, either as a source of experience or as a source of processing capacity, particularly during the development of uses for the DU materials and as a means for surge capacity. The PEIS also does not appear to draw upon the operating experience of these facilities, including waste generation and uranium content of byproducts. Reliance upon existing facilities may lessen environmental impacts associated with the construction of a new facility. Thus, DOE may wish to include the *89-14*

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experience of operating commercial facilities and comment upon their potential use (or non-use) during the development of applications for the DU.

12. Economic/ Socioeconomic Analyses

The PEIS mentions a separate Cost Analysis Report (CAR) as providing input to the PEIS (page 1-7). However, program costs do not appear to be included in the analyses. DOE should consider including a brief comparison of the costs and other economic impacts in the PEIS, perhaps as part of the summary (e.g., in Table S-2). Also, from a socioeconomic standpoint, all the alternatives considered will create jobs, DOE should address whether or not the areas chosen for construction can sustain the necessary development that will accompany the influx of workers *89-15*

Specific Comments:

1. Fuel Cycle Process

In the background section of the summary on pages S-1, S-2, DOE may want to briefly explain the fuel cycle process and point out the various forms of uranium at each stage. This would help elucidate the natural occurrence of U_3O_8 and substantiate its suitability for disposal alternatives. *89-16*

2. Mass of DU

The insert on page S-2 identifies some 46,422 DU cylinders distributed between the three sites. While the total quantity is listed in the main text of the report, it would be helpful to have the approximate masses (as either MTU or $MTUF_6$) for the three sites listed in the summary as well. *89-17*

3. United States Enrichment Corporation DU

The insert on page S-2 also notes that an additional 8,000 cylinders have been produced by USEC. It is suggested that this number is also divided between the sites and expressed in mass quantities. It is also recommended that a brief discussion about the USEC DU be included, perhaps as part of the first paragraph on page S-4. While the EIS excludes the USEC DU from its analysis, it also implies that there is a reasonable probability of it becoming DOE's responsibility. Consequently, DOE may want to consider that possibility in its impact analysis. *89-18*

4. Summary Table S.2

On pages S-17 and S-18, irreversible adverse health effects as well as adverse effects are identified for cylinder accidents. This terminology should be defined and explained by a footnote in the table. A more quantitative measure of chemical effects should be included, as uranium toxicity is a major concern that needs to be addressed. In addition, the cylinder accident scenarios should indicate estimated quantities of the releases of uranium and HF *89-19*

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shown in the table including the time period of exposure and length of time of the release. Finally, DOE should indicate exposures to involved workers instead of only exposures to the public and non-involved workers.

5. New Madrid Seismic Zone

Page S-34 mentions "the conversion accidents estimated to have the largest potential consequences were...involving the rupture of tanks of anhydrous HF or ammonia" would be caused by a large earthquake which has an assumed frequency of less than 1 in 1 million per year of operations. DOE should mention that a facility built near the Paducah Gaseous Diffusion Plant would be located near the New Madrid seismic zone. Additional seismic analyses would need to be performed for such a facility as well as an accident analysis taking into account the seismicity of this area. *89-20*

6. Non-Shield Use of DU

Page 2-21 mentions uses for DU such as developing penetrators, vehicle armor, and industrial ballasts. No mention is made of quantities or relative percentages of the DU inventor that these uses would require. Also, it is not self-explanatory that DU cask manufacturing and uses bound all of the potential uses. For example, metal uses would appear to require a significant amount of alloying and/or machining, and involve handling and disposal concerns. DOE may wish to include a longer discussion and a more comprehensive explanation. *89-21*

7. Leach Rates for Disposal

Page 2-22 briefly mentions leach rates and waste forms, and states that grouted wastes are representative of immobilized waste forms with low leach rates, with the implication that grouting is also representative of vitrification. DOE should clarify this text, as grouting may be representative of vitrification for some parameters (e.g., facility size) but not representative in others (e.g., energy usage, emissions). Also, while grouting should provide for somewhat lower leach rates as compared to the ungrouted material, vitrification would be expected to provide 5 to 6 orders of magnitude lower leach rates than grouting. Furthermore, a quantitative mention of the values of the leach rates is beneficial, as each uranium form will exhibit different rates. These factors may be an issue for some disposal options and consequently should be discussed. *89-22*

8. Disposition of Empty Cylinders

Often when a cylinder is processed, an amount of UF_6 (the heel, containing U^{235} daughter products) remains in the cylinder. DOE should describe how the cylinders will be cleaned and how the heels are going to be dealt with. Furthermore, though potential options for the disposition of empty DU cylinders are listed on page 2-23, the impacts are not included. It would seem reasonable to provide a brief discussion on these options and include impacts from cylinder disposition in the EIS. *89-23*

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9. Water and Soil Impacts from DU Disposal

The summary table of impacts (Table 2-2) and the supporting text for the water and soil section (page 2-50) note that the groundwater uranium concentrations will exceed drinking water guidelines. It is recommended that the expected concentrations are also expressed in terms of individual radiation doses. *89-24*

10. Waste Management

Pages 2-52 et seq present a summary of the waste management impacts from the alternatives. Comparisons of the amounts generated are primarily made relative to the DOE waste management system, however, these facilities could also be commercially operated under NRC or State regulations. Consequently, DOE should consider adding a comparison to commercial LLW generation rates. The section should also include estimated uranium levels for the magnesium fluoride waste (from DU metal production) and discuss the aspects of DU disposal, including the potential need for either a dedicated or a deep disposal facility. *89-25*

11. DOE's Preferred Alternative

Section 2.5 (pages 2-54 et seq) present DOE's preferred alternative. This section would benefit from a greater discussion of the potential uses of DU, including the SNF storage casks. *89-26*

12. Generic Sites

Pages 3-58 et seq present information on the generic sites for wet and dry locations for disposal, and mention that the site data for each are derived from actual wet and dry sites. It is suggested that the actual sites which provide the basis for the generic locations be listed. *89-27*

13. PEIS Time Period

Page 4-2 lists a 41 year time period for the EIS (through the year 2039), and indicates activities beyond 2039 would be subject to appropriate NEPA reviews and decisions in the future. This appears to truncate the analyses for some of the alternatives which might influence the selection of the preferred option; for example, impacts from wastes in a disposal cell are unlikely to occur by 2039, major cylinder/container replacements may be required for the storage option in the 10-20 years after 2039, significant applications for use of the DU may not have developed etc. DOE may wish to consider a time period consistent with the logical conclusion of the options or their "life-cycle," which may require a timeframe beyond 2039 *89-28*

14. Background Radiation

On page 4-15, the example with background radiation appears to have left "year" out of the units. *89-29*

15. Waste Management Approach

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Page 4-25 lists the waste management approach. Inclusion of waste categorization methods and categories (e.g., per 10 CFR 61), and current commercial capabilities would be beneficial. DOE may also want to discuss if there are any waste management situations that require the development of additional waste management capabilities and/or capacity. *89-30*

16. No Action and Storage Alternatives

Pages 5-3 and 5-19 discuss the estimated cylinder failure rates for the No Action and UF6 Storage alternative. These appear to use the opposite ends of the failure rate range - No Action uses the lowest failure rate, while Storage uses the highest failure rate - without explanation. Also, the existing cylinders may not have adequate wall thicknesses under either alternative due to both internal and external corrosion over the years (see Appendix E), and the DU may have to be transferred to new cylinders within the timeframe covered by the EIS. Furthermore, if the cylinder wall thicknesses deteriorate significantly, they may not meet American Society of Mechanical Engineering (ASME) code for processing. DOE should consider presenting a discussion on these items in the text. *89-31*

17. Tank Rupture Frequencies

On page 5-40, Table 5.4 lists tank rupture accidents as "incredible" events, when typically they are assigned a value corresponding to the "extremely unlikely" frequency bin. A brief discussion of the basis for DOE's assessment is recommended. *89-32*

18. Surface Water Dilution of Effluents

On page 5-51, the text indicates effluent levels greatly exceeding EPA guidelines for uranium, but notes that the concentration would be much lower and below the guideline after dilution in nearby surface water. This should be clarified, and potential dose consequences of these effluents presented. *89-33*

19. Land Use Requirements

Page 5-55 identifies land use requirements for the facilities. Contrary to the small land requirements indicated in the PEIS, conversion and metal use plants would be anticipated to have larger land use because of facility size and require potentially larger setbacks for potential accident mitigation from uranium releases. The LES EIS maintains the amount of land required for a generic conversion facility is 1000 acres whereas the PEIS indicates only 30-40 acres are necessary. The text also does not indicate if any major setbacks, protective action distances (PADs), or planning zones are likely to be needed around the facility because of the handling of large quantities of DU, the hexafluoride, and/or the metal (including melting operations). DOE should consider a discussion in the text on these subject matters. *89-34*

20. Oxide and Metal Accident Consequences

Pages 5-55 et seq discuss the use and impacts of uranium dioxide as shielding, and pages 5-66 et seq discuss the use and impacts of uranium metal as shielding. Some of the values imply non-intuitively obvious lower impacts from a metal route as compared to the oxide route; it is *89-35*

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recommended that these are discussed and explained in more detail. For example, the text on page 5-71 estimates the highest consequences from an accident with the metal route as 15 mrem (from a fire involving three cylinders, an energetic accident with reactive materials), as compared to 270 mrem (from an earthquake during uranium dioxide storage, a low energy event with non-reactive materials) - there is no explanation for the difference. Also, the supporting information in Appendix H shows similar inconsistencies; the unlikely accidents for the oxide (Table H-5, page H-18) are significantly higher than the corresponding accidents for the metal (page H-17). Page H-17 also contains apparent inconsistencies; the mishandling/dropping of solid DU metal accident releases a greater quantity of uranium than the molten uranium accidents. Upon further review, the source of these apparent anomalies goes back to Section 6.11 of the Engineering Analysis Report (EAR). These anomalies and inconsistencies include:

- Page 6.11-7-6 uses a damage fraction of 30% for the metal and 100% for the oxide; comparable or lower values would seem appropriate for the oxide.

- Page 6.11-7-7 uses a damage fraction of 1% with molten uranium metal and 100% for the oxide for a mixer/melter accident; these values for the damage fraction appear to be contradictory and may have been inadvertently reversed (i.e. they should be 100% for the metal and 1% for the oxide).

- A similar incongruity exists for the Mixer/Melter Discharging Accidents on pages 6.11-7-7 and 6.11-7-8, where the damage fraction for metal use is 1% while 100% is used for the oxide route. *89-35 (Con't.)*

- On page 6.11-7-8, the metal shield failure uses a damage fraction of 0.1% while the oxide shield failure damage fraction uses 100%; again, these appear to be reversed. Also, the failure modes may be completely different, and this does not appear to have been captured by the scenarios and calculations.

- The stated release fractions for the metal accidents on these pages appear to be unconservatively low; DOE-HDBK-3010-94 recommends 1E-02 as bounding for "disturbed molten metal surface with high turbulence" and 1.0 for "small molten metal drops hurled through air or explosion of entire metal mass." The melter failure and discharge accidents would appear to be in the latter category, and most of the other accidents would appear to be bimodal, with some portions of the release in both categories. These effects would increase the source terms for the analyses.

- The oxide and metal design basis events are analyzed with different bases; the high efficiency particulate air (HEPA) filters for the metal facility are assumed to keep functioning, while the oxide HEPA system does not function. This seems inconsistent.

- The oxide release fractions appear to be based upon fuel pellet data sintered from powders (i.e., submicron grain size), sintered too close to the theoretical density of uranium dioxide (11 g/cc). It is not clear how this data applies to the lower density

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uranium dioxide pellets (i.e. 8 g/cc, expect a somewhat higher release fraction) and the density of the solution formed gelation particles (much larger grain sizes - expect a lower release fraction).

- Table H-5 of the PEIS categorizes a furnace failure as an "Incredible" event while the EAR (page 6-11-7-6) implies 8E-5/yr. *89-35 (Con't.)*

These points should be discussed and explained better in the PEIS, and values corrected as required.

21. Metal Cask Waste

Page 5-76 of the PEIS presents waste management for the metal cask manufacturing route. Waste management appears to have overlooked secondary wastes related to manufacturing, which are unique to uranium metal. For example, induction furnaces for uranium metal are usually lined with graphite, which requires periodic removal and replacement (sometimes as frequently as every ten charges). Also, while the proposed approach appears to use primarily direct casting, some uranium metal machining operations may be required, and, historically, these generate significant wastes containing partially oxidized uranium metal. The PEIS should include these potential impacts that primarily affect only the metal route. *89-36*

22. Waste Disposal

Section 5.6 (pages 5-78 et seq) and Appendix I present the impacts from disposal of the DU, for both the operational phase and the post-closure period. The radiological impacts from the accidents seem unexpectedly high. For example, public doses of up to 1.1 rem and noninvolved worker doses as high as 140 rem are determined, apparently due to earthquake initiated events, without explanation. The routine impacts also seem high for the post-closure phase and appear to follow the radiological order: mine impacts > vault impacts > trench impacts. Calculations appear to use an infiltration area effect and do not account for chemical form, solubility, and kinetic effects. Table I.31 contains values of zero for the dry site doses for all three disposal approaches, and no collective dose estimates are included. These points are not obvious and it is recommended that they are explained in more detail. *89-37*

23. Other Uranium Forms

The primary uses the PEIS focuses on are uranium in concrete and DU metal for the shielding material. Other uses exist such as vitrified pellets with UO_2, and UO_2 composite material in a SNF cask. These have been published in the open literature and should be mentioned and referenced. *89-38*

24. Low Estimates of Staffing Levels

The estimated numbers of staff required for several of the alternatives in the PEIS seem low. For example, the UO_2 pellet approaches use similar technologies to existing fuel fabrication *89-39*

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facilities of 1,000 te/yr capacity which employ several hundred people. However, the PEIS estimates only 300 workers will be needed for a plant of 20,000 te/yr capacity. Th s seems low even considering economies of scale. *89-39 (Con't.)*

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COMMENTOR NO. 90: BOWERS, BRIAN OAK RIDGE, TENNESSEE

TO: depleted UF6 at SAIC EMZ

Subject. DUF6 PEIS Comments

Please accept my comments below on the DUF6 PEIS. I did my best to get them to you as soon as possible. Thank you for the opportunity to comment.

Brian Bowers

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*

1. General - The PEIS describes the preferred alternative as "to use the entire inventory of material." This is misleading. The goal is to use the material but since there is little demand at present, the actual action is continued storage indefinitely. Demand for use of the material, as stated in the PEIS, is quite limited at present. It is accurate to say that the material would be converted and reused as demand dictates but it is misleading to emphasize the speculative portion of the alternative when, in reality, it could be stored as UF6 for a long time. I agree that the best alternative is to continue the safe storage of the UF6 and convert/use it as demand dictates, but I think the PEIS needs to clearly present the preferred alternative in those terms rather than mislead the reader into focusing on uses that have yet to be identified. *90-1*

2. General - The main conclusions of the cost analysis report should be included in the analysis of socioeconomics in the PEIS. It is misleading and irresponsible to analyze only the perceived benefits (employment, increased local revenue) and not consider the costs. Who is going to pay for these actions and how much is it going to cost? In this era of taxpayer dissatisfaction, consideration of costs must be included in any socioeconomic analysis as this is certainly a potential impact on the human environment. *90-2*

3. General - The PEIS does not adequately evaluate the impacts associated with the empty steel cylinders that would be generated in the event of conversion and/or reuse of the material. What to do with over 46,000 14 ton, radioactively contaminated steel cylinders is an extremely important part of the long-term management strategy and must be appropriately analyzed and considered in any decision making. The PEIS does not demonstrate adequate analysis of this issue. *90-3*

4. General - I understand the accident analysis methodology in terms of probability and consequence. However, I could not find in the PEIS where such "statistical" accidents were matched to real accident scenarios. From comments on other documents, it is clear this is what the public *90-4*

COMMENTOR NO. 90: BOWERS, BRIAN (CONT'D.)
OAK RIDGE, TENNESSEE

wants to know. They want to know about the probability and consequences of a tornado and an earthquake. I could not tell if such scenarios were adequately represented in the PEIS.

5. General There are still numerous places where the West Kentucky Wildlife Management Area is incorrectly referred to as the Western Kentucky Wildlife Management Area. **90-5**

6. p. S-2, para. 2 - I challenge the notion that the current management plan call s for conversion to triuranium octaoxide. Where is this written? How would conversion and disposal be paid for? This is not considered part of No Action. **90-6**

7. Section 3, general - Based on the text on page 3.1 and Figure 3.1, the PEIS describes the "Paducah site" as including all of the land owned by DOE including that licensed to the Commonwealth of Kentucky. The PEIS describes the "PGDP" as a 750 acre industrial area within the Paducah site. As there is a security fence around the 750-acre area (actually 748 acres) and the area outside this fence is primarily wooded, it is appropriate to discuss these separately, where necessary, to distinguish differences in the two environments. However, the PEIS makes numerous mistakes when describing various aspects of the two environments, apparently due to confusing the "Paducah site" with the "PGDP." For example, Section 3.1.5.3 states that there are no wetlands "identified on the Paducah site by the National Wetlands Inventory." This statement would be correct for PGDP but not the Paducah site. These errors are pointed out in the specific comments below. **90-7**

In addition, the PEIS often does not use the most current and accurate information readily available For example, the National Wetlands Inventory does not provide very useful information for anyone wanting to know about wetlands that occur on the Paducah site. Two reports that should be used include:

<paraindent><param>left</param>U. S. Department of the Army, Corps of Engineers - Nashville District and Waterways Experiment Station, <italic>Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area McCracken County, Kentucky</italic>, Volumes I -V, May 1994

</paraindent> **90-8**

<paraindent><param>left</param>CH2M Federal Programs Corporation, <italic>Investigation of Sensitive Ecological Resources Inside the Paducah Gaseous Diffusion Plant</italic>, August 19, 1994, Document Control Number 7916- 003-FR-DBRY

</paraindent>

The first document reports on wetlands, floodplains, cultural resources, and threatened/endangered species on and near the PGDP site, primarily outside of the plant security fence. The latter document reports on wetlands and threatened/endangered species inside the plant security fence. There have been some informal updates to these reports since they were issued.

COMMENTOR NO. 90: BOWERS, BRIAN (CONT'D.)
OAK RIDGE, TENNESSEE

Two sensitive resources common to the DOE reservation at PGDP but not analyzed in the PEIS are 100-year floodplains and prime farmland. Granted, there would not be much analysis based on the PEIS approach of deferring site specific evaluations to later NEPA documents. However, the PEIS should include these resources in site descriptions and evaluate for potential impacts at the appropriate time. Information on floodplains at PGDP is reported in the Corps of Engineers report referenced above. Prime farmland information is available from site personnel or local offices of the Natural Resources Conservation Service. **90-9**

Section 3 should be thoroughly reviewed and revised to accurately describe the affected environment. Consequently, analysis of potential impacts should be revised, where necessary. **90-10**

8. Sec. 3.1 - The PEIS does not provide an accurate portrayal of the size and location of the West Kentucky Wildlife Management Area (WKWMA). WKWMA totals about 6623 acres of which the state owns 3106, 1986 acres are licensed from DOE, and 1731 acres are licensed from the Tennessee Valley Authority. WKWMA completely surrounds PGDP. Much of the area referred to in the PEIS as the Paducah site is also part of WKWMA. This is not reflected in Figure 3.1 or in some of the analyses of impacts. **90-11**

9 Sec. 3.1.5.1 - DOE received a new KPDES permit on March 13, 1998. The PEIS should be revised accordingly to reflect the changes. **90-12**

10. Sec. 3.1.6.2 - The PEIS is incorrect - there are many wetlands on the Paducah site. In fact, some were filled in to build the latest cylinder storage yard. **90-13**

11. Sec. 3.1.6.4 - The information here with regards to threatened and endangered species is misleading. First, there is a lot of significant potential summer habitat for the federally endangered Indiana bat so it is quite likely it occurs on the Paducah site. Second, there is no state line with any enforceable protection standards. I applaud the PEIS for looking at these "state-listed" species but their legal status should be made clear. **90-14**

12. Sec. 3.1.10 - Overall, the description of cultural resources is current and well done. However, there is at least one cemetery on the Paducah site, just north of PGDP. **90-15**

13. Sec. 5.8 The PEIS purports to include other past, present, and future actions, and non-DOE actions in its cumulative impacts analysis. However, no specific actions are identified. In order for the reader to assess if cumulative impacts were adequately assessed, the PEIS needs to include specific information on what other activities were considered. **90-16**

14. Pages D-3 to D-5 tell me all I really need to know regarding potential impacts Continued storage (No Action Alternative) would result in an estimated worst case of 59 cylinder breaches through 2039 Impacts from these breaches would be minimal. On the other hand, the action alternatives would result in an estimated worst case of 731 breaches through 2039. On the basis of potential impacts alone, it is **90-17**

COMMENTOR NO. 90: BOWERS, BRIAN (CONT'D.)
OAK RIDGE, TENNESSEE

clear that No Action is environmentally preferrable. The PRTS needs to clearly state this in all summary text areas.

15. General (Overall Conclusion) The PEIS clearly supports continued storage of the material as UF6 until viable uses are identified (called No Action in the PEIS). Continued storage, with the assumption of at least partial use by the year 2019, is shown to have the lowest environmental impacts. It is also, by far, the least costly alternative although the PEIS is deficient in showing this. Finally, continued storage for several more years with little adverse impact would allow for further demands for the material to be developed and speculative measures, such as conversion or consolidation, would not be necessary at this time. It is disappointing that all of DOE's effort did not result in any significant, realistic near-term uses for the material but at least the PEIS shows that continued storage as UF6 at the current sites would not present unmanageable problems **90-18**

END OF COMMENTS

COMMENTOR NO. 91: UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
CHICAGO, ILLINOIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
77 WEST JACKSON BOULEVARD
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MAY 15 1998

REPLY TO THE ATTENTION OF

B-19J

Charles E. Bradley, Jr.
Depleted Uranium Hexaflouride Management Program
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874-1290

Re: Draft Programmatic Environmental Impact Statement for Alternatives Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride

Dear Mr. Bradley:

Thank you for your letter dated December 18, 1997 and the Draft Programmatic Environmental Impact Statement for Alternatives Strategies for the Long-Term Management and Use of Depleted Uranium Hexaflouride which accompanied it. It is our agency's opinion that the depleted uranium hexaflouride (DUF_6) should be converted to a form that is more stable and less hazardous, such as uranium oxide (U_3O_8), for long term storage or until an alternate use can be found and we applaud your management program for proposing this alternative. In accordance with our responsibilities under the National Environmental Policy Act (NEPA) and Section 309 of the Clean Air Act, we have reviewed the information that you submitted. Based on the information provided, we have rated this DEIS EC-2. The EC portion of the rating indicates that we have environmental concerns and the 2 portion of the rating indicates additional information, data, analyses or discussion should be included in the final EIS. To satisfy these concerns, please provide additional discussion, data, and/or analysis to addresses the following: **91-1** **91-2**

1. A single location for a conversion pilot plant should be identified to evaluate the engineering and other demands of converting the material. After experience has been gained operating a stabilization process in a single location, consideration should be given to whether the single plant, or plants at multiple locations would be best suited to converting any remaining material. **91-3**

2. Until such time as the DUF_6 is converted to a more stable form, a long-term storage strategy should be developed to address issues surrounding deteriorating storage canisters. **91-4**

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3. Before transporting DUF_6 in storage canisters with deteriorated or uncertain integrity, secondary containment or other engineering measures should be employed to ensure safety comparable to that provided by new canisters. *91-5*

4. U.S. Department of Energy (USDOE) and the United States Enrichment Corporation (USEC) should apply a single, compatible methodology to discharge their respective responsibilities for the materials. *91-6*

5. Conversion of this material should not be dependant on market demand. DOE should include plans to seek funds from Congress for conversion of all DUF_6. *91-7*

6. An appropriate budget should be submitted to adequately fund this process for the necessary time periods. Funding needs to be provided to insure the reduction of potential risks to the environment and to public health. *91-8*

Be advised that you may require a Section 404 permit from the U.S. Army Corps of Engineers if wetlands will be impacted during this project. You should be in contact with them to determine whether this project will require such a permit. In accordance with the Section 404(b) (1) guidelines of the Clean Water Act, wetland impacts must be avoided and/or minimized whenever possible, and satisfactory compensation for unavoidable impacts must be provided.

With respect to provision of compensatory wetlands, our Agency routinely finds that a minimum of 1.5 acres of compensatory wetlands are necessary to offset the loss of each acre of naturally occurring wetlands impacted by the project at issue. In addition, the compensatory wetlands should be designed to replicate as closely as possible the specific mix of types, functions and values provided by the project-impacted wetlands. The compensatory wetlands should be established via the process of restoration to the extent feasible, and they should be located in an area as close as practicable to the project-impacted wetlands. *91-9*

We trust that you will find these comments useful. If you should have any questions, please contact me at 312-886-7342.

Sincerely,

Michael W. MacMullen, Manager
Federal Activities Program
Office of Strategic Environmental Analysis

COMMENTOR NO. 92: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION MOREHEAD, KENTUCKY

JAMES E. BICKFORD
SECRETARY

PAUL E. PATTON
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
MOREHEAD REGIONAL OFFICE
200 CHERRY CREEK RD. STE. 4
MOREHEAD KY 40351-1346

June 4, 1998

Charles E Bradley, Jr.
Office of Facilities (NE-40),
Office of Nuclear Energy, Science and Technology
U S Department of Energy
19901 Germantown Road
Germantown MD 20874

Re: Draft Programmatic Impact Statement for Alternative Strategies for the Long-Term Management and Use of Depleted Uranium Hexafluoride.

Dear Mr. Bradley:

The Natural Resources and Environmental Protection Cabinet (NREPC) serves as the state clearinghouse for review of environmental documents generated pursuant to the National Environmental Policy Act (NEPA). Within the cabinet, the Commissioner's Office in the Department for Environmental Protection coordinates the review for Kentucky State Agencies.

We have just gotten response from one of the Kentucky State Agencies, the Division of Water, which has comments (attached) on the UF_6 Management Strategy that you may be able to use in your considerations for selecting alternative strategies. I am hopeful that you can still incorporate these comments. If, and/or when, a final environmental impact statement is published, please send 16 copies of the document, and I will coordinate responses from the Kentucky State Agencies

If you should have any questions, please contact me at (502) 564-2150, ext. 112.

Sincerely,

Alex Barber

Enclosure

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COMMENTOR NO. 92: COMMONWEALTH OF KENTUCKY, DEPARTMENT FOR ENVIRONMENTAL PROTECTION (CONT'D.) MOREHEAD, KENTUCKY

JAMES E. BICKFORD
SECRETARY

PAUL E. PATTON
GOVERNOR

COMMONWEALTH OF KENTUCKY
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION
FRANKFORT OFFICE PARK
14 REILLY RD
FRANKFORT KY 40601

MEMORANDUM

TO: Alex Barber
State Environmental Review Officer
Department for Environmental Protection

FROM: Timothy Kuryla TK
EIS Coordinator
Division of Water

DATE: June 4, 1998

SUBJECT: PDEIS, Long Term Management of UF_6 (No Apparent Kentucky County), SERO 980114-02

The Division of Water has reviewed the Programmatic Draft Environmental Impact Statement, prepared by the U.S. Department of Energy, Office of Nuclear Energy, Science, and Technology, regarding the long term management and use of depleted Uranium Hexafluoride (UF_6) (no apparent Kentucky county). The Division finds the current facility emergency response contingency plans appear to be adequate. If UF_6 were to be used or stored in Kentucky, then pursuant to 401 KAR 5:037, a groundwater protection plan would be required. **92-1**

cc: William Borger, Field Operations Branch
Phil O'dell, Groundwater Branch

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COMMENTOR NO. 93: SANTA FE ALLOYS ALBUQUERQUE, NEW MEXICO

Santa Fe Alloys

4515 Stockbridge Avenue, NW
Albuquerque, NM 87120-5407, USA
Phone, or Call for Fax (505) 899-2178

May 30,1998

Mr. Charles E. Bradley, Jr.
Office of Facilities (NE-40)
Office of Nuclear Energy, Science and Technology
U.S. Department of Energy
19901 Germantown Road
Germantown, MD 20874
Direct Phone: (301) 903-5512
Subject: Comments for UF6 meeting on June 2, 1998

Dear Mr. Bradley:

I would like to submit the following comments for public use in your upcoming UF_6 meeting:

1. I believe that DOE offers reasonable evaluations and wise preferences among the alternative strategies, i.e., preferring 100% use of the UF_6 (i) for conversion to uranium as oxide or metal and (ii) using as much of the material as DOE can to leave it recoverable.

Roughly 99 times the potential energy of the bomb U-235 material remains with the U-238 (DU) residue—as some of your readers will know. This DU could all be used in breeder reactors to generate future electric power, and then it would have high economic value.

It would be an environmental tragedy to throw it away, yet many people urge discarding this "useless" metal. **93-1**

I commend DOE's for trying its best to save the material and for how it has identified DU use for radiation shielding. This would leave the DU available and not wasted. Other uses are sought.

One of the saddest parts of this situation is that **all the DU metal could be saved if we would**—the DU volume from all UF_6 (and all that energy) could be stored in a cube less than 100 feet on edge. But such storage is probably not politically feasible at this time.

1

COMMENTOR NO. 93: SANTA FE ALLOYS (CONT'D.) ALBUQUERQUE, NEW MEXICO

2. The draft PEIS serves well in justifying the DOE preference above, but care must be taken that postulated processes are reasonably justified experimentally before they are heavily funded. Sometimes, an overall process is not well evaluated to see if the pieces have been combined in ways that are not awkward. *93-2*

Specifically in the case of the selected CMR production of DU metal, there should be evaluations and experimental confirmation of whether the old hydrogen reduction of UF_6 should be a precursor of the metal production, or if other approaches are better. Also, features such as minimization of radioactive transport (which the public dislike) should also be considered carefully.

3. The people doing the postulated process writeups have done well, but further input is needed. Your public meetings may provide that input, especially as combined with private meetings from outside DOE. *93-3*

Thank you for this opportunity for input.

Sincerely,

Guy R. B. Elliott

Guy R. B. Elliott
President