

June 25, 1997

Nuclear Waste Technical Advisory Board
2300 Clarendon Boulevard Suite 1300
Arlington, VA 22201-3367

Please include the following written comments and attached documents as part of the public comment period for the June 25-26, 1997 Summer Board Meeting in the Crowne Plaza Hotel, Las Vegas, Nevada:

The proposed Yucca Mountain nuclear waste repository NW of Las Vegas is now technically obsolete because radioactive waste can be ameliorated by using a brand new technology called "plasma-injected transmutation". To save billions of dollars of federal tax money, the Yucca Mountain Project can and should be terminated as soon as possible.

For a year and a half, I have been closely following a particular nuclear research effort involving three private groups in the San Francisco Bay Area, Salt Lake City, and Cincinnati. On April 4, a breakthrough was finally made where a four-hour test of plasma-injected transmutation in Salt Lake City resulted in 30% reduction in the radioactivity of a solution of radioactive thorium nitrate. At this time, tests of an improved version of plasma-injected transmutation are achieving 50% reduction of radioactivity in less than one hour of processing time, the production of much more thermal energy than was input as electrical energy, and the appearance of many elements that were not previously present in the pre-processed sample. More tests and improvements are expected to be forthcoming.

I have attached Hal Fox's April 2, 1997 Yucca Mountain comment, Fox's summary of 7 methods of radioactivity remediation, Robert Bass's June 16, 1997 news release, and an explanation of the basic principle I wrote as "A Primer for Non-Physicists". Reduction of radioactivity using plasma-injected transmutation can be demonstrated in Fox's laboratory.

Would it be possible for the Nuclear Waste Technical Advisory Board to help with terminating the Yucca Mountain nuclear waste repository project? We need to advise Congress to switch funding of the Yucca Mountain project over to U.S. Department of Energy funding of further development of plasma-injected transmutation technology for the amelioration of high-level radioactive waste on-site at nuclear power plants.

The benefits would be significant: In addition to huge financial savings in the handling of radioactive waste, there would be no more radioactive waste to worry about leaving for future generations to safeguard. There would be less fissionable material for potential nuclear terrorists to make city-destroying bombs out of. Nuclear power plants would be safer due to less radioactive waste stored on-site. We have also been talking about reprocessing and reducing the radioactivity of uranium mine and mill tailings piles such as the one in the Moab area.

A few notes of explanation:

Ameliorating the radioactivity of solid waste such as spent nuclear fuel pellets requires Ken Shoulders' SPARX. Ameliorating the radioactivity of high-level radioactive liquids requires the Neal-Gleeson process (Cincinnati) which has been enhanced by the work of the Salt Lake City group. However, they both use the high-density charge-cluster principle as explained by my ping pong ball/bowling ball analogy.

When the discovery of excess heat resulting from a process similar to electrolysis was made, it was originally thought that a mysterious form of fusing hydrogen atoms into helium atoms had been found which does not require the extremely high pressures and temperatures found in a fission-fusion-fission bomb or the stars. Thus it was dubbed "cold fusion". Subsequent inability to find "helium ash" that should be left over from such a reaction led to public discrediting of the process. Replication difficulties, contamination problems, and strange quirks additionally confused researchers. I probably should slightly rewrite my simplified explanation of "low-energy" nuclear reactions (plasma-injected transmutation) in order to clarify this point. So far, 173 "cold fusion" patents have been granted in Japan, but only a few "cold fusion" patents have been granted by the U.S. Patent Office due to opposition by the hot fusion community.

The reason for stopping at 50% reduction of radioactivity rather than 100% reduction of radioactivity can be understood as follows: Assume a sample starts out with 1,000,000 atoms of thorium. The probability is high that the high-density charge clusters will hit a thorium atom during a plasma-injected transmutation procedure. After 50% reduction of radioactivity, what is left are 500,000 atoms of thorium and 1,000,000 or more atoms of non-radioactive daughter elements. Now the probability is much lower that a high-density charge cluster will hit a thorium atom. Instead, the clusters are more likely to hit a daughter element atom. The efficiency of the process is thus greatly reduced, and it pays to stop the process and remove the daughter elements to get them out of the way.

Technical articles on plasma-injected transmutation and additional information are available from Fusion Information Center, Inc., PO Box 58639, Salt Lake City, Utah 84158 (801) 583-6232, fax (801) 583-2963, email: halfox@slkc.uswest.net

Sincerely,



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April 2, 1997

Gary Vesperman *

April Gil, U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Yucca Mountain Site Characterization Office
Docket No. RW-RM-96-100,
POBox 30307
Las Vegas, NV 80036-0307

SUBJECT: COMMENT ON YUCCA MOUNTAIN REGULATIONS

TO: Whom it May Concern

The mission of the DOE should include the optimal means of handling high-level radioactive waste with minimal risk to U.S. citizens in all echelons of processing. If the high-level radioactive waste can be ameliorated **on site**, then the combined risks of packaging, transporting, and geologic storage are removed. **The purpose of this letter is to inform you that technology now exists by which high-level radioactive wastes can be ameliorated.**

Contrary to the findings of the National Research Council, as published in the book Nuclear Wastes, Technologies for separations and Transmutation, there is a better method than geologic storage. The purpose of this letter is to inform you that such technology now exists to greatly reduce the radioactivity of radioactive slurries and solids. This new technology can be implemented at a fraction of the cost of packaging, transporting, and geologic storage.

This technology is being developed by three private groups and as of March 1997 had been given to a major university for independent replication. No government funds have been provided for the development of this technology **mainly because the technology had not been independently replicated**. However, the theory for the technology has been developed by one of the three groups and is now being evaluated by nuclear physicists associated with one of the National Energy Laboratories.

At the present time there is insufficient information as to the effect of high-level nuclear wastes on the encapsulating materials used to contain and/or transport these high-level radioactive materials. Therefore, there is inadequate assurance that the storage facilities in Yucca Mountain can protect the health and safety of the public. In

addition, there is inadequate assurance that such high-level radioactive materials can be packaged, transported, and delivered to Yucca Mountain without civilian risk.

In view of these risk factors, **but more important, because there is new technology available to remove most of the risks of packaging, transporting, and storing high-level radioactive wastes**, this on-site treatment process should be immediately and thoroughly investigated.

Our staff is ready and willing to help the DOE achieve its mission of handling the radioactive high-level wastes in a manner that should be the most politically acceptable, the safest, and the most economical. This new technology is scientifically correct (meets the requirements of standard nuclear physics), is politically the correct choice, and eliminates most of the hazards to the public that are entailed in the currently proposed process of packaging, transporting, and long-term storage. In addition, this new technology is expected to be far less expensive.

We strongly encourage the DOE to plan immediate proof of and support for on-site amelioration of all high-level radioactive wastes.

Sincerely,

Hal Fox, Editor, *Journal of New Energy*

cc: Utah's Senators and Utah's Congressmen and other political leaders.

P.S. For the latest technical and professional papers see Volume 2, Numbers 3 & 4 of the *Journal of New Energy*. Here are the most important references:

Ken Shoulders & Steve Shoulders, "Observations on the Role of Charge Clusters in Nuclear Cluster Reactions", *J. of New Energy*, vol 1, no 3, pp 111-121, Fall 1996.

Robert Bass, Rod Neal, Stan Gleeson, & Hal Fox, "Electro-Nuclear Transmutation: Low-Energy Nuclear Reactions in an Electrolytic Cell", *J. of New Energy*, vol 1, no 3.

Hal Fox, Robert W. Bass, Shang-Xian Jin, "Plasma-Injected Transmutation", *J. of New Energy*, vol 1, no 3, Fall 1996, pp 222-230, 23 refs, 4 figs.

Shang-Xian Jin & Hal Fox, "Characteristics of High-Density Charge Clusters: A Theoretical Model", *J. of New Energy*, vol 1, no 4, Winter 1996, pp 5-20, 16 refs.

EXHIBIT 1

RADIOACTIVITY REMEDIATION

Harold L. Fox

Editor, Journal of New Energy

Fusion Information Center, P.O. Box 58639, Salt Lake City, UT 84158 (801) 583-6232; FAX (801) 583-2963
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The latest government-funded study, *Nuclear Wastes: Technologies for Separations and Transmutation*, Committee on Separations Technology and Transmutation Systems, Board on Radioactive Waste Management, Commission on Geosciences, Environment, and Resources, National Research Council, published by the National Academy Press, Washington, D.C. and copyright 1996 by the National Academy of Sciences, did not find a process known to the committee members that would be more economical for treatment of radioactive materials than geologic storage.

However, the following persons or groups are those known to have technology that has been demonstrated to reduce radioactivity or for which patents are pending:

1. **Yul Brown**: uses a flame derived from the burning of the gases derived from the electrolysis of water. Presumably the hydrogen ions in the flame can combine with the nuclei of some radioactive ions and produce transmutation. Patent on process is said to have expired. It is reported that Brown has newer concepts not yet patented.

2. **Roberto Monti**: uses an explosive mixture with the radioactive materials and achieves a measured reduction in radioactivity. Multiple shots may be necessary. Being funded by Ernst Bauer, a Canadian industrialist.

3. **James Patterson**: work based on Clean Energy Technology Inc.'s (CETI's) patented Patterson Power Cell™ has shown considerable nuclear changes. It is reported that Dr. Patterson has been notified that CETI's pending patent on reduction of radioactivity will be allowed by the PTO. It is apparently necessary to load the radionuclides into the plated spheres in a PPC™. Reportedly CETI is interested in remediation of solid radioactive wastes, such as in spent fission reactor rods.

4. **Ron Brightsen**: A pending patent of Clustron Sciences Corporation claims methods of low-energy electromagnetic radionuclide transmutation which R.W. Bass [to appear] states predict effects experimentally observed by Lin & Bockris. The international version of this patent, filed in August, 1993, is based upon Brightsen's Nucleon Cluster Model of the nucleus and according to the PCT rules has been "laid open" [published] by WIPO in Geneva for inspection and comment by interested parties.

5. **Robert T. Bush and Robert D. Eagleton**: their initial two pending patent applications [one drafted by Bass], owned by ENECO, Inc., claim that protons can be captured by a type of cold-fusion electrolysis and produce both nuclear changes and anomalous excess energy; they have published proof of the concept in several experiments. More recently they extended the idea to the amelioration of radioactivity. An additional patent (including low-energy transmutations and radionuclide elimination [drafted by Bass]), owned by Proticus Processes, Inc., has been pending since February, 1993.

6. **Rod Neal and Stan Gleeson**: in a public announcement made in January, 1996 in Cambridge, MA, it was announced that there had been demonstrated a gross macroscopic reduction in radioactivity (in both thorium and cesium-137). A patent application [drafted by Bass] is owned by Morning Star Energy, Inc. and was filed on December 23, 1995. Improvement patents are in process of being filed.

7. **Hal Fox, Shang-Xian Jin, and Robert W. Bass**: patent pending [drafted by Bass] since early November, 1996 pertaining to "Non-neutral Plasma Injection" and low-energy externally-stimulated transmutation; this application was intended to protect improvements in both the Neal-Gleeson process and Ken Shoulders' patented electron-cluster processes from broad patent coverage by unfriendly entities, especially from outside the USA.

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NEWS RELEASE

Monday, June 16, 1997

LOW-ENERGY BULK-PROCESS ALCHEMY

One-Tenth Gram of Thorium Becomes Titanium & Copper

Most Sacrosanct Principles of Physics Overturned

CINCINNATI, OHIO: In a stunning upset of the fundamental dogmas of high-energy nuclear physics, a small group of inspired inventors acting in the tradition of the Wright Brothers of nearby Dayton OH, has achieved reliable, multiply-confirmed, replicable-upon-demand, low-energy, bulk-process, high-speed, dirt-cheap, modern alchemy. For example, in less than an hour, one-tenth gram of radioactive thorium has been transmuted into nine-hundredths gram of titanium plus one-hundredth gram of copper.

After two years of partial public disclosures, these latter-day Prometheans have finally achieved multiple third-party confirmations by numerous established measurement techniques and cross-checking procedures to rule out irrefutably all possibility of contamination or other experimental error, and are now calling for the public to encourage the Environmental Protection Agency (EPA), the Nuclear Regulatory Commission (NRC), and the Department of Energy (DOE), to pay attention to their unprecedented technological breakthrough, which seems providentially to have arrived at the height of national concern over the expensive and dangerous problem posed by disposal of massive stockpiles of radioactive wastes produced both by the Department of Defense (DOD) atomic-weapons program and by the nation's many civilian nuclear power-generating plants.

Conventional-minded physical scientists have long-proclaimed low-energy bulk-process transmutation of one chemical element into another to be a flatly impossible "ancient and medieval dream" whose absurdity has been exposed by modern discoveries concerning the structure of the atom and its nucleus. Supposedly only multi-million-dollar high-energy particle accelerators, operating at energies in excess of tens of thousands of electron volts in expensive national laboratories, can perform nuclear alchemy, and that only in invisible amounts too small for ordinary comprehension or practical utility.

In contrast, the new process announced by the Cincinnati Group, as it is known to the few thousand remaining followers of the long-smoldering cold fusion controversy, could be reproduced in any high-school laboratory. The total power required to transmute one tenth gram

of thorium is less than 300 watts, and the processing time is under an hour, so less than three-tenths of a kilowatt-hour (or less than three pennies' worth of electricity) is the energy requirement. The patent-pending, proprietary reaction vessel, whose technical secrets will be made available for independent replication by others as soon as the Patent issues (or at once, to serious investigators, under a standard Non-Disclosure Agreement [NDA]), fits inside of a four-inch cube. Initially five identical processing cells were fabricated, after the process was discovered by trial-and-error in one corner of a welding shop. The process has never failed to transmute at least eighty percent of one-tenth gram of thorium metal in under one hour at a power cost of less than three-tenths of a kW-hr. Other elements, such as ultra-dangerous cesium-137, and uranium, also have been processed with similar results, auguring hope that mankind's Faustian-bargain nightmare of long-lived high-level radioactive waste can at last be eliminated. Different sizes of cells have been constructed and operated successfully, indicating that the process can be scaled up from grams to tons at will.

The objective is to convert a radioactive element into non-radioactive elements, which happens in nature over millions or billions of years depending upon the particular "radio-nuclide" under consideration. For example, in nature, uranium and thorium decay, by emission of alpha-& beta-particles, in a long and complicated chain of reactions which stops only when the final decay products are isotopes of lead. It takes thorium ten half-lives, or 45 billion years, for 99.9 percent of any sample to decay naturally into lead. However, the new process causes random multiple fragmentation of the thorium nucleus into elements which are non-radioactive when first created, thereby drastically speeding up the process by eliminating the need for further radioactive decay.

In one particular run, thorium was transmuted entirely into titanium and copper, within experimental error of the measuring instruments. In this case the transmutation result consisted of ninety-percent titanium and ten-percent copper. In other runs, the result was almost entirely copper, with a small amount of titanium and iron. In one particular test, the result was about one-tenth of a gram of flakes of copper, which could be seen with the naked eye and picked up with tweezers! A color photo of this man-made copper is available. The fact that this could not have been due to contamination was subsequently confirmed by processing cell blanks along with the thorium test samples, in which the only difference in the solutions placed into the reaction vessel was the presence or absence of dissolved thorium nitrate. Moreover, the clinching evidence that the copper could not have been the result of error or hoax was that its isotopic abundance ratio was discrepant from that of natural copper by about two thousand percent!

In naturally-occurring copper, the abundance of the isotope of atomic weight 65 (meaning that there is a total of 65 protons and neutrons in its nucleus) constitutes about 45 percent of the amount of the copper isotope of atomic weight 63. But in the test-run which produced macroscopically visible copper flakes, the abundance ratio was increased by a factor of 21.7 to a staggering 973 percent! Likewise two of the four isotopes of titanium in another run were hugely discrepant as regards natural isotopic abundance ratios. To produce one-tenth of a gram of copper and titanium isotopes so out of alignment with what occurs in nature suggests to those familiar with the difficulty of separation of other metallic isotopes that would-be hoaxers are facing a mini-Manhattan project, which is obviously far beyond the resources of private individuals working on a modest budget. This single piece of evidence alone precludes the possibility of hoax or error.

However, the Cincinnati Group, remembering the violent skepticism which greeted the claims of Fleischmann & Pons in 1989 to have demonstrated "cold" nuclear fusion of deuterium into helium by electrolysis in a simple electrochemical cell, have subjected their process to the

scrutiny of every known sophisticated measurement process, at both a nationally prominent testing laboratory and two nationally reputable universities, with confirmatory results. The before-and-after testing of the process-sample has employed both quadrupole mass spectrometry (utilizing an inductively coupled plasma excitation source) and atomic-emission spectrometry (based upon scanning electron microscopy). Also used were Geiger counters (to note decrease in external counts during processing) and computer-monitored scintillation counters for more accurate quantitative measurements of initial and final radiation emission by the bare unprocessed and processed samples themselves.

The basic protocol involves dissolving one gram of thorium nitrate in 100 milliliters (ml) of double-distilled water and other reagents. Then 75 ml is retained for testing as a "before" or unprocessed sample, while 25 ml is inserted into the reaction vessel. Electric current is run through the cell for less than one hour. The contents of the cell are then collected for testing as an "after" or processed sample. To ascertain that no radioactive elements remain in the cell, it is disassembled and each part monitored for radioactivity. Additionally, one unused cell was ground up, dissolved in acid, and the digested mixture tested [by ICP/MS & TEM-EDXA] to ensure that no contaminants sufficient to produce the observed amounts of copper, titanium, etc. were present. Furthermore even though such amounts of contaminants were already known not to be present, and yet to double-check under the fictitious assumption that they might have been present, and that ablation, leaching and/or possible transmutation of some of the elements of the cell itself might have led to error in the results, a blank test was also prepared and subjected to the reaction process, in which the sole difference between the blank run and the actual run was the absence or presence of thorium nitrate in the solution introduced into the reaction chamber. Most of the mass-spectroscopy analyses were done on four separate but related samples: (1) a reagent blank [whose results were subtracted from the following results]; (2) a cell blank [as already described]; (3) a processed sample; and (4) an unprocessed sample [from the same initial batch]. The conclusion about what percentage of the thorium had been transmuted was based upon comparison of items (3) and (4).

One of the many runs based upon the protocol just described led to a "Third Party Verification" Certificate which reads in part: "The quantitative analysis of the data indicated that the amount of thorium which had undergone transmutation was equivalent to the amount of titanium plus copper which had been formed, within experimental error."

Traditionally, science has been based upon openness and peer-reviewed publications, with no details omitted, and widespread acceptance contingent upon independent replication and confirmation. Unfortunately, basic science as practiced today is almost entirely dependent upon public funding, such as from the National Science Foundation (NSF), NASA, or, as already mentioned, the DOD and DOE. But in the case of cold fusion (CF), which is a special case of the present subject of Low Energy Nuclear Reactions (LENR), the Energy Research Advisory Board (ERAB) Report submitted to the DOE and essentially claiming that CF/LENR and the like are "physically IMPOSSIBLE" has precluded normally funded research in this emergent field. Therefore it has been all bootlegged or privately funded by small entities.

The Cincinnati Group, operating upon a shoestring, and obtaining results which the august National Academy of Science (NAS), in an elaborately expensive study and report to the DOE on the subject of cost-effective radioactive waste elimination by transmutation, has branded as essentially "inherently physically impossible," has no choice but to seek Patent Protection for its intellectual property in order to attract the necessary venture capital by means of which this almost-miraculous process can be scaled up from grams to pounds and, eventually, to tons.

Concerned citizens, who would like to see "a twenty-first century science solution" to the agonizing national problem of Radwaste Remediation (RR), should urge their Senators to encourage the Assistant Commissioner for Patents of the USPTO to strongly encourage Art Group 220 to expedite the issuance of CF/LENR patents. Only when the dead hand of the Establishment is taken off the necks of America's real creators, the small, independent inventors, and the Patent System functions in the manner which the founding fathers of this country intended when they authorized it in the Constitution, can the average citizen-taxpayer benefit from such breakthroughs as that now announced by the Cincinnati Group.

In conclusion, the Cincinnati Group wishes to express its appreciation to those who have helped it the most, starting with those elements of the national press who do not cater to "pack mentality." They would not have started their project if it had not been for the courageous decision of the Editors and Publishers of "Popular Science" magazine, breaking with their colleagues at "Nature", "Science" and "Scientific American," to feature as a cover story "It Ain't Over Til It's Over!", a hard-hitting unbiased account of the CF scandal by "Wall Street Journal" reporter Jerry Bishop. From this article, the Cincinnati Group learned to contact Dr. Hal Fox, founder of the Fusion Information Center [P.O. Box 58639, Salt Lake City, UT 84158-0638], who advised them that the nation perhaps needed RR more desperately than cheap, clean energy at the present time. Fox, who publishes the archival, internationally Abstracted, peer-reviewed "Journal of New Energy," also publishes a "CF Source Book" which he has dedicated to "The Children of Chernobyl." The Cincinnati Group further publicly acknowledges great help from Dr. Eugene Mallove, publisher and editor of "Infinite Energy" magazine [available for an annual subscription of \$29.50 from P.O. Box 2816, Concord, NH 03302-2816], whose next issue will contain much more detail pertaining to the presently announced seemingly-miraculous achievement. Persons with a scientific interest who would like to peruse unedited copies of the Test Reports summarized above (or contemplate signing an NDA in order to receive full disclosure) may contact Celine at P.O. Box 1262, Covington, KY 41012-1262 or, M-F, at (513) 244-1144. After June 19, the merely curious may consult the Cincinnati Group's forthcoming web page.

"LOW-ENERGY" NUCLEAR REACTIONS

A Primer for Non-Physicists

Atoms comprise of negatively charged electrons whirling around a relatively small nucleus of neutrons and positively charged protons. Protons have a mass 1836 times the mass of electrons. A neutron is a combination of an electron and a proton with zero net electrostatic charge. An atom's number of protons and its equal number of electrons determine its type of element. Only when a positive ion (such as a proton or nucleus of a helium atom) penetrates an atom's nucleus does the atomic nucleus become another element (or another isotope of the same element) or becomes unstable and splits (fissions) into two or more elements.

For decades, physicists have assumed that changing (transmuting) elements always requires high energies. Elaborately expensive machinery was required to accelerate a positively charged particle of less than atomic size to a high enough energy to overcome the electrostatic repulsion of an atom's nucleus and penetrate its interior.

Cold fusion is only one of several types of physical phenomena which indicate the existence of a mechanism by which elements could be changed to other elements without *seemingly* requiring very high energies. However, the secret of cold fusion's excess heat had remained a mystery until September 13, 1996 when Kenneth Shoulders explained how the fracturing of palladium loaded with hydrogen (deuterons) could produce high-density charge clusters and cause nuclear reactions. Based on this evidence and on the pioneering work of Rod Neal and Stan Gleeson, a trio of physicists, Hal Fox, Robert W. Bass, and Shang-Xian Jin, finally deduced a more complete theory of the nature of the mechanism which extends beyond the discovery of cold fusion. The magnitude of their fundamental scientific discovery can best be appreciated by considering that Hal Fox's Fusion Information Center, Inc., has collected over 3,000 papers on cold fusion since its discovery in 1989 without anyone being able to offer a complete understanding of just how cold fusion works.

"LOW-ENERGY" NUCLEAR REACTIONS

A Primer for Non-Physicists (cont'd)

What follows is a simplified explanation of their remarkable concept using an analogy of electrons as ping pong balls and protons as bowling balls. Visualize a room with one wall as the positive plate connected to the positive terminal of a battery, and the opposite wall as the negative plate connected to the battery's negative terminal. Each ping pong ball is negatively charged and when released at the negative wall, electrostatic repulsion/atraction will cause the ping pong ball to fly across the room to the positive wall. Each bowling ball is positively charged and when released at the positive wall, it will roll slowly in the opposite direction across the room to the negative wall.

Both the ping pong ball and the bowling ball have an equal but opposite electrostatic charge. So therefore they both draw the *same* amount of electrical energy from the battery as they fly or roll from one wall to the opposite wall. But because the ping pong ball is so much lighter than the bowling ball, the ping pong ball will strike the opposite wall at a much greater speed than the bowling ball.

Now assume that 1,000,000 ping pong balls are released as a cluster at the negative wall. (At a high enough density, electrons will forget their mutual electrostatic repulsion and cluster in the same manner as ball lightning. Mama Nature sometimes pulls weird tricks.) Embedded in the ping pong ball cluster are 10 bowling balls. Because there are so many more negatively charged ping pong balls, the positively charged bowling balls are going to stick with the ping pong balls and ignore the attraction of the negative wall and the repulsion of the positive wall. So therefore the bowling balls hitch a free ride along with the ping pong balls. When the bowling balls hit the positive wall along with the ping pong balls *at the same speed as the ping pong balls*, the bowling balls will hit the positive wall with enormously greater energies than if they had hit the negative wall, rolling alone, in the opposite direction.

In the same manner, protons (and other types of positive ions) in "low-energy" nuclear reactions are hurled into the nucleus of atoms by their "piggy-back" ride on high-density electron charge clusters with sufficient energy to split or transmute atoms. This mechanism apparently is the secret of cold fusion's excess heat, eliminating radioactivity, transmutation of common elements into scarce elements, and powerful new atom smashers small enough for college physics laboratories. If the new theory holds up to scrutiny by other physicists, it might win a Nobel prize in physics!

The Viability Assessment has become more important in terms of what it is rather than what it will say. The centerpiece, as far as I'm concerned, is the TSPA. All previous TSPAs have been simply "where are we now" products: tools to be used in determining what additional work needed to be done. It was stated today that Congress endorsed the Program Plan in the 1997 Appropriations Act. That would imply that if Congress funds the Yucca Mountain Project after receipt of the VA, it means that Congress endorses the project on the basis of that report. The VA also becomes a suitability document in that the President can, upon consideration of the VA, determine that the site is not suitable. By not doing so, it appears that the Administration believes the site to be suitable.

When Lake Barrett spoke earlier, he mentioned the end of the cold war and the weapons materials that are now slated for disposition, and also international nuclear waste management policies, supposedly guided by U.S. actions. One can probably create a long list of imperatives for a high-level nuclear waste repository in this, and other countries. However, the perceived need for a permanent disposal facility, whether real or not, has nothing to do with the suitability of Yucca Mountain. This site cannot be judged on the basis of how much anyone believes it is needed. We are continually told that we have to "do the right thing" for this and future generations in terms of establishing a nuclear waste disposal site. I agree with that. I sincerely believe that the worst thing that we can do for ourselves, our children and their children, and the international community who may or may not be looking to us for guidance, is to build a repository that will not safely isolate waste for the necessary time period. To take what I firmly believe is an irreversible step without absolute assurance of its ability to protect the population for the many thousands of years necessary sentences them to consequences that they are unable to reverse or correct.

In addition to the TSPA section of the VA, which I fear will carry far too much weight in future decision making, the document will also include cost estimates. Those too will be

considered more seriously than they should. A perfect example of the over emphasis on cost and schedule is certainly the DOE decision to subject the VA to only a one-month internal review. If the report was only regarded as a "where are we now" product, as it should be, this would be acceptable. But as we all clearly see, especially in the way it is being considered in pending federal legislation, it is not any kind of a routine milestone report. To rule out a full public review based on the fact that it would add a year and some added costs to the program is outrageous. It is inexcusable to saddle the future public with an unfixable health and safety problem at Yucca Mountain because we were not willing to examine it beforehand for a year (or more). That has always been the justification given by the Department for not studying other waste disposal options or even other geologic sites. It is unethical, immoral and just plain bad policy.

It is my hope that the Board will not accept the philosophy that "we have to do something" and "we'll do the best we can." It is too important and you can't experiment if you can't afford to fail. Yucca Mountain can be allowed to fail as a potential site and the public now and in the future will not be harmed. A failed repository makes the problems that we are discussing today certainly seem small by comparison.

Judy Fischbeck, Exec. Dir.
Nevada Nuclear Waste
Task Force

COMMUNICATING WITH THE PUBLIC:

Recognizing the Spiritual Basis for Part of the Opposition

To Nuclear Waste Disposal and All Things Nuclear

Prepared as a personal statement for oral presentation to the Nuclear Waste Technical Review Board (NWTRB) Summer Meeting, in Las Vegas, by Abe Van Luik, June 1997.

FOREWORD

This document may be placed in the record of said meeting, and reproduced and distributed, as the NWTRB may see fit. It contains several paragraphs left out of the oral presentation in the interest of time. This document was prepared as a personal statement, using no U.S. Government resources (Abe is an employee of the U.S. Department of Energy, Yucca Mountain Project, Las Vegas, Nevada).

MOTIVE: To open a dialogue, not to make a final statement, regarding the complexity inherent in the term "the public." We do need to communicate, honestly and openly, with "the public." But spewing technically correct facts cannot "reach" all, or even most, of "the public." "The public" it is not a simple monolith, it is a complex mosaic. To dramatize that complexity, this personal essay describes one person's experience with, and views on, one faction within this larger entity we too often simply think of as "the public."

INTRODUCTION

In 1995 I took part in a series of public meetings on radioactive waste disposal issues. In those meetings I was shocked when I began to realize that what motivated some of the people who were so hostile to me and to my work, and who never tired of declaring that our waste disposal activities are immoral at their very root, was their vision of what life is all about: their spirituality.

I interpreted them to be claiming a superior spirituality as a basis for their stance, and I was shocked because I had for years included myself in the group that actively explored and shared that same, Earth-centered spiritual vision.

A repeating theme was echoed by those critical of people like myself who are engaged in investigating the merits of disposing of nuclear waste in deep geological settings (the preferred approach of every nuclear nation I know of). We are injuring and defiling the Earth and not being good custodians, they accused. We continue to attempt to conquer the Earth rather than revere it as our source, they complained. We are void of the Spirituality that comes with a rootedness to the Earth, they observed.

In every meeting where Native Americans spoke, these heartfelt ideas were stirringly expressed, over and over, evidencing a deep-seated cultural belief.

From listening to these people, and reading, I generalized the following as my own interpretation of what we were facing in these meetings. I believe we will be facing this specific type of opposition in many future exchanges with the public.

There is a lot of strong emotion behind these spiritually-motivated ideas against all things nuclear, and the anger expressed towards those who apparently are blind to this vision is actually felt by those expressing it: it is not play-acting, it is very real. We are perceived to thoughtlessly and with foul intent run rough-shod over their strongest inner convictions and feelings. In these critics' eyes we persist in continuing to defile our common Earth Mother, and think we are intellectually superior not only to our critics, but superior to the forces of Nature as well. This kind of hubris is written all over our faces and is conveyed in every technical word we speak, and the more we speak technical "stuff" the more it makes the listeners feel hopeless and angry.

This anger is not something we want to aggravate. It is dangerous. We also don't want to discount these people just because in the U.S. they (largely, perhaps, devotees of the New Age, and Native Americans) are likely to be and remain in the minority. When it comes to their perception of potential risk from our potential waste disposal activities, exaggerated as that risk may be, they are probably representative of a sizable fraction of the total population. It is only in their gut feelings and spiritual convictions about why our activity is immoral that they drop into a minority.

Their descriptions of an Earth-spirituality and the cosmological connectedness that it recognizes, fosters and celebrates, is one that matches in many ways my own experience and perception of reality. So, often in these public meetings, I was in an amazing (for me) state of agreement with the sentiments being expressed on the abstract level. It is in the application of those sentiments, however, that I part company with these critics.

WHAT DOES THIS HAVE TO DO WITH NUCLEAR WASTE DISPOSAL?

There are two levels at which I'd like to offer a criticism of the statements typically made by those claiming to be motivated by an Earth-centered spirituality: (a) the public risk level, and (b) the spiritual level.

a). Many made a rather typical comment that there was no environmental crisis hence waste should stay where it is in many locations on the Earth's surface and not be disposed of in a central location deep in the Earth. These comments echo a sentiment clearly stated in a recent book, which I will cite and reply to: "instead of burying this waste to deny it, thus making life intolerable for generations to come, we ought to keep it visible above ground" . . . in "guardian sites" [from a book by Matthew Fox: "Creation Spirituality," HarperCollins Publishers, New York].

I am not suggesting at all that our critics are familiar with the book from which I took this quote. I suspect some are, and are feeding these concepts and sentiments to others, hence the vehemence -in part- of the feelings this geologic disposal option aroused. Others have derived this sentiment independently. The Native American critics, for example, have no need of this type of priming by an advocate of "creation-centered" spirituality, which is to me conceptually the same as Native American Earth-Mother centered spirituality except that it allows adaptation to a larger group of religious symbols and systems.

My response to this notion is that I believe that until creation/Earth spirituality takes over the world and assures benign government everywhere, human political institutions will continue to be as unstable and unpredictable as they currently are, and as they have been in all of history. Surface storage in many locations is providing the potential for relatively easy access to this dangerous material above ground, even with active defensive systems in place. This poses an undue societal risk. The possession of this material does not necessarily represent a capability to create nuclear weapons (reactor spent fuel has to be reprocessed, which is not easy to do, to extract fissile uranium and plutonium), but it does give a potential terrorist group or individual the opportunity to seriously poison land and water unless demands are met.

Geology, on the other hand, is much more stable than human institutions or societies. And deep, carefully engineered emplacement in a competently selected site promises an extremely low level of risk to future generations. All over the world, the consensus is that deep geological disposal into stable formations is the way to handle this type of waste. And in many nations' written statements on why this is the preferred option they explicitly cite the instability of human institutions over very long time periods.

Many countries have shallow burial grounds for short-lived, relatively innocuous radioactive waste. Several countries already have working repositories for medium-lived wastes, Sweden and Finland are two examples.

Highly radioactive, long-lived waste repositories are under development in well over a dozen countries. In discussions that have taken place as part of cooperative work between these nations' programs, it has become apparent that all are acutely aware of the need to remove these materials from the surface of the earth precisely because there is no way to guarantee the current institutional controls over the long time periods needed.

As has been suggested in Matthew Fox's book, and repeated by some of our critics in our public meetings, these sites, particularly if they also contain the radioactive wastes of weapons programs, could be marked with museums to human stupidity and cruelty, and outline the stupendous costs of assuring total mutual- and self- destructive capability. I have no problem with that: I hope no one ever builds nuclear weapons again. But this gets us to the second level of my criticism.

(b). Part of the support for moral opposition came from the insistent and deliberate confusion of "military and civilian power plants" [another quote from Fox's book]. I was shocked and sorry to see the repeated and indiscriminate mixed-mentioning of military plants, which usually exist only to produce plutonium or tritium, not power, and civilian plants, which usually exist only to produce power and are not particularly useful for making weapons' grade plutonium. I say usually because there have been and are a few exceptions, especially in the former U.S.S.R. Even in the U.S. there was until recently ONE dual-purpose reactor, N-Reactor at Hanford, Washington. But this reactor has been permanently shut down and was NOT EVER run by a civilian electric utility.

I take it that the reason for the purposeful blurring of distinctions between civilian and military uses of nuclear processes is to underscore that to use nuclear fuel to produce power is incompatible with regarding "the planet as a sacred trust." [Fox] My question is, why do so many coming from this Earth-centered spiritual tradition feel that way?

Before going into the spirituality side of the argument I would like to make some side-observations about generating electricity from burning fossil fuels, which does not seem to create the type of fear and antagonism that using nuclear fission does. Burning coal releases natural radioactivity, radon, in substantial quantities, and is linked with air pollution, acid rain, mining and ash wastes. Miners' deaths are also, it seems, a price for coal that society is willing to pay. Environmental impact problems from coal mines is where I started my career in the applied environmental sciences, and I have nothing against this resource if environmental controls and waste disposal practices are properly used.

To select nuclear power from an Earth-centered spirituality perspective and not equally oppose the burning of coal, reflects a double standard, I believe. Coal isn't an environmentally clean energy source, and it is extracted through a process (mining) that defiles Mother Earth as surely as burying nuclear waste and at a much larger magnitude.

There are societal costs associated with fossil fuel dependence over and above environmental costs. There are financial concerns, sure, and eventually trains using diesel fuel as a power source will become uneconomical from a user perspective, and railroads may then be electrified except where remoteness or grade prohibits it. From a global perspective, however, the cost of oil dependence must include moral costs that have direct bearing on respect for life and thus spirituality. Wars, such as the Gulf War of this decade, will become more likely as this nonrenewable resource dwindles in terms of supply and gains economic value.

But rather than get into an environmental or moral "which is worse" debate, (there's no such thing as an environmental-free-lunch when it comes to making electricity) let's get back to why I disagree with the opposition to all things nuclear and still, myself, subscribe to the same Earth-centered spiritual point of view from which that opposition allegedly derives both its substance and vehemence.

Look at the gifts of Mother Nature that took their turns in creating the home in which Mother Earth could finally spawn life, and us: they are a series of nuclear processes. The Big Bang's "fireball" of subatomic particles is still expanding and coalescing. The subsequent fusion of these lighter elements make the basic ingredients of the cosmos as we know it. The fusions are now localized in stars, and still make the heavier elements that make worlds such as ours possible. All these creative processes are nuclear processes.

Our Earth, from which we have our being, after over 4 billion years, still has a hot core. Why? Because it has a significant radioactive component, lots of radionuclides down there undergoing fission and making heat, keeping the core molten. This, in turn, fuels the ultimate long-term recycling machine: it allows the plates that make up the Earth's crust to be continually subducted and remolten, and sends recycled crust back up into the deep-ocean spreading zones to eventually become new land.

And finally, it is the radiative energy output of a nuclear device, the Sun, that is absorbed by the Earth's crust and allows life to come forth and exist as we know it. Thus, all of Mother Nature's most fundamental creative processes are in turn energized and fueled by nuclear processes.

And since we are of the Earth, we are ourselves radioactive, largely because of our potassium content.

But let's look at another amazing aspect of this nuclear material that is diffused throughout the Earth's surface. When hydrothermal events send hot water streaming upward they preferentially dissolve certain metals out of the surrounding rock, and carry them upward. As the hot solutions cool, some of the dissolved metals plate out and form deposits.

Similarly, near-surface groundwaters dissolve minute quantities of metals from the rocks they move through, and as these waters descend in the Earth they lose their oxygen content, the metals change oxidation states and become insoluble, and large deposits can form. Among these metals are the radioactive ones. Mother Nature delivers them to us, as it were.

Nature also teaches us what can be done with these materials. At Oklo, in Gabon, these types of deposits were so rich in fissile uranium, because the new Earth was rich in fissile uranium then, that they went critical as if they had been placed in the core of a reactor. These natural nuclear reactors were quenched over a billion years ago, but they are still around today to be mined and to be studied. They spawned natural plutonium, the one material thought to be totally un-natural by many, most all of which has now decayed away. A whale of a good argument for the stability of the deep geology, is it not? And a good argument for that geology's ability to contain the types of radioactive elements that many industrialized nations are trying to dispose of in similar fashion.

The point of all of this is: how is it disrespectful and unspiritual to imitate the design of the cosmos and utilize these materials and processes? Of course it is disrespectful to use these powers to destroy, but the same can be said for fire or almost anything else that has power. But to use these natural forces to warm us, or to move us (the excellent French electric railroads, like the rest of the country, are 76% nuclear powered), or to power our computers and light bulbs without spewing tons of noxious gases into the atmosphere and without huge quantities of heavy-metal laden fly ash to dispose of? To me, it is not at all a contradiction that I feel at peace with the cosmos and yet favor the responsible exploitation of this natural resource and the responsible disposal of its waste streams.

There is nothing intrinsically disrespectful, immoral, or unspiritual in these materials or processes. On the contrary, the universe, and life, were created from these processes, and depend on them daily for their continued existence.

These materials and processes are primary cosmic gifts of the first magnitude. It takes discipline and knowledge for us to use them correctly and safely, true. There is significant danger in doing things sloppily. And Chernobyl was an exercise in arrogance: Soviet engineers bragged, in publications I have read describing these reactors, that they were so safe that they only required one cooling system. They pointed out that Western engineers were such boneheads they put in redundant systems to make up for potential defects in their inferior designs. In the Soviet nuclear engineers' defense, I must say it was the deliberate shutdown of that one well-designed cooling system that caused the problem. That shutdown evidenced more arrogance: they heard the alarms but thought they knew better what the state of the system was than the idiot lights and buzzers, and so ignored them.

But my point here is that learning chemistry and physics, and practicing an exacting self-discipline in the manufacture of materials and systems, are hardly crimes against nature, and they are hardly incompatible with spirituality.

Maybe you can see from the above why I am chagrined at the denunciations I personally, and my enterprise collectively, received at our public meetings. The speakers there assumed that everyone with Earth- (or creation-) centered spiritual insight would feel that nuclear power and nuclear waste disposal are inherently immoral. It just isn't so.

IS THERE A LEGITIMATE SUPERIORITY IN CLAIMING ALLEGIANCE TO A SPECIFIC SPIRITUALITY OR COSMOLOGY?

I felt strongly that those who denounced all things nuclear from an Earth-(or creation-) centered spirituality point of view assumed that everyone without this type of spiritual insight was morally inferior. I felt strongly that just isn't so.

Our Native American critics, and those who have adopted or adapted their Earth-centered spirituality, live or seek to live in a state wherein one is spiritually and intuitively one with the Earth, or the "All" depending on their particular cosmology. This is a noble striving, in my opinion.

Perhaps one curse of Western modernity is that we have led ourselves, falsely I believe, to think it possible to rationally comprehend the nature of reality in the absolute sense. In doing so, I believe we bump up against the functional limits of our brains and face, and then usually turn from, the unknowable. In the judgment of some, we typically live in a state of reality-denial and are neither connected with the All nor rooted in Mother Earth. If this is true, then perhaps we live in the here and now defined by our limited understanding only: we live limited lives.

We lack a type of spirituality that the Native American peoples, and others who follow their spiritual concepts, claim for themselves. Whether that claimed spirituality is "real" or just another type of band-aid to cover the unknowable is not for me to say. In my opinion they are onto something, but as with any human institutionalization of basic truth, they are as apt to carry their convictions into the realm of presumption and arrogance as we are.

Ultimate truth, I believe, is forever a mystery precisely because it spawned us, we are a subset of it and can thus never comprehend the whole except in the numinous sense of experiencing our radical (at the root) unity with it. Many of our critics claim this unity to be their state of being, and that from this state of being truth is self-evident. And this self-evident truth apparently includes knowing the moral turpitude of engaging in any activities involving nuclear processes.

To me this is just more human hubris. We don't experience this knowing through unity with the all continuously, but we are designed to hunger for it, and it rewards us with joy and awe when we do make our partial discoveries on the path of contemplation and doing good. Ever searching but never coming to a full knowledge of the truth, I believe, is the real human condition except during those relatively rare times when one is spiritually and intuitively one with the all.

Perhaps my experiences of unity have been lacking: they never taught me to oppose anything in particular. They simply increased my wonder for and appreciation of just being, of the miracle of the cosmic gift that is life.

But even though I feel "their" way is not, a priori, superior to "our" (nominally "Western") way, neither is our way, a priori, superior to their way. In fact, I find there is evidence for this same type of nature-centered spirituality in and at the root of every mature spiritual/religious tradition.

I feel strongly that no human being is superior to any other human being because of a claimed allegiance to any tradition, no matter how spiritually or intellectually superior it may be in concept. People are people, and are capable of, if not indeed destined to, make a mockery of every noble intent, and make a mess of every opportunity for doing a lofty deed.

This human trait has been and still is grist for the mills of the peoples' philosophers, those who write plays and scripts, all the way from the Greek civilization and its "tragedies" right into our own times and in our own entertainment media.

It is this undeniable "tragic" component of the human condition, as the Greeks used the concept, that leads me to be suspect of anyone claiming moral superiority over anyone else. This is also why I feel that the people (even those of us who feel we are highly idealistic) who run the world's nuclear waste programs need, despite their (our) sometime protestations, a serious degree of independent oversight.

cc:
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