Discussions, if any, between NRC and DOE regarding acceptability of alternative waste form [to vitrified glass] at Yucca Mountain

- **The current issue resolution process of the Yucca Mountain Project includes accepting more than 250 potential waste form types from DOE. They fall into 34 groups of 11 categories for TSPA-SR. Waste forms for criticality control and pre-closure design have separate categories. Calcine waste form was specifically addressed in the pre-closure technical exchange (4/26/2002). In the open public forums such as conferences DOE talked about additional waste forms such as Pu disposition glass, Pu disposition ceramics, borosilicate glasses containing large amount of nuclear waste, and phosphate glass.**

- **Letter to Lake Barrett to Carl Paperiello (1/25, 1999) in response to Letter to Carl Paperiello from Lake Barrett (12/10/1998): global NRC's perspectives on accepting DOE's alternative waste form. An emphasis was placed on disposal of surplus weapon plutonium. No existing legal or regulatory provisions that would prevent disposal of immobilized plutonium waste forms in a high-level waste repository.**

Outline of the process DOE needs to follow in order to obtain licensing approval for Yucca Mountain to receive other forms of high-level waste than vitrified glass

- **Compliance with pre- and post-closure performance objectives in conjunction with 63.112 requirements**

- **Other requirements such as security aspects** 63.21B

Legacy-20

Discussion, if any, between NRC and DOE about acceptable glass standards for Yucca Mountain (that is, anything other than borosilicate glass)

- **The first discussion addresses this question.**
- **DOE's Waste Acceptance System Requirements Documents (WASRD) provides specifications of borosilicate glass.**

Future Plan: NRC/DOE Technical Exchange on Alternative Waste Form

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 25, 1999

Mr. Lake H. Barrett, Acting Director
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
1000 Independence Avenue, SW
Washington, DC 20585

SUBJECT: U.S. DEPARTMENT OF ENERGY PLANS FOR DISPOSAL OF SURPLUS WEAPONS PLUTONIUM

Reference: Letter of December 10, 1998, from L. Barrett, DOE, to C. Paperiello, NRC

Dear Mr. Barrett:

I am writing in response to the referenced letter regarding U.S. Department of Energy (DOE) plans for disposition of a portion of the weapons-usable plutonium declared surplus to National defense needs. Specifically, you requested that the U.S. Nuclear Regulatory Commission (NRC) inform DOE of any potential legal or regulatory provisions that would prevent disposal of immobilized surplus plutonium waste forms and packages in a monitored geologic repository.

As you are aware, in 1995 NRC staff held a series of meetings with DOE's Office of Fissile Materials Disposition to discuss alternatives under consideration by DOE for disposition of surplus weapons plutonium. These discussions included the reactor and immobilization alternatives that would involve the ultimate disposal of materials (e.g., spent mixed oxide fuel, plutonium immobilized in glass) in a high-level waste repository. Since 1995, the staff has followed both the evolution and maturation of DOE's strategy for surplus weapons plutonium disposition, including the decision by DOE in 1997 to pursue disposition of some surplus plutonium by immobilization in glass or ceramic waste forms as envisioned in the "can-in-canister" concept.

The staff is not aware of any existing legal or regulatory provisions that would prevent disposal of immobilized plutonium waste forms in a high-level waste repository. The detailed technical evaluation of these waste forms, their packaging, and the principal issues related to these wastes (i.e., criticality, safeguards, and impact on repository performance) cannot be performed until DOE finalizes its waste package, engineered barrier, and repository designs and submits its pending license application for the planned high-level waste repository at Yucca Mountain, Nevada. The staff recognizes that the canisters with immobilized plutonium will constitute only a small fraction of both the total fissile material (including the fissile plutonium in commercial spent fuel) and radionuclide inventory in the repository and that likely potential impacts from these canisters are expected to be correspondingly small.

Thus, the staff believes that, with adequate canister and package design features and appropriate measures to address the aforementioned principal issues related to these wastes, the immobilized plutonium waste forms can be acceptable for disposal in a high-level waste repository.

Please advise if you have any questions regarding this letter.

Sincerely,

Carl J. Paperiello, Director
Office of Nuclear Material Safety
and Safeguards

J. Greeley

Department of Energy
Washington, DC 20585
December 10, 1998

Dr. Carl Paperiello, Director
Nuclear Materials Safeguards and Security
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Dr. Paperiello,

The purpose of this letter is to inform and request a response from the Nuclear Regulatory Commission (NRC) regarding the Department's plans to dispose of a portion of the weapons-usable plutonium declared surplus to National defense needs. This material would be converted to an immobilized waste form that is suitable for emplacement in a monitored geologic repository.

In January 1997, the Department issued a Record of Decision (ROD) announcing its strategy to disposition the surplus plutonium inventory in a manner that would render it as inaccessible and unattractive for diversion as the residual plutonium in spent nuclear fuel from commercial power reactors. The strategy anticipates that, as part of the follow-on proposed action, a portion of the surplus plutonium will be immobilized using the "can-in-canister" technology. This technology involves incorporating plutonium into a stable glass or ceramic matrix in stainless-steel cans, arranging these cans into large canisters, filling the canisters with vitrified high-level radioactive waste, and sealing the canisters. The Department is presently completing NEPA analyses of specific implementation alternatives for immobilization technologies and facilities.

The Department is evaluating the feasibility of disposal of immobilized plutonium waste forms, and continues to include these waste forms into assessments of engineered barrier and total system performance. The Department has conducted preliminary evaluations of total system performance and long-term criticality control with waste forms using analytical methodologies familiar to NRC staff. Based on these evaluations, the Department believes that this waste form is very similar to canisters of vitrified high-level radioactive waste, and additional postclosure design considerations are expected to be minimal. Also, it is expected that this waste form would have little impact on repository preclosure design or operations. Therefore, the Department believes that there is no need for additional waste form criteria.

The Department plans to include immobilized plutonium waste forms in the repository license application, and to seek NRC construction authorization for a repository that would isolate such waste forms. The NRC is requested to inform the Department whether it believes there are any legal or regulatory provisions that would prevent disposal of immobilized plutonium waste forms in a monitored geologic repository.

We look forward to working closely with NRC staff on this matter. Should you have any questions, please contact Alan Brownstein at (202) 586-4973 or Dr. Stephan Brocoum at (702) 794-1359.

Sincerely,

Lake H. Barrett, Acting Director
Office of Civilian Radioactive
Waste Management

cc: R. Loux, State of Nevada
J. Hoffman, State of Nevada
R. Price, NV Legislative Committee, NV
J. Meder, NV Legislative Counsel Bureau, NV
M. Murphy, Nye County, NV
N. Stellavato, Nye County, NV
M. Baughman, Licoln County, NV
D. Bechtel, Clark County, NV
B. Mettam, Inyo County, CA
V. Poe, Mineral County, NV
W. Cameron, White Pine county, NV
T. Manzeni, Lander County, NV
L. Fiorenzi, Eureka County, NV
E. von Tiesenhousen, Clark County, NV
J. Regan, Churchill County, NV
L. Bradshaw, Nye County, NV
W. Barnard, NWTRB, Washington, DC
R. Arnold, Pahrump County, NV
S. Kraft, NEI
D. Dudley, Esmeralda County, NV
E. Culverwell, Lincoln County, NV
J. Wallis, Mineral County, NV
J. Greeves, NRC
R. Dyer, YMPO
S. Brocoum, YMPO
D. Horton, YMPO
A. Brownstein, DOE, HQ

Department of Energy

Washington, DC 20585

July 17, 1998

Memorandum For: Lake H. Barrett, Acting Director
Office of Civilian Radioactive Waste Management

Howard Cantor, Acting Director
Office of Fissile Materials

From: Mary Anne Sullivan
General Counsel

Subject: Disposition of Surplus Weapons-Usable Plutonium

This responds to a request received from your offices for confirmation that surplus weapons-usable plutonium may be emplaced in a geologic repository authorized under the Nuclear Waste Policy Act of 1982 (NWPA). The Department of Energy (DOE or the Department) issued a Record of Decision in January 1997 based on the DOE Programmatic Environmental Impact Statement for the Storage and Disposition of Weapons-Usable Fissile Materials, which provides a dual strategy for disposing of surplus weapons-usable plutonium. The portion of the strategy relevant here provides for: 1) immobilization of the surplus weapons-usable plutonium in either a glass or ceramic substance in cans containing approximately 1 to 2 kilograms of plutonium, 2) emplacement of the cans in open canisters, 3) surrounding the plutonium cans in the canister with liquid high-level radioactive waste that is vitrified, and finally 4) closing the canisters and packaging them for transport to a geologic repository for disposal. Disposal of plutonium in this form (can-in-canister) would not only render the weapons-usable material irretrievable, but it would also likely meet this objective with minimal impact on repository design and operations.

QUESTION PRESENTED

Is the Department authorized to emplace the plutonium in the form described above in the geologic repository constructed and operated under the NWPA?

SUMMARY OF ANALYSIS

The NWPA authorizes the disposal of spent nuclear fuel and high-level radioactive waste (HLW) in the repository constructed under that Act. Because the plutonium in question will be emplaced within vitrified HLW before it is emplaced in the repository, the overall waste form qualifies as HLW for the purpose of disposal. Furthermore, the NRC has determined, in 10 CFR Part 61, pursuant to its Atomic Energy Act (AEA) and Energy Reorganization Act (ERA) authority, that material with concentrations of transuranic elements in the amount present in surplus weapons-

usable plutonium must be disposed of in a geologic repository unless NRC approves some other mode. Finally, disposal of surplus plutonium in the repository is consistent with the intention of Congress, as reflected in the legislative history of the NWPA, to provide a comprehensive solution to the management of radioactive waste and to utilize NRC's preexisting authorities under the AEA and the ERA.

ANALYSIS

Nuclear Waste Policy Act Authority to Dispose of Otherwise Qualifying Defense Waste

The NWPA establishes a comprehensive scheme for constructing, licensing and operating a repository for the disposal of spent nuclear fuel and HLW. Section 302(b)(4) of the NWPA establishes a method of payment for disposal of spent nuclear fuel and HLW generated or owned by any department of the United States. This payment provision provides a clear indication that Congress intended to grant the Department authority to dispose of its spent nuclear fuel and HLW subject to the conditions contained in the NWPA. (See attached March 23, 1994 memorandum to Assistant Secretary Grumbly.)

Furthermore, disposal of defense HLW is specifically authorized by Section 8(b)(2) of the NWPA if the President determines that a separate repository is not required for the disposal of HLW resulting from atomic energy defense activities. In 1985, President Reagan found that a defense-only repository was not required and determined that defense spent fuel and HLW should be disposed of in commercial repositories authorized under the NWPA.

Section 2(23) of the NWPA defines spent nuclear fuel as "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing."

Section 2(12) of the NWPA defines HLW as "(A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and (B) other highly radioactive material that the [Nuclear Regulatory] Commission, consistent with existing law, determines by rule requires permanent isolation."

Because the plutonium will be emplaced within vitrified HLW before it is emplaced in the repository, the overall waste form qualifies as HLW for the purpose of disposal. The question of the propriety of the disposal in a geologic repository under the NWPA of can-in-canister plutonium has arisen because NRC has not expressly included plutonium in its definition of HLW under section 2(12) of the NWPA. However, the NWPA does not prohibit the disposal of other radioactive material in a geologic repository constructed pursuant to the NWPA, and the NRC

TRU : > 100 nCi/gram (Thorium > 20 years)
Part 61

Unsc. 7 10 nCi/gr TRU less than 100 nCi/gr

has exercised its other independent authority under the AEA to require disposal of such material in a geologic repository.

NRC Regulatory Authority

Section 121 of the NWPA authorizes the NRC, "pursuant to authority under other provisions of law," to promulgate technical requirements and criteria that it will apply, "under the Atomic Energy Act of 1954 ... and the Energy Reorganization Act of 1974," in approving or disapproving applications for authorization to construct repositories and to receive and possess spent fuel and HLW in such repositories. Thus, the NRC authority to regulate DOE's receipt and possession of spent fuel and HLW in a repository constructed under the NWPA derives from NRC's AEA and ERA licensing authority.

Under the AEA, NRC is generally authorized to license the possession and use of special nuclear, byproduct and source material. Spent nuclear fuel and HLW contain special nuclear and byproduct material and thus are generally regulated by the NRC. Although DOE is not a "person" under the AEA and is therefore generally exempt from NRC licensing authority, section 202 of the ERA provides that notwithstanding the exclusions provided for in the AEA, the NRC is authorized to license any facilities for the express purpose of long-term storage of HLW generated by DOE that are not used for or are part of research and development activities. Thus, NRC has authority under the NWPA to set the technical criteria for disposal in the repository and under the AEA to regulate DOE's disposal of surplus weapons-usable plutonium.

NRC has promulgated the technical criteria for the repository to be constructed under the NWPA and, as required by the NWPA, has utilized its authority under the AEA and ERA as its basis for these regulations. In these regulations, 10 CFR Part 60, NRC has defined HLW as only those wastes in clause (A) of the statutory definition. 10 CFR 60.2. However, under its broad rulemaking authority under section 121 of the NWPA, NRC has authorized the disposal of other wastes in the repository.[1]

---

[1]"Radioactive waste" is defined in 10 CFR 60.2 to mean HLW and other radioactive material other than HLW that is received for emplacement in a geologic repository. 10 CFR Part 60.102 provides that:

> (3) The exercise of Commission authority requires that the geologic repository operations area be used for *storage* (which includes *disposal*) of *high-level radioactive wastes* (HLW).
>
> (4) HLW includes irradiated reactor fuel as well as reprocessing wastes. However, if DOE proposes to use the geologic repository operations area for storage of radioactive waste other

1987 NRC Rulemaking on Definition of HLW

Subsequent to the initial promulgation of 10 CFR Part 60, the NRC issued an advance notice of proposed rulemaking (advance notice) to modify the definition of HLW in Part 60 "so as to follow more closely the statutory definition in the [NWPA]" and determine what wastes should be disposed of in a repository in order to assure protection of the public health and safety. 52 Fed. Reg. 5992 (Feb. 27, 1987). In the advance notice, the NRC proposed to classify wastes as HLW under section 2(12) (B) of the NWPA based on concentrations exceeding numerical values that would be stated explicitly in the form of a table. Under that approach, HLW would have been characterized by the kind of hazard that could only be guarded against by disposal in a geologic repository or equivalent facility and greater than Class C low-level radioactive waste, which posed such a hazard, would have to be disposed of in a repository.

However, in 1988, NRC issued a Notice of Proposed Rulemaking (proposal) to amend its regulations for near surface disposal of low-level radioactive waste (LLW) at 10 CFR Part 61, stating that "the Commission has determined that it would be best to proceed quite differently from its original suggestion put forth in the ANPRM [advanced notice]." Although the proposal was an amendment to Part 61 (near-surface disposal regulations for LLW), rather than Part 60 (geologic repositories for spent nuclear fuel and HLW), NRC addressed the same question in both the advance notice and the proposal, whether greater than Class C wastes should be disposed of in a geologic repository or in some intermediate facility. 53 Fed. Reg. 17709 (May 18, 1988). NRC proposed, and ultimately determined in the final rule, to promulgate 10 CFR Part 61.55(a)(2)(iv), requiring disposal of greater than Class C waste in a deep geologic repository unless disposal elsewhere is approved by the NRC. The final rule provides that:

> (iv) Waste that is not generally acceptable for near-surface disposal is waste for which form and disposal methods must be different, and in general more stringent, than those specified for Class C waste. In the absence of specific requirements in this part, such waste must be disposed of in a geologic repository as defined in Part 60 of this chapter unless proposals for disposal of such waste in a disposal site licensed pursuant to this part are approved by the Commission. 10 CFR 61.55(a) (2)(iv).

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than HLW, the storage of this radioactive waste is subject to the requirements of this part.

10 CFR 60.136(d) provides:

> (d) *Design criteria for other radioactive wastes.* Design criteria for waste types other than HLW will be addressed on an individual basis if and when they are proposed for disposal in a geologic repository.

Surplus weapons-usable plutonium falls under the description of greater than Class C waste because it contains alpha emitting transuranic nuclides with a half life greater than five years in concentrations exceeding 100 nanocuries per gram. 10 CFR 61.55, Table 1. Therefore, pursuant to 10 CFR 61.55(a)(2)(iv), it must be disposed of in a geologic repository under Part 60 unless otherwise approved by the NRC.

Furthermore, the preamble to the final rule provides that "the jurisdictional reach of Part 61 would be extended to cover all activities of the [DOE] that may be subject to the licensing and regulatory authority of the Commission." To implement this, section 61.2 was amended to provide in the definition of "person" that ". . . the Department of Energy is considered a person within the meaning of the regulations in this part to the extent that its facilities and activities are subject to licensing and related regulatory authority of the [NRC] pursuant to law . . . .".[2]

When Congress has given deference to a particular agency, in this case the NRC, that agency's interpretations or policy making pronouncements are entitled to primacy. See Batterton v. Francis, 432 U.S. 416 (1977); Nat'l Muffler Dealers Ass'n v. U.S., 440 U.S. 472, 476-77 (1979). This doctrine, applies with particular vigor when a statute leaves open an agency's discretion to develop criteria under a broad mandate:

> [t]his principle has even greater force when Congress has specifically left it to the agency to flesh out the terms of the statute. Indeed, the Supreme Court has instructed us to give particular deference to the construction of a statute advanced "by the men charged with the responsibility of setting its machinery in motion, [and] of making its parts work efficiently and smoothly while they are yet untried and new." Nat. Res. Defense Council v. NRC, 666 F.2d 595, 603 (D.C. Cir. 1981), quoting Power Reactor Development Co. v. Electric Workers Int'l Union, 367 U.S. 396, 408 (1961).

Section 121(b) of the NWPA, by its terms, leaves NRC to flesh out the terms of the NWPA, the AEA and ERA in promulgating regulations for licenses to receive and possess radioactive waste in a repository authorized under the NWPA.

---

[2]This is consistent with NRC views expressed in the preamble to the advanced notice on HLW, which stated that:

> The[NRC] would not find tenable the argument that a material requires permanent isolation because it is highly radioactive. The need for permanent isolation correlates with the length of time a material will remain hazardous. Long half-lives, in turn, correlated with low rather than high levels of radioactivity. 52 Fed. Reg. 5992, 5995. n. 11.

THE LEGISLATIVE HISTORY OF THE NWPA

The legislative history of the NWPA indicates that Congress intended an expansive view of what kinds of radioactive defense wastes may be disposed of in a licensed repository constructed under the NWPA.

In a joint report of the Senate Committees on Energy and Natural Resources and Environment and Public Works, the view was expressed that "the disposal of high-level radioactive from nuclear reactors has been a clear need since the beginning of the nuclear weapons program during World War II." S. Rep. No.282, 97 Cong., 1st Sess. 6-7(1981).

During the course of the Senate's consideration of an early version of the NWPA (S. 1662), an amendment in the form of a compromise bill was offered up by Senator McClure for himself and a group of influential supporters of the NWPA, that included Sens. Johnston, Simpson, Jackson and Domenici. That bill contained a provision (section. 202(b)(2)) that was similar to section 8 of the NWPA, and dealt more directly with the issue at hand, as follows:

> For purposes of the application of Title VII to any repository or monitored, retrievable storage facility, the terms "spent fuel" and "high-level radioactive waste" include material generated in the atomic energy defense activities of the Department. 128 Cong. Rec. 6440 (1982).

A report of the House Committee on Science and Technology on one of the House versions of NWPA (H.R.5016) explained:

> The Committee intends that none of the provisions of the Act apply to facilities that would be used for radioactive wastes resulting from atomic energy defense activities. This would not prevent the Secretary from disposing of defense related wastes in the civilian repository, provided that the Secretary complies with all of the requirements of the Nuclear Regulatory Commission. H. Rep. No. 411, 97th Cong, 1st Sess. 29 (1981).

In a Report by the House Committee of Interior and Insular Affairs to accompany the H.R. 3809, the House's original version of the NWPA, it was reported that,

> The Committee rejected an amendment proposed to explicitly exempt from the Act any facilities for disposal of defense wastes, in order to assure that facilities constructed and operated under this Act could be available for disposal of wastes from the Department of Energy or the Department of Defense activities if those agencies should elect to use these facilities. . . .

> The Committee does not endorse in principle or in practice the separation of programs for management of defense and commercial high-level nuclear waste.
>
> It is clear that mismanagement or lack of commitment to waste management in the defense sector reflects upon and can directly affect the domestic nuclear industry. It could further erode public acceptance of domestic nuclear technology if a public perception existed that a nuclear waste management program represented a solution for only half the nation's high level nuclear wastes.
>
> By providing that repositories constructed under the Committee amendment can be used for waste from any national source, the Committee is helping to assure that the waste management program will be accepted as a comprehensive solution. H. Rep. No. 491, Part 1, 97th Cong, 1st Sess. 44-45 (1981).

H.R. 3809 was also referred to the House Committee on Armed Services. That Committee reported out certain amendments to the draft bill and provided comments that recognized that DOE defense nuclear wastes include many different forms, in the following:

> Radioactive wastes are created in almost every phase of the DOE's naval nuclear reactor program, the nuclear weapons program and the defense nuclear materials production program. Since the inception of these programs, facilities have been designed to process nuclear materials and to handle and store waste materials as continuous, integrated processes.
>
> Defense nuclear wastes are in may forms: liquids, solids, recovered gases, contaminated equipment and machinery, clothing, scrap metal, treated wastes, and various other forms. H. Rep. 491, Part 2, 97th Cong., 2d Sess. 8 (1982).

These statements demonstrate Congressional recognition of the broad scope of waste that could be emplaced in the repository.

CONCLUSION

Surplus weapons-usable plutonium in the form proposed by DOE for disposal may be disposed of in the geologic repository constructed under the NWPA .

Attachment

Department of Energy
Washington, DC 20585

March 23, 1994

MEMORANDUM FOR: Thomas P. Grumbly
Assistant Secretary for Environmental Restoration and Waste Management

FROM: Robert R. Nordhaus
General Counsel

SUBJECT: Legal Basis for Disposal of Spent Research Reactor Fuel Containing U.S. Origin Enriched Uranium

By memorandum dated November 17, 1993, you requested an opinion regarding legal authority under the Nuclear Waste Policy Act of 1982, as amended (NWPA), for disposal of spent research reactor fuel in the repository to be developed in accordance with the NWPA. Your question is posed in the context of Secretary O'Leary's proposed policy to accept spent fuel containing U.S.-origin enriched uranium from foreign research reactors, although we understand that the Department also receives spent fuel from domestic research reactors. You specifically asked whether regulations at 10 C.F.R. Part 961, which implement the NWPA, and section 961.5 in particular, would be applicable to such disposal.

I. BACKGROUND

The Department is currently preparing an Environmental Impact Statement on the Secretary's proposed policy, in support of the United States' nonproliferation interests, to accept the return from foreign research reactors of spent nuclear fuel containing uranium enriched in the United States. Under the proposal, up to 15,000 spent nuclear fuel elements containing uranium enriched in the United States would be accepted from foreign reactors over a period of up to 15 years. Passage of title to the United States Government would typically take place upon arrival of the spent fuel at a Government facility in the United States. In any event, the United States would take title at some point prior to disposal.

II. THE NUCLEAR WASTE POLICY ACT OF 1982, AS AMENDED

The NWPA establishes a comprehensive scheme for constructing, licensing and operating a repository for the disposal[1] of spent nuclear fuel. The term "spent nuclear fuel" is defined at section 2(23) as "fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing." The definition does not address the type or location of the nuclear reactor from which the spent nuclear fuel has been withdrawn. Nor does the NWPA squarely and expressly authorize the disposal of research reactor spent nuclear fuel, either foreign or domestic, in the repository. Nevertheless, section 302 of the NWPA, which establishes the Nuclear Waste Fund and a mechanism for ensuring that the owners and generators of spent nuclear fuel pay the full cost of disposal through payments into the Fund, contains an implied grant of disposal authority for research reactor spent fuel.

Section 302(a) specifically authorizes the disposal of spent nuclear fuel of domestic origin from civilian powerplants licensed in the United States. Without providing a parallel express grant of disposal authority, section 302(b) further establishes a method of payment for owners and generators of spent nuclear fuel from research reactors, as well as for U.S. Government-owned spent fuel. The only reasonable implication that can be drawn from this payment provision is that Congress intended to grant the Department authority to dispose of such fuel, subject to the conditions contained in section 302(b).

III. DISPOSAL OF SPENT NUCLEAR FUEL FROM DOMESTIC RESEARCH REACTORS

Section 302(b)(1)(A) of the NWPA provides that the Nuclear Regulatory Commission (Commission) shall not issue or renew a license to any person to use a reactor licensed under the authority of section 103 or 104 of the Atomic Energy Act of 1954, as amended (AEA), unless such person has contracted with or is in good faith negotiating with the Secretary to enter into a contract with the Secretary for disposal under section 302 of the NWPA. Section (302)(b)(1)(B) of the NWPA further provides that the Commission may require a disposal contract with the Secretary as a precondition to the issuance or renewal of a license under section 103 or 104 of the AEA. Section 104 of the AEA authorizes licenses for reactors used for medical therapy (104a.) and research and development activities (104c.).[2]

---

[1] The term "disposal", defined at section 2(9) of the NWPA, means "the emplacement in a repository of high-level radioactive waste, spent nuclear fuel, or other highly radioactive material with no foreseeable intent of recovery, whether or not such emplacement permits the recovery of such waste."

[2] Section 103 of the AEA authorizes licenses for reactors used for industrial or commercial purposes.

Consistent with the foregoing licensing requirements, section 302(b)(2) provides that spent nuclear fuel generated or owned by anyone other than the United States Government may not be disposed of in the repository constructed under the NWPA unless the generator or owner has entered into a contract with the Secretary for such disposal by June 30, 1983, or the date when such generator or owner commences generation of, or takes title to, such spent nuclear fuel or waste, whichever occurs later.[3]

Thus, pursuant to section 302(b)(2), generators and owners of spent nuclear fuel from research reactors in the United States that have entered into disposal agreements with the Department would be afforded a place in the repository for their spent nuclear fuel. (Generally, domestic research reactors use fuel owned by the United States government and such spent fuel would be afforded a place in the repository by virtue of the United States owning the spent fuel.)

IV. DISPOSAL OF SPENT NUCLEAR FUEL FROM FOREIGN RESEARCH REACTORS

In addition to the authority granted by section 302(b)(2) to accept domestic research reactor fuel, the Department has authority to contract under section 302(b)(2) of the NWPA to accept for disposal spent nuclear fuel from reactors licensed for export abroad pursuant to section 104d. of the AEA if the owner or generator of the spent fuel has entered into such contract by June 30, 1983, or the date when such generator or owner commences generation of, or takes title to, such spent nuclear fuel.[4]

---

[3] Specifically, section 302(b)(2) of the NWPA provides:

> Except as provided in paragraph (1), no spent nuclear fuel or high-level radioactive waste generated or owned by any person (other than a department of the United States referred to in section 101 or 102 of title 5, United States Code) may be disposed of by the Secretary in any repository constructed under this Act unless the generator or owner of such spent fuel or waste has entered into a contract with the Secretary under this section by not later than-
> (A) June 30, 1983; or
> (B) the date on which such generator or owner commences generation of, or takes title to, such spent fuel or waste; whichever occurs later.

[4] This is a discretionary authority; there is no requirement that the Department accept such fuel.

However, we are not aware of any such agreements with foreign research reactor operators, nor do we have any information that the research reactors that generated the spent fuel to be returned to the United States were licensed for export from the United States. Thus, while this is theoretically a source of authority for accepting spent fuel from one class of foreign research reactors, it does not appear to have much practical utility.

Section 302(b)(4) of the NWPA provides separately for disposal of spent nuclear fuel owned by the United States. It specifies:

> No high-level radioactive waste or spent nuclear fuel generated or owned by any department of the United States referred to in section 101 or 102 of title 5, United States Code, may be disposed of by the Secretary in any repository constructed under this Act unless such department transfers to the Secretary, for deposit in the Nuclear Waste Fund, amounts equivalent to the fees that would be paid to the Secretary under the contracts referred to in this section if such waste or spent fuel were generated by any other person.

This section does not indicate that spent nuclear fuel owned by the United States must be of domestic origin in order to qualify for disposal, nor does it require a pre-existing disposal contract, as is required by section 302(b)(2). It merely requires payment of fees necessary to ensure full-cost recovery for the disposal. Thus, this provision could provide the basis for accepting foreign reactor spent fuel once title has been transferred to the United States.

Section 961.5 of the Standard Contract implements section 302(b)(4) by providing:

> Federal agencies or departments requiring DOE's disposal services for SNF and/or HLW will be accommodated by a suitable interagency agreement reflecting, as appropriate, the terms and conditions set forth in the contract in section 961.11; Provided, however, that the fees to be paid by Federal agencies will be equivalent to the fees that would be paid under the contract.

(Emphasis added.) Section 961.5 leaves open the question of which terms and conditions in the Standard Contract would constitute "appropriate" terms and conditions in an interagency agreement. Here, however, where the Department itself will acquire ownership of the foreign research reactor fuel at or about the time of its delivery, no interagency agreement would be necessary.

Because the NWPA places no restriction on either the type or location of the reactor from which the spent nuclear fuel owned by the Government had been irradiated, Government-owned spent nuclear fuel that was withdrawn from a foreign reactor could be disposed of in the repository as long as the Department pays for such disposal an amount equivalent to the fees paid by domestic civilian powerplants under the Standard Contract.

V. CONCLUSIONS

1. Section 302(b)(2) of the NWPA provides a mechanism for generators and owners of spent nuclear fuel from domestic research reactors to contract for its disposal. The NWPA provides that such contracts must be executed before June 30, 1983, or the date on which such generator or owner commences generation of, or takes title to, such spent nuclear fuel — whichever occurs later. The only reasonable implication that can be drawn from this payment provision is that Congress intended to grant the Department the authority to dispose of such fuel, subject to the conditions in section 302(b).

2. Section 302(b)(4) of the NWPA authorizes the disposal of spent nuclear fuel owned by the United States Government and places no restrictions on either the type or location of the reactor in which such fuel owned by the Government has been irradiated. Because, under the proposed action, the United States would take title to the spent nuclear fuel containing U.S.-origin enriched uranium prior to disposal, section 302(b)(4) provides authority for disposal of such foreign research reactor fuel. Such disposal is, however, conditioned upon payment by the Department of a fee adequate to cover the full cost of disposal.

ited States Government Department of Energy

nemorandum

DATE: NOV 17 1993

PLY TO TN OF: EM-37

BJECT: Legal Basis for Disposal in the Geological Depository of Spent Research Reactor Fuel Containing U.S. Origin Enriched Uranium

TO: General Counsel, GC-1

Historically, DOE accepted for reprocessing spent fuel from university research reactors and foreign research reactors (provided that the enriched uranium in the spent fuel was of U.S. origin), as well as from DOE research reactors.

For foreign research reactors, the DOE policy to accept such spent fuel lapsed in 1988 for fuel containing highly enriched uranium (HEU) and in 1992 for fuel containing low enriched uranium (LEU). Currently, the Department is considering renewal of the acceptance process. Specifically, in a July 13, 1993, letter to Secretary of State Warren Christopher, Secretary O'Leary indicated that DOE proposes to establish a new policy to accept spent fuel containing enriched uranium of U.S. origin from foreign research reactors, subject to completion of appropriate NEPA reviews.

Much of the spent research reactor fuel previously received by DOE was reprocessed along with spent fuel from DOE production reactors, but a significant amount is still in storage at various DOE sites. For economic, environmental, and proliferation reasons, the Department is phasing out reprocessing of spent fuel. Consequently, existing spent research reactor fuel in storage and that which will be returned to DOE in the future will likely be disposed of directly in the geologic repository being developed under the requirements of the Nuclear Waste Policy Act of 1982. In the past, questions have been raised concerning both the technical and legal basis for such disposal. The Department must resolve all of these questions in order to determine the final disposition of this spent fuel. Our Office of Waste Management is now addressing the technical safety issues. I am writing to you to seek your opinion on the legal issues.

The major thrust of the Nuclear Waste Policy Act of 1982 is directed at developing the means to dispose of spent fuel from domestic nuclear power plants. However, one of the enabling regulations, the "Standard Contract for Disposal of Spent Nuclear Fuel and/or High-Level Radioactive Waste" (10 CFR 961) indicates in part 961.5 that Federal agencies or departments requiring DOE's disposal services for high-level waste and/or spent nuclear fuel will be accommodated, provided that the fees paid by the Federal agencies are equivalent to the fees that would be paid under contracts established with other owners or generators of spent fuel or high-level waste. We believe that this provision could be interpretated to allow DOE itself to use the geologic repository, provided that it pays fees equivalent to those that would be paid under

the standard contract (10 CFR 961), and meets the requirements of the Nuclear Waste Policy Act, 40 CFR 191, 10 CFR 60, and 10 CFR 961.

I would appreciate it if you would inform me if 10 CFR 961.5, or any other provision of CFR Titles 10 and 40 or the Nuclear Waste Policy Act, provides a legal basis for disposal in the geologic repository being developed to meet the requirements of the Nuclear Waste Policy Act of research reactor spent nuclear fuel. If there is no such basis, I request your assistance in identifying any legal requirements for the disposal of this spent fuel, especially considering (1) the Congressional mandate that spent nuclear fuel is to be disposed of in a geologic repository and (2) the reality that no geologic repository, other than the one being developed under the Nuclear Waste Policy Act (with the exception of WIPP for defense related transuranic waste disposal), is likely to exist in the foreseeable future.

Thank you for your assistance in this matter. If you need to contact my office, please feel free to call me, or contact Mr. John Jicha at X6-7292 or Mr. Charles Head, X6-0200.

Thomas P. Grumbly
Assistant Secretary for Environmental
Restoration and Waste Management

Markus Popa

Department of Energy

Civilian Radioactive Waste Management

**Office of Strategy and Program Development,
Office of Systems Analysis and Strategy Development,
RW-20E**

Telephone: (202)586-5330
Date: 5 Feb 2003
Fax: (202)586-1047

To: Tae Ahn

Number of pages: 5 **(including cover sheet)**

Message: the 2 letters we talked about

MP

Markus Popa

Department of Energy

Civilian Radioactive Waste Management

Office of Strategy and Program Development,
Office of Systems Analysis and Strategy Development,
RW-20E

Telephone: (202)586-5330
Date: 5 Feb 2003
Fax: (202)586-1047

To: Tae Ahn

Number of pages: 15 (including cover sheet)

1 letter

Message: the ~~2 letters~~ we talked about – instead of mailing.

MP

From: Tae Ahn
To: Patricia Santiago
Date: 4/27/01 8:35AM
Subject: Transmutation - EDO Q

Attached is A.

CC: Charles Greene; N. King Stablein

Main - xo

NRC has not been involved in the DOE's program for Accelerated Transmutation of Waste. In transmutation, an accelerator is used to rework nuclear waste into a less radioactive material. This process still gives off heat that can be used to generate electricity and reduces the volume of nuclear waste by a tremendous amount. However scientists have said this technology may not be a reality for 20 to 50 years. Sen. Pete Domenici, R-N.M. introduced a bill in March 2001 to authorize $120 million for research into transmutation of spent nuclear reactor fuel into compressed and less toxic material.

---

scan

EDO Principal Correspondence Control

FROM: OCA

DUE: 04/30/01 noon

EDO CONTROL: G20010163
DOC DT: 04/26/01
FINAL REPLY:

TO:

EDO

FOR SIGNATURE OF : ** PRI **

CRC NO:

DESC:

Chairman Backup Q's for the Joint Senate Hearing on Nuclear Energy, 5/3/01

DATE: 04/26/01

ROUTING:

Travers
Paperiello
Kane
Norry
Reiter
Craig
Burns/Cyr
Anderson, OEDO
Corley, OEDO
Rathbun, OCA

ASSIGNED TO:	CONTACT:
NRR	Collins
OGC	Cyr
IP	Dunn Lee
RES	Thadani
CFO	Funches
NMSS	Virgilio
HR	Bird

SPECIAL INSTRUCTIONS OR REMARKS:

Use Q&A format attached. Provide hard copy with diskette to Patty Anderson, OEDO (not in ADAMS) by 12:00 N 4/30/01. Answer new questions. Review previously submitted answers and update, if necessary. If no update is needed, notify Patty by e-mail.

Assign as follows

pg 7 - L.7 - FCSS

pg 7 - E.7 - DWM

Responses due to Seelig COB 4/27. Seelig will send to EDO by noon 4/30.

NMSS 5. *Can we license Yucca Mountain to the groundwater standards in the EPA proposed rule?*

E. HIGH-LEVEL RADIOACTIVE WASTE

NMSS 1. (A). What is the status of the NRC's activities in the nations high-level waste program? (B) Briefly, what are the major concerns?

NMSS 2. What do you see as the outlook for progress at Yucca Mt. and the suitability of the site?

NRR 3. How many plants are out of space, or will soon be out of space, in their spent fuel pools? Are there any significant problems related to spent fuel storage at operating reactors?

OGC/NMSS 4. What are some of the significant features you would like in HLW legislation?

NMSS 5. (A) What is the status of applications or interest in private storage sites? Are they on schedule? (B) Specifically, provide the status of the licensing effort for the Private Fuel Storage (PFS) facility which will be located near Salt Lake City, Utah.

NMSS 6. Will the NRC reopen the Private Fuel Storage (PFS) draft EIS for public comment since additional information from PFS regarding F-16 overflights and geo-technical data has been submitted?

New NMSS - DWM 7. What is DOE's program for Accelerator Transmutation of Waste? 13015

L. USEC

NMSS 1. What issues are being addressed related to USEC? Are you taking their financial situation into account in your certifications?

2. What is the status of the Portsmouth GDP?

4. Are the GDPs safe? Should we be concerned about the safety of workers at these facilities?

5. *How can we issue an amendment to the Paducah certificate and simultaneously allow closure of the Portsmouth facility without assurance that Paducah is reliable at the new assay levels?*

6. *What does the Commission intend to do with its study of the viability of USEC as a financial and reliable supplier of enrichment services?*

New NMSS - FCSS 7. Regarding the application to produce higher enriched uranium at the Paducah GDP, when was it approved, is the facility capable of producing higher enriched uranium, and are there any problems with the upgrade?

NOTE: Question numbers are based on the backup Qs for the Environment and Public Works Hearing

March 9, 2001
Las Vegas Review-Journal, March 9, 2001

Bill Promotes Nuclear Power, Funds Transmutation Research

By STEVE TETREAULT
DONREY WASHINGTON BUREAU

WASHINGTON -- A leading senate advocate of nuclear energy introduced a bill this week to promote development of new nuclear power plants while continuing to back research into possible alternatives to radioactive waste burial.

"The United States has basically abandoned its leadership in the field of nuclear energy," Sen. Pete Domenici, R-N.M., said. "We've erected so many regulatory hurdles that there hasn't been a single new nuclear plant built in more than 20 years."

Domenici's bill, introduced Wednesday, would authorize $406 million to encourage new plant construction, revamp Nuclear Regulatory Commission rules, develop new solutions to waste disposal, and increase the visibility of nuclear energy development within the Energy Department.

It would authorize $120 million for research into "transmutation" of spent reactor fuel into compressed and less toxic material, a process embraced by some as a way to render nuclear waste less harmful while generating heat energy at the same time. Now the government allocates $131 million for those activities, Domenici said.

Another $40 million would be earmarked to develop an advanced accelerator that would be utilized to rework the nuclear waste through the transmutation process.

Joe Colvin, president of the Nuclear Energy Institute, applauded Domenici for boosting the nation's "leading emission-free source of electricity."

The Domenici bill contains no provisions directly affecting the Energy Department's ongoing studies of Yucca Mountain in Nevada as a nuclear waste repository, according to aides to Nevada lawmakers who examined the legislation.

Still, more nuclear power plants more nuclear waste, an environmental advocate pointed out.

"This bill attempts to extend the life of nuclear power plants and funds research into the siting of future power plants," said Anna Aurilio, legislative director of U.S. Public Interest Research Group. "The amount of nuclear waste headed to Nevada could increase. This is going in the wrong direction."

Domenici said he will try to attach his bill to a national energy strategy being developed by the Bush administration and by other Senate leaders. A number of its provisions are similar to a bill introduced last week by the chairman of the Senate Energy Committee, Frank Murkowski, R-Alaska.

For instance, both would establish an Office of Spent Nuclear Fuel Research to oversee waste disposal studies.

contandi
202-694-7139

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Thursday, March 25, 1999

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2001

Senator offers Yucca option

A New Mexico lawmaker suggests making nuclear waste less lethal and using that waste to yield electricity.

By Tony Batt
Donrey Washington Bureau

WASHINGTON -- A senior senator who controls spending for the Department of Energy said Wednesday he will consider eliminating funding for the Yucca Mountain program this year in favor of a new strategy to decontaminate radioactive waste instead of burying it in Nevada.

Sen. Pete Domenici, R-N.M., said he plans to introduce a bill soon to speed development of transmutation, a process of changing nuclear waste into a less lethal product.

"Permanent storage is almost impossible. It's dumb to think we can (bury nuclear waste) forever," Domenici said.

"We have spent about $7 billion for nuclear waste storage and have yet to put a single atom of this dangerous material at the Yucca Mountain facility," said the senator, who has long been concerned about mounting costs of the program.

Domenici said his bill would establish transmutation and storage facilities at the Nevada Test Site and at another location that has not been determined.

In transmutation, an accelerator is used to rework nuclear waste into a less radioactive material that still gives off heat that can be used to generate electricity.

Instead of remaining lethal for 10,000 years, high

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level nuclear waste that is transmutated would be toxic for 200 or 300 years.

Transmutation is distinct from reprocessing, which recycles nuclear spent fuel for continued use by reactors. Reprocessing is a more controversial process that President Carter prohibited in 1979, citing fears it could aid nuclear weapons proliferation.

"Transmutation is preferable to reprocessing because it reduces the volume of nuclear waste by a tremendous amount, and it would make the best use of existing technology at the test site," said Troy Wade, chairman of the Nevada Alliance for Defense Energy and Business, a group supporting alternative uses of the test site.

Last year, Domenici inserted $4 million for transmutation research into the nuclear waste budget for 1999. The Clinton administration did not include any money for transmutation in its budget request for 2000, but Domenici could add more.

Earlier this month, Nevada state senators debated a resolution by state Sen. Joe Neal, D-North Las Vegas, that called for more federal research into transmutation.

At the session, the head of the state nuclear projects office, Bob Loux, said he has attended meetings where scientists have said transmutation may not be a reality for 20 to 50 years.

Domenici is chairman of the Senate's energy and water subcommittee and is considered influential on nuclear matters. His state is home to the Sandia and Los Alamos national laboratories.

He announced his plan at a Senate nuclear waste hearing. He described his proposal as a "revolutionary new approach for nuclear waste for America."

Even though transmutation would require nuclear waste to be sent to the test site and stored there, Sen. Harry Reid, D-Nev., told Domenici he appreciated his fresh approach and would be willing to work with him.

Reid and the other three members of the Nevada congressional delegation -- Sen. Richard Bryan, D-Nev., and Reps. Jim Gibbons, R-Nev., and Shelley Berkley, D-Nev., testified at Wednesday's hearing against a bill by Sen. Frank Murkowski, R-Alaska, that would send nuclear waste to the Nevada Test Site for interim storage by June 30, 2003.

Under Murkowski's bill, nuclear waste from civilian reactors would remain at the test site until a permanent repository is opened at Yucca Mountain,

100 miles northwest of Las Vegas, by 2010 at the earliest.

Despite his criticism of Yucca Mountain, Domenici said he supports Murkowski's bill and he dismissed objections about interim storage at the test site.

"It's a little tiny issue and for most countries (interim storage) is not a problem," he said.

But primarily because of its estimated cost, Domenici has long been a skeptic of a permanent repository that would store 77,000 tons of highly radioactive nuclear waste at Yucca Mountain.

As far back as 1992, after being told a license for a nuclear waste repository could cost $6.3 billion, Domenici said the Department of Energy should halt work at Yucca Mountain and explore alternatives.

And in October 1997, in a speech at Harvard University, he urged a reassessment of U.S. nuclear policies.

Domenici said his new plan would mandate a comprehensive review of U.S. nuclear waste policy and would include consultation with international collaborators.

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STOP CASSINI Newsletter #146 -- June 29th, 1999

STOP CASSINI Newsletters Index

To: Subscribers, Press, Government Officials

Subject: What is a half-life? STOP CASSINI #146

Date: June 29th, 1999

Time Frame: Cassini should be redirected to impact the moon immediately!

Today's Subjects:

---

(1) Finally: SC newsletter editor hears from someone at NASA!

The following email came as a shock to me, since no one as NASA has ever officially even acknowledged receiving our newsletter, let alone answer the charges we have brought against them.

----- INCOMING EMAIL FROM DAVID F. DOODY, NASA/JPL -----

At 09:35 AM 6/28/99 -0700, you wrote:
Date: Mon, 28 Jun 1999 09:35:16 -0700
To: "Russell D. Hoffman" (rhoffman@animatedsoftware.com)
From: David F Doody (David.F.Doody@jpl.nasa.gov)
Subject: Re: A small correction is all it takes: Smash Cassini into the moon! STOP CASSINI #144 June 25th, 1999
X-UIDL: c096ab285c71425deff1f134dd3db539

UNSUBSCRIBE STOP CASSINI NEWSLETTER

Thank you.

dd

Dave Doody
Systems Engineer
Cassini Realtime Operations
david.f.doody@jpl.nasa.gov
818-393-7732

----- END OF INCOMING EMAIL FROM DAVID. F. DOODY -----

----- MY RESPONSE -----

Dear Sir,

You are not a subscriber. The STOP CASSINI newsletter is sent to you because you are a public official, whose employment is paid for with my tax dollars, and you have made statements about Cassini in public which need to be answered. The address is not your private email address, it is the way the public communicates with the Government.

You haven't even tried to answer our charges against your stupid mission. (You haven't even acknowledged reading the newsletters.) You will NOT be "unsubscribed", although this correspondence will appear in my next newsletter so others can see your desire to stick your head in the sand.

Sincerely,

Russell Hoffman

----- END OF MY RESPONSE -----

---

(2) Some facts and figures about Cassini's plutonium:

Cassini has over 400,000 Curies of Plutonium on board. At launch, it was about 406,000 Curies, but there has been 2 years for it to decay, so it might be down to 402,000, maybe a little less.

Pu 238 is not "weapons grade plutonium" (Pu 239), as NASA is quick to point out, as though this were reassuring or comforting. In fact, Pu 238 is about 280 times MORE radioactive than Pu 239. What this means is that it decays about 280 times FASTER. That is, its half-life is 1/280th that of Pu 239. Pu 238's half-life, according to NASA, is 87.75 years (some technical books give a slightly different value). Pu 239, on the other hand, has a half-life about 280 times longer, or roughly 24,131 years (NASA's figure again.)

Of the 72.3 pounds of plutonium dioxide, 11.852% is oxygen and 2.413% is "other" (described as "small amounts of long-lived actinides and stable impurities" in NASA's June 1995 Environmental Impact Statement (EIS) for the Cassini mission). The rest is plutonium. Here is the full breakdown of the plutonium components, from page 2-18 of the 1995 EIS:

Fuel component (Weight % at launch) (Half-life)

Pu 236 (0.0000010%) (2.851 years)
Pu-238 (70.810%) (87.75 years)
Pu-239 (12.859%) (24,141 years)
Pu-240 (1.787%) (6,569 years)
Pu-241 (0.168%) (14.4 years)
Pu-242 (0.111%) (375,800 years)

Thus, there are 400,000+ Curies, roughly, of plutonium on board Cassini, and the vast majority of the Curies are from the Pu-238. There were (launch values) 132,920 Curies in each of three Radioactive Thermoelectric Generators (RTGs) on board, of which 130,925.20 Curies is from the Pu 238 alone. Note that there are also about 130 Radioactive Heater Units (RHUs) on board Cassini as well, each with 2.7 grams of plutonium dioxide, and each of which WILL INCINERATE in a reentry accident, according to NASA's own documentation!

How does this much plutonium compare to what was released during nuclear weapons testing? That was mostly Pu 239, so by weight, you would need about 280 times as much of it as of Pu 238 for the same amount of radioactivity (400,000+ Curies). As it turns out, that is about the amount that is believed to have been released in weapons testing -- about 440,000 Curies of Plutonium, almost all of it Pu 239. That is about 12 tons of Pu 239. If spread into the environment, Cassini's 72.3 pounds of plutonium, being mostly Pu 238, would have nearly the same radiological impact on human health (and other living things).

Regarding Pu 238 already in the environment, weapons testing, 1945 - 1974, according to NASA's June 1995 Cassini EIS (page 3-44) released about 9,000 Curies of Pu 238 into the environment. NASA's own SNAP-9A released 17,000 Curies of plutonium, again mostly Pu 238, into the environment in 1964 when it reentered Earth's atmosphere and was intentionally incinerated at high altitude (NASA had assured the public, and the late Dr. Karl Z. Morgan specifically, that there was a "one in ten million" chance of SNAP-9A reentering Earth's atmosphere, but it happened.) Page 3-44 of the 1995 EIS also indicates that "Overseas Nuclear Reprocessing Plants, 1967 - 1987" released Plutonium 238 into the environment (3,000 Curies), and Chernobyl is listed as having released 810 Curies of Pu 238. The total of these sources for Pu 238 contamination in the environment is 29,810 Curies. Cassini could increase this amount by about 400,000 Curies -- more than an order of magnitude.

In the next 50 years, over a billion people will die of cancer. The #1 reason will be cigarette smoking. But the #2 reason will be "other environmental assaults". Plutonium causes cancer, leukemia, and birth defects. Cancer is something no one needs to get. No matter how survivable modern medical technology makes it, the best way to survive cancer will always be not to get it in the first place.

Knowledge about Saturn is not worth this risk to humanity, but NASA is using Cassini as a cover-up for a military nuclear agenda, and excuses the risk as being necessary in the interest of national security. They excuse the lies, the cover-ups, the character assassination of their opponents, the arrogance -- all of it -- in the name of "national security". But national security comes from being an innovative and compassionate nation, not an arrogant and stupid one. And it comes from saving the lives of people all over the world, not from risking those lives needlessly.

-- rdh

(3) More details about plutonium and its behavior:

If you take a given weight, let's say a kilogram of Plutonium 238, the majority of the kind of plutonium on board Cassini, and the same weight, (again, let's say a kilogram) of plutonium 239, the majority of the kind used in atomic bombs, they will each have about the same actual number of atoms of plutonium, because the atomic weights are very similar.

Each atom of plutonium decays only once. When it does it shoots off an "alpha" particle which is just a helium atom without the electrons. It doesn't go very far when outside the body, a few inches in air for example, and it will not penetrate skin (which is a dead layer of cells designed over a period of eons to protect the living human cells within from external sources of radiation such as the sun).

Inside the body, however, radioactive materials irradiate the closest cells horrendously! Each alpha particle that is shot off when a plutonium atom decays is like a tiny little bullet, which cuts through the cells. The exact nature of the damage is complex, not totally understood by science, and in a sense, not entirely relevant to this discussion. What is relevant is that the damage can be done by even one alpha particle. This has been scientifically proven. (See newsletter #127, which contains a letter from Dr. John W. Gofman explaining this (his credentials are also briefly stated.)

To continue the discussion about Pu 238 versus Pu 239, the difference is that Pu 238 "explodes" about 280 times more frequently than Pu 239. By explosion I mean, the shooting off of the alpha particle. It's a tiny, tiny "nuclear" explosion, which cannot be stopped, (see Newsletter #140, the quote by W. W. Schutz, General Electric, 1951). It WILL happen, but no one can predict exactly when an individual Pu atom will decay.

For that, we must turn to statistical reasoning. That is what a "half-life" is. It is the time it takes for half of a large sample of atoms to decay. It is a value which can be determined with extreme accuracy for a large sample, but if you had only one atom of plutonium, you would have no way of knowing when it would decay. If it is plutonium 238, then chances are 50/50 that it will decay within 87.75 years. If on the other hand, it is an atom of plutonium 239, then chances are 50/50 that it would decay some time within 24,100 years.

But half the atoms in a sample will NOT have decayed within the first "half life". Of that half, what happens to them? Do they all decay in the second "half-life" and then we are done with it?

No, not at all.

What happens is that half of what is left will decay in the second half-life. Thus, in the period from 87.75 years to 175.50 years (2 X 87.75), 25% of the original sample of Pu 238, or half of what is left, will decay. And thus, 25% of the original sample would remain after the second 87.75 years.

The next 87.75 would see half the 25% that was left decay, leaving 12.5% of the sample. The next 87.75 would see that cut in half, and so on.

It is generally accepted that after 10 half-life periods, most of anything would have decayed (less than a thousandth of the original quantity would be left), and after 20 half-lifes, where less than a millionth of something would be left, that it is as good as "transmutated". For Pu 239, that is about 500,000 years. For

Pu 238, it is about 2,000 years.

This leads to the question: Which is worse? Something with a long half-life or something with a short half-life? It depends really on what you do with it -- do you plan to store it, or do you plan to spread it around the environment (or do you plan to try to rocket into space, which risks spreading in around instead)?

If you want to keep something which is radioactive away from human life, then it is better for it to have a short half-life, because then you only need to worry about it for a comparatively little while. Some radioactive substances have half-lives of billions of years, for instance. That's basically always going to be radioactive, since by the time it has decayed to where a "large sample" is not radioactive, the sun will have gone super-nova and swallowed Earth in its hellfire! Such substances must be carefully stored forever, at a cost we simply cannot imagine, since we have no idea how it will be done.

Something with a short half-life means that smaller samples give off the same amount of radiation as larger samples of things with longer half-lifes. Such is the case with Cassini's plutonium 238 compared to the more commonly understood variety, that used for nuclear weapons, Pu 239. It is a well-accepted statement that "27 micrograms" (See newsletter #141 for how this value is determined) of plutonium 239 is enough to cause a lung cancer in anyone who inhales such a quantity. Pu 238, being about 280 times more radioactive (that is, having a half-life about 280 times shorter), would require 1/280th of that amount, or about a tenth of a millionth of a gram, for the same effect, for any particle inhaled or ingested into the body.

Thus, Pu 238, with its very short half-life, is dangerous in far smaller quantities, than Pu 239 with its much longer half-life. There is, in fact, an inverse proportion of half-life to danger-per-weight, because in every other respect, the two atoms are very similar to each other. They weigh almost the same and have nearly identical chemical properties.

NASA's decision to risk spreading vaporized plutonium 238 into the atmosphere is the most insane thing a human being could possibly want to risk! If Pu 238 is vaporized, it will create "a spectrum of sizes" of particles as the late Dr. Karl Z. Morgan put it to me in a conversation I had with him when I first got involved with Cassini over two years ago. Most will be far smaller than a tenth of a microgram, and so NASA claims that these smaller particles are virtually harmless. But that is NOT TRUE! They are proportionally just as dangerous! In other words, if you have a particle that is a thousandth the size of one that will cause cancer for sure when deposited in a human lung, then that smaller particle will have a thousandth as much chance of causing cancer.

If you have a particle which is a millionth the size of a particle that will "for sure" cause a lung cancer (again, that would be about 27 micrograms for Pu 239, and about one tenth of a microgram for Pu 238) then that millionth-sized particle will have a millionth-chance of causing a lung cancer. But the chance will not be zero. (And NASA's own documents indicate that "5 billion" of the population might get SOME plutonium in their systems from a Cassini reentry accident!)

Thus, spreading Cassini's plutonium into the upper atmosphere is a trick NASA is playing with human lives. It is a trick that will make it impossible to identify who gets a cancer, leukemia, or birth defect from Cassini, but those effects WILL happen if Cassini reenters the Earth's atmosphere on August 18th,1999. If it does, there WILL be a release of plutonium into the environment! Perhaps half a pound, perhaps 10 pounds, perhaps the full 72.3 pounds (about 33 kilograms), or roughly 400,000 Curies of plutonium, will be dispersed into the environment. Sane people do not gamble with other people's lives like that.

-- rdh

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(4) A nuclear EMP as it relates to hospitals and nuclear power plants

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Readers may recall a series of letters to and from a certain Jeff Nyquist, writer for World Net Daily (www.worldnetdaily.com). These letters concerned the effects of nuclear war and the effects of the Electromagnetic Pulse which accompanies any nuclear blast. They appeared in newsletters #128, #129, #132, #133, #134 and #135. On June 27th, I sent Jeff Nyquist the following letter regarding an article published in SPACE NEWS, which we discussed in the previous newsletter (#145):

----- OUTGOING EMAIL TO J. R. NYQUIST (jnyquist@northcoast.com)-----

Mr. Nyquist,

Here's a place where you can learn something important without having to listen to me, whom you obviously don't believe (though you should).

Check out SPACE NEWS, June 28th, 1999, page 17: "Energy Pulses Called an Overlooked Threat". For you, it should be quite an eye-opener (but don't think even it tells the WHOLE story. For that, you'll just have to listen to me after all!)

-- Russell Hoffman

----- END OF OUTGOING EMAIL TO J. R. NYQUIST -----

----- INCOMING RESPONSE FROM J. R. NYQUIST -----

At 10:22 PM 6/27/99 +0000, J. R. Nyquist wrote:

I understand about EMP. I've written about it elsewhere. However, I do not believe that it would cause nuclear plants to melt down.

J.

----- END OF INCOMING RESPONSE FROM J. R. NYQUIST -----

I responded immediately with, "If that's what you don't believe, you haven't studied it very well." I followed that up with the following more in-depth discussion of the electromagnetic pulse:

----- FOLLOWUP OUTGOING EMAIL TO J .R. NYQUIST: -----

SUBJECT: Mr. Nyquist: Exactly how certain of this are you?

Mr. Nyquist,

Regarding your statement [shown above], exactly how certain of this are you? 100%? 99.999%? 99%? 90%? 51%?

Because you're talking about what would lay waste to millions of acres of land, kill hundreds of thousands or even millions of people, and destroy the infrastructure of the nation. Don't forget, Mr. Nyquist, TMI was NOT a meltdown (okay, maybe just a little bit). Chernobyl wasn't even a "worst case scenario" by any stretch of the imagination! It was not a "China Syndrome". It was the start of one. Are you aware of that fact? How sure are you that a nuclear EMP would not effect the nuclear power plants in America?

Is this sureness based on your assumption that the EMP would simply not be that strong for anything? Or is it that nuclear power plants are uniquely not vulnerable, because they all have old, outdated equipment? Because if just ONE vital piece of the complex nuclear plant has been upgraded to today's digital technology, such as more efficient electronic controllers for the hundreds of pumps, or various display and control panels in the control room -- if any of these are the least bit "modern", then the EMP could be catastrophic for that nuclear power plant. Or do you disagree with that statement? If so, state which nuclear power plants you think have NOT ONE VITAL PIECE OF COMPUTER EQUIPMENT IN THEM so someone can check your facts.

If you really understand the EMP, then you know it would also destroy all the fine electronics in every hospital in the country. One EMP would do that. With all the fancy hospital equipment destroyed, then even the smallest of nuclear wars (just a minor holocaust, you might say) would turn into a global horror, since infections could not be treated, broken bones could not be x-rayed, operations could not be performed. Oh sure, you could still stick a scalpel in someone, but have you visited a modern hospital lately? They are high-tech wonders. They are completely vulnerable to the EMP. Even the emergency lighting systems would undoubtedly fail.

One last question. Why haven't you published a link to our rebuttals of your statements, especially after asking if *I* had the decency to publish YOUR absurd statements (which I did, and will do again)? Are you afraid your readers might see the logic of our position and the absurdity of yours (I don't blame you if you are)?

Sincerely,

Russell Hoffman

----- END OF FOLLOWUP OUTGOING EMAIL TO J .R. NYQUIST: -----

Any subscribers in Maryland who are represented by Roscoe Bartlett (R-Md) are implored to pass our comments on to him. -- rdh

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(5) Interesting web site: Free anti-war banners for the www and print:

Visit this ultra-cool web site for graphic art you can use at your web site for free!

http://www.servus.at/kunsthalle/

ANTI-WAR LOGOS BANNERS POSTERS FOR THE WWW AND PRINT

---

(6) What you can do today to stop the Cassini flyby of Earth:

To learn about the absurd excuses NASA used to launch Cassini in 1997, ask them for the June, 1995 Environmental Impact Statement for the Cassini Mission. At the same time, be sure to ask them for ANY and ALL documentation available on future uses of plutonium in space, including MILITARY, CIVILIAN, or "OTHER" (just in case they make a new category somehow!). To get this information, contact:

Cassini Public Information
Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena CA 91109
(818) 354-5011 or
(818) 354-6478

NASA states that they do not have the resources anymore to answer most emails they receive. Liars! They have $13 billion dollars to play with. They can answer the public's questions!

Here's NASA's "comments" email address:comments@www.hq.nasa.gov

Daniel Goldin is the head of NASA. Here's his email address:
daniel.goldin@hq.nasa.gov or
dgoldin@mail.hq.nasa.gov

Here's the NASA URL to find additional addresses to submit written questions to:

http://www.hq.nasa.gov/office/pao/facts/HTML/FS-002-HQ.html

YOU HAVE A RIGHT TO KNOW WHAT NASA IS DOING TO YOUR HEALTH.

Be sure to "cc" the president and VP and your senators and congresspeople, too.

president@whitehouse.gov vice.president@whitehouse.gov

Always include your full name and postal address in all correspondence to any Government official of any country.

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(7) Subscription information

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Previous issue (#145)

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First placed online June 29th, 1999.
Last modified July 12th, 1999.

Webwiz: Russell D. Hoffman

TTC1 11:00 am 4/27

From: Dennis Galvin
To: navy-rpt
Date: 4/26/01 12:55PM
Subject: Navy review

Attached is my proposal for wording to use in the Navy SER related to waste package lifetime and rockfall issues in preparation for meeting with Bill Reamer tomorrow (limited to NRC at this point.) Please provide any comments, refinements, or questions.

thanks

CC: David Brooks; Timothy McCartin

Team issues for discussion

Here are the first two issues and their proposed resolution. While my propose resolution would implicitly allow specific mechanisms to be screened out base upon waste package lifetime, the resolution does not do so implicitly. This would allow NRC to refine its position at a later date. I believe my wording also accounts for the possibility that waste package penetration and waste package mechanical damage will occur during the regulatory period.

Issue as originally stated:

1. Waste Package Lifetime: NNPP assumes that there will be no waste failures before 10,000 years based on OCRWM. While there are close pending agreements, NRC has identified several issues which when resolved may result in waste package failures before 10,000 years. Should NRC conditionally accept the 10,000 year period with no failures? The current writeup takes an alternative approach of identifying it as an open item since NNPP has made approaches and conclusions based on no failures with no backup approach. I have also made the acceptance condition:

> Acceptance of the approach to screen out mechanisms that depend on the introduction of materials into the waste package until after waste package penetration is conditional upon OCRWM closing the waste package lifetime issues documented in the agreements made at the NRC-OCRWM closure technical exchanges by the time of license application.

Here is my proposed resolution:

> **Prior to waste package penetration, NRC accepts screening out mechanisms that depend on the introduction of materials into the waste package. However, since NRC has not accepted a waste package penetration time and NNPP is seeking acceptance of approaches well before the issues with the waste package penetration time will be closed, NNPP's approaches should be applicable to a waste package penetration during the regulatory period including waste package penetration upon repository closure. NRC does not accept approaches and conclusions that are based upon a specific waste package penetration time, such as 10,000 years. NRC acceptance of a specific waste package penetration time is dependent upon OCRWM closing the agreements made at the closure technical exchanges related to waste package lifetime and upon OCRWM successfully justifying the waste package failure time distribution for use in the TSPA.**

Issue as originally stated:

2. Waste Package Integrity: NNPP assumes that there will no damage to the waste package or its contents from rockfall and disruptive events (besides igneous) for 10,000 years based on OCRWM arguements. While there are close pending agreements, my understanding is that currently OCRWM has very little basis for their positions, and it is fairly likely, at least compared to waste package lifetime, that OCRWM will have to change their position. Should NRC conditionally accept the 10,000 year period with no damage? The current writeup takes an alternative approach of identifying it as an open item since NNPP has made approaches and conclusions based on no failures with no backup approach.

Here is my proposed resolution:

NNPP has proposed screening out mechanical damage to the waste package from dynamic impacts, rockfalls, for 10,000 years based upon the design of the EBS. NRC has not accepted that the design of the EBS will preclude mechanical damage to the waste package for a specific period of time, such as 10,000 years. Since the NNPP is seeking acceptance of approaches well before issues involving rockfalls will be closed, NNPP's approaches should be applicable to mechanical damage to the waste package and its contents during the regulatory period including upon repository closure. NRC acceptance of a specific time before which mechanical damage from rockfalls does not have be considered is dependent upon OCRWM closing the agreements made at the closure technical exchanges related to rockfalls and upon OCRWM successfully justifying the time distribution for use in the TSPA.

(210) 522-6838

Team issues for discussion

These are the issues I have identified from complying the SER and discussing it with the team members that we need additional consensus on or changes that I have made that I have not informed the entire team. Please send me any issues that are not on this list that you think need to be discussed.

1. Waste Package Lifetime: NNPP assumes that there will be no waste failures before 10,000 years based on OCRWM. While there are close pending agreements, NRC has identified several issues which when resolved may result in waste package failures before 10,000 years. Should NRC conditionally accept the 10,000 year period with no failures? The current writeup takes an alternative approach of identifying it as an open item since NNPP has made approaches and conclusions based on no failures with no backup approach. I have also made the acceptance condition:

> Acceptance of the approach to screen out mechanisms that depend on the introduction of materials into the waste package until after waste package penetration is conditional upon OCRWM closing the waste package lifetime issues documented in the agreements made at the NRC-OCRWM closure technical exchanges by the time of license application.

2. Waste Package Integrity: NNPP assumes that there will no damage to the waste package or its contents from rockfall and disruptive events (besides igneous) for 10,000 years based on OCRWM. While there are close pending agreements, my understanding is that currently OCRWM has very little basis for their positions, and it is fairly likely, at least compared to waste package lifetime, that OCRWM will have to change their poisition. Should NRC conditionally accept the 10,000 year period with no damage? The current writeup takes an alternative approach of identifying it as an open item since NNPP has made approaches and conclusions based on no failures with no backup approach.

3. Open items: Should we have open items if we have all these close pending agreements? The current writeup contains many open items. One argument we could make is that we haven't had a closure technical exchange with the NNPP yet.

4. Core-specific analyses: NNPP mentions through out the Addendum and other submittal that particular analyses will be in the core specific analyses. These core-specific analyses will be a significant part of NNPP's licensing basis. Yet we have a little idea of the form they will take, and their contents are dispersed throughout the Addendum and other submittals. I could not identify a basis for an open item or acceptance condition for the core-specific analyses, but an outline or a list of what will be in them would be very helpful.

Other issues:

These are various positions I took that are more specific:

5. NNPP does not have to directly evaluate changes to the Master Scenario List. NNPP essentially said that while they looked at the Master Scenario List, It is not really part of their process of identifying FEPs. I accepted this.

6. NNPP has stated that they will reduce the probability of certain FEPs by having qualified workers but have not provided a training or qualification program. I made an open item that NNPP has to demonstrate that their workers and supervisors are qualified, such as by submitting a training and qualification program or having DOE approve their training and qualification program. The regulation is silent on this matter.

7. I made an open item that NNPP needs to provides additional details on the hydraulic analysis that they might perform for FEP 26. For example, NNPP did not identify any methodology or any basis for validating it for the specific application.

8. We did not specifically discuss NNPP's unmoderated criticality calculation in the SER. In the Addendum NNPP indicated that this was a bounding calculation to show that there could be now unmoderated criticalities. James has indicated that this should be covered by their sensitivity studies so it may be a moot point.