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**Comments
on the Scope of
U. S. Department of Energy
Consolidation
of
Nuclear Operations
Related to
Production of
Radioisotope Power Systems
Environmental Impact Statement
and
Other Planned Space Nuclear Programs**

**Submitted by
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on behalf of
Environmental Defense Institute
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I. Summary

The Environmental Defense Institute (EDI) is a non-profit public interest organization dedicated to research and public policy accountability on environmental issues.

EDI offers these “scoping” comments not only to the Department of Energy (DOE) but primarily for the public benefit as an information source in the preparation of their own individual comments. EDI’s comments will be finalized and formally submitted to DOE prior to the January 31, 2005 deadline.¹

EDI offers the information below because DOE is currently providing little or no information or data on this new Consolidated Environmental Impact Statement (EIS) on what environmental health and safety impact this new DOE program will have on Idaho and other affected DOE sites. EDI acknowledges that (despite our best efforts to gain access to the information) the cited documentation below is “dated,” and contradictory, however, it is currently all we have available at this time.

EDI’s limited access to crucial information restricts our ability to offer comprehensive comments. What information EDI has gleaned from available (but difficult to access) documents, makes it clear that DOE must conduct a new comprehensive programmatic impact statement (PEIS) on the agency’s intent to produce plutonium-238, and due to the fact that numerous federal agency programs and numerous DOE sites are involved that also include a multitude of problematic waste that must be managed and fully accounted for at these far-flung DOE operations, supports EDI request for a new comprehensive PEIS that will cover all the issues discussed below.

The State of Idaho’s legal efforts to force DOE to appropriately manage existing waste at Idaho National Laboratory (INL) was dealt a serious set back in December 2004 when the U.S. Court of Appeals for the Ninth Circuit reversed the 2003 District Court ruling requiring DOE remove all transuranic waste from INL.² The Environmental Defense Institute submitted an Amicus Curiae brief in this case September 17, 1993 to advise the court and the parties of deficiencies in the Idaho/DOE Settlement Agreement at issue in the case that posed significant environmental, health and safety issues related to buried waste not clearly identified in the Agreement. Both Idaho and DOE linked arms in opposition to EDI’s brief and the court subsequently (September 21, 1993) issued an Order Denying Motions to Intervene and to Participate as Amicus Curiae. Had Idaho heeded this warning, the State would not be in the legal predicament it is currently in. This court ruling is a credible indication that regulatory control over hazardous and radioactive waste management is severely compromised. In short, this leaves the public at the mercy of DOE which has historically demonstrated a consistent lack of concern over environmental, health, and safety issues.

The DOE data below is offered because it is the only apparent information available to the public for insight into the crucial information related to these proposed projects that otherwise (with full disclosure) is necessary for an informed comment. EDI acknowledges that the below cited DOE data conflict between publicly available and internal DOE report information. Public access to the withdrawn 2000 PEIS is blocked by DOE. EDI, luckily, requested and received a rare copy of the PEIS back in 2000 from DOE’s Hanford Office when the status of the Fast Flux Test Facility (FFTF) was in question and subsequently shut down.

Recent DOE Congressional testimony in support of its Nuclear Energy program funding clearly identifies INL as the “designated lead laboratory for nuclear energy research and

development” and “the funding at the Idaho site, given the lead-lab status is clearly insufficient.”³ Clearly, DOE already is already seeking funding for major programs that are not being fully disclosed to Idaho residents and more importantly before a comprehensive environmental impact statement has been completed. This is a direct violation of National Environmental Policy Act that mandates a complete environmental impact analysis prior to seeking or committing resources.

Additionally, the shipment of spent nuclear fuel reprocessing waste (containing neptunium-237) from the Savannah River Site (SRS) to INL for the production of plutonium-238 likely violates the 1995 State of Idaho Settlement Agreement and Consent Order with DOE.⁴ Eager for economic development at any risk, the State of Idaho is actively supporting this DOE program by approving the final RCRA permit for the High-Level Liquid Waste Evaporator needed to process the waste from Savannah River site.⁵

II. Previous DOE NI/PEIS on Plutonium-237 Production

DOE released in December 2000 the Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research & Development and Isotope Production Missions in the US, Including the Role of the Fast Flux Test Facility, hereinafter referred to as PEIS,⁶ also called the Nuclear Infrastructure Programmatic EIS (NI PEIS).⁷

DOE withdrew this 2000 PEIS and launched this new Environmental Impact Statement public “scoping” process for a “consolidated” Pu-238 program to reflect major policy changes (which remain largely undisclosed).

This relaunched program offers the public an opportunity to comment on various alternatives for the production of plutonium-238.⁸ This plutonium is “reportedly” for use in advanced radioisotope power systems (RPS) for military surveillance satellites, National Aeronautics and Space Administration (NASA) space exploration missions, and support of the nation’s civilian nuclear energy research and development needs.⁹ “It is believed that plutonium-238 is used in the Navy’s Sound Surveillance System (SOSUS), which consists of hundreds of sea bed monitors. It is also known that the Navy has placed terrestrial devices containing Radioisotopic Thermoelectric Generators (RTGs), which contain plutonium-238, at remote locations for powering instrumentation. [NCI, 9/18/00 comments to C.E. Brown, Office of Space and Defense Power Systems (NE-50) USDOE] Since neither DOE nor NASA is willing to fully disclose all programs related to this Pu-238 production project and related ongoing operations, the public is left in the dark and unable to substantively comment on the new EIS without this crucial information.

The former PEIS “Preferred” Alternative 2 Option 7 advocates the use of existing processing facilities at Oak Ridge and INL [previously called INEEL] (with the Advanced Test Reactor [ATR] replacing the Hanford Fast Flux Test Facility [FFTF] reactor). DOE’s claim in this option of **ZERO** spent nuclear fuel, does not appear credible, given the fact that nuclear reactors are being used to irradiate neptunium targets for the production of plutonium-238.

DOE’s current contractor Work plan discloses “The [INL] contractor shall receive and safely store approximately 8 shipments of Advanced Test Reactor (ATR) SNF (with approximately eight elements per shipment) for each fiscal year from FY-2006 through FY-2010, for a total of up to 1,230 elements. The contractor shall receive and safely store up to 31 shipments per year of ATR SNF (with approximately eight elements per shipment) for each

fiscal year from FY 2006 through FY 2010, for a total (including FY-2005) of up to 1,294 elements. The contractor shall receive and safely store 5 kg of non-ATR SNF from TRA, as described in Table C.7 in Section C.5.6.”¹⁰

This alternative/option is included for comparison only because it may have “real” operating numbers of existing facilities as opposed to the other alternatives/options discussed below, which are “estimates” for new facilities at INL.

The PEIS Alternative 4 Option 2 advocates for the construction of a new research reactor and all Pu-238 processing at INL. News reports and DOE’s new consolidated mission suggest this is the direction DOE is currently headed. Also note that DOE publicly claims that no high-level waste (HLW) is generated, yet, the below data show eleven tons. It must be further noted that DOE is using a definition of HLW that was ruled in U.S. District Court as illegal and DOE is now desperately appealing that decision in the U. S. Court of Appeals.¹¹ The Environmental Defense Institute is a “party” in this litigation via court approved amicus (friend of the court) brief filed by EDI.

Additionally, the TRU/HLW numbers are the same between Alternative 2 and 4 below, yet Alternative 4 shows 11 metric tons of spent nuclear fuel (SNF) otherwise classified as high-level waste (HLW). This raises serious questions about DOE’s documentation.

The PEIS Alternative 4 Option 2 intends to use the “newer” Fluorinel Dissolution Process Facility (FDPF) also called FAST (CPP-666) at INTEC, which was build but not used extensively (reprocessing was shutdown in 1992) to reprocess zirconium/stainless clad Navy SNF; and CPP-651 Storage Vault. The closest PEIS “alternative” is Number 4 Option 2 to what DOE is currently talking about at public meetings. Also DOE’s claim of \$230 million funding would only be enough to retool the FDPF for Pu-238 processing, and is only a fraction of the costs detailed in the PEIS.¹² See DOE’s Cost Tables below. DOE has no Resource Conservation Recovery Act (RECA), Clean Air Act Title V, or Clean Water Act permits for the FDPF, nor has DOE shown that the FDPF could ever meet these permitting requirements. [See Endnote # 12]

Even DOE’s own 2003 internal Infrastructure Task Force (ITF) review advisory panel report advised; “Some [INEEL/ANL-W] facilities should be shut down or not considered for further development. In the ITF view this includes the uncompleted Fuel Processing Facility (FPF) that ITF recommends be abandoned. There may be others such as the [INTEC] Flourinel Dissolution Process Cell (FDP).”¹³ Also called Flourinel Dissolution Process Facility (FDPF). The “Fuel Processing Facility” was built at INL/INTEC in the late 80s -early 90s as whole new SNF reprocessing building (to replace existing non-compliant SNF processing plants) that was never completed at INTEC because SNF reprocessing was discontinued in 1992.

According to DOE’s long-term plans [see Robert Long Testimony, endnote] the Department does not need the Flourinel operation (FDP) right now (and maybe never since it operated last in 1988 and is likely outdated and dedicated to stainless/zirconium clad SNF). DOE will apparently continue with existing aluminum clad neptunium-237 targets and the old SNF reprocessing plants/reactors until they get funding for Gen IV high-temp reactors when they’ll have to use stainless steel/zirconium clad targets. DOE then will build a new “state-of-art” replacement for FDP (which by then will be 30-40 years old).

Environmental Defense Institute, Inc., Keep Yellowstone Nuclear Free, Inc., and David McCoy submitted a formal Petition to EPA Office of Inspector General requesting a

comprehensive investigation of environmental statute and regulatory violations at DOE's INL in October 2002.¹⁴ <http://www.environmental-defense-institute.org/publications> Responding to this Petition EPA/OIG subsequently released a "Evaluation Report" No. 2004-P-00006, February 5, 2004 that largely acknowledged EDI's allegations of DOE/INL violations.¹⁵

**Comparison of Waste and Spent Nuclear Fuel (SNF) Generation
units in cubic meters (over 35 years) [PEIS pg S-63]**

Option	TRU/HLW (a)	LLW	MLLW	Hazardous	Nonhaz Waste	SNF (tons)
Alternative 2 Option 7	380	2,100	>180	3,100	105,000	0
Alternative 4 Option 1	380	4,800	330	3,300	1.1x10E6	11
Alternative 4 Option 2	240	4,900	330	3,300	1.1x10E6	11

Acronyms for above table:

TRU = transuranic waste; HLW = high-level waste; LLW = low-level waste; MLLW = mixed hazardous and radioactive waste; SNF = irradiated spent nuclear fuel; 10E6 = one million.

a. PEIS Definitions of Transuranic/High-level Waste for above table:

"The analysis for the Draft NI PEIS assumed that the waste generated from the processing of irradiated neptunium-237 targets is transuranic waste. However as a result of comments received during the public comment period, DOE is considering whether the waste from processing of irradiated neptunium-237 targets should be classified as high-level radioactive waste. Irrespective of how the waste is classified (i.e., transuranic or high-level radioactive), the waste composition and characteristics are the same, and the waste management (i.e., treatment and onsite storage as described in the NI PEIS would be the same. In addition, either waste type would require disposal in a suitable repository." [PEIS at S-64]

DOE Contractor 2005 Statement of Work on ATR SNF ¹⁶

ATR SNF Fuel	Shipments	Number of Elements
FY-2005	8	64
FY-2006 to 2010	31	1,230
Totals	39	1,294

These DOE numbers are the most recent (but not publicly available) conflict with the PEIS numbers that show Zero for ATR Spent Nuclear Fuel (SNF) high-level waste generation.

**Waste Generation Rates at INL Advanced Test Reactor (ATR)
and Flourinel Dissolution Process Facility (FDPF) Per Year¹⁷**

Waste Type	ATR (cubic meters per year)	FDPF (a) (cubic meters per year)
High-level Radioactive (a)	0	0
Transuranic (b)	0	0
Low-level Radioactive	404	0
Mixed Low-level Radioactive (b) (c)	<1	0
Hazardous (b)	190	0
Non-hazardous (c)		
Process Wastewater	794,000	0
Sanitary Wastewater	42,000	0
Solid	4,208	0

(a) The above waste numbers for the FDPF are all Zeros because this Spent Nuclear Fuel (SNF) reprocessing plant has not operated since 1988. Therefore, the zeros are **NO** indication about waste generation if/when the plant is restarted.

Also, DOE lists ATR high-level waste generation at zero, which is physically impossible since operating a nuclear reactor (ie. ATR) generates SNF (HLW as defined in the NWSA).

DOE's FY-2005 Statement of Work for INL site contractor Section C shows 39 ATR SNF shipments (containing 1,294 SNF elements) to INTEC between FY-2005 through FY-2010.¹⁸ Therefore, the above DOE "zeros" for ATR data lacks credibility.

(b) DOE lists Transuranic waste generated at zero, which is not credible for any acid/solvent dissolution processing operation that generates TRU waste and/or mixed hazardous TRU and mixed Low-level waste.

(c) DOE lists [PEIS pg. 3-83] annual Waste Management Capabilities at INEEL [INL] LLW Test Reactor Area (TRA) where ATR is located "**online**" Warm Waste Evaporation Ponds at 31,830, and Cold Waste Pond at 795,800 cubic meters **per year**. These unlined percolation ponds are specifically identified by EPA as a primary source of radioactive and hazardous waste contamination of the Snake River Aquifer. See EDI Aquifer Report 12/19/03 that for instance documents DOE monitoring data of cesium-137 ground water contamination at 21 million pCi/L or 176,470 times over EPA Maximum Contaminate Levels for cesium under the TRA.

[See NI/PEIS page A-5 and 8]	Radioisotope Power System Fuel Cell Production
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DOE must provide in its new EIS complete waste characterization data to include; 1.) EPA waste code numbers; 2.) waste volumes; 3.) waste management treatment; and 4.) waste disposition for each of the material production stages in the above plutonium-238 production graph.

Consolidation of the Pu-238 production program at INL would apparently include moving purification of neptunium currently produced at DOE's Savannah River Site (SRS), target fabrication, and post irradiation target processing currently done at Oak Ridge (ORNL). This is a major move of production operations to Idaho.

"The fabrication of neptunium-237 targets for plutonium-238 production would require dissolving the neptunium oxide, purification of neptunium to remove radioactive decay products, conversion of the neptunium to an oxide, and fabrication of neptunium oxide into targets for irradiation." [PEIS @ A.1.3]

"For the production of Pu-238 [at INL's ATR], neptunium 237 targets would be placed in the beryllium reflector position. The proposed target design consists of neptunium dioxide blended with aluminum powder, pressed into a target core, and clad with aluminum." This a technical way of saying, there is indirect use of spent nuclear fuel in the Pu-238 production. [PEIS at (B-3)]

"The neptunium-237 to be used in the targets would come from two sources: (1) neptunium that had been separated previously during spent nuclear fuel processing at SRS, converted to an oxide, and then shipped to ORNL for storage (Section A.1.2); and (2) neptunium that would be recovered from irradiated neptunium-237 targets and recycled for use in new targets (Section A.1.4)." [PEIS at A-5]

"Post irradiation processing of neptunium-237 targets at ORNL would involve dissolution; separation of the actinides from the fission products; separation of neptunium from plutonium; a third solvent extraction process to purify the remaining neptunium; purification of plutonium; precipitation of plutonium oxalate; calcination of plutonium oxalate to plutonium oxide; and exchange of oxygen-17 and -18 by oxygen 16 in the plutonium oxide." PEIS (A.1.4)

According to the old NI/PEIS, the neptunium-237 insert is aluminum clad and looks like a fuel rod about 35 inches long [PEIS @ 2-20] but is inserted into the reactor for irradiation, and then run through a three-stage reprocess using the same basic PUREX acid/solvent dissolution process used with aluminum clad Spent Nuclear Fuel (SNF) but in this case, fission products are discharged as liquid waste [PEIS@2-8] that likely the same proportional liquid waste rates as SNF.

"Dissolution of the irradiated targets at INEEL would be accomplished using a one-step target dissolution process in a nitric acid-fluoroboric acid solution instead of the two-step process for the ATR and HFIR targets that would be used at ORNL and Hanford. It would be necessary to shear or chop the targets at INEEL before the acid leach process." [PEIS @ 2-7] DOE's apparent intent to consolidate all these operations at INEEL would mean the Flourinel Dissolution Process Facility (FDPF) will replace the current ORNL operations. This operation of "chopping" the top and bottom of the inserts produces highly radioactive solid waste is a

major issue at INL because a long history of SNF “chopped” parts that were dumped in unlined “soil-vaults”, unpermitted RWMC landfill by both DOE and the Naval Reactor Facility. Disposition of this waste is apparently again at the INL RWMC burial ground. DOE must provide a full characterization and disposition plan for this waste in the new Consolidated EIS.

Appellees to DOE’s Circuit Court of Appeal challenging the new legislation granting DOE exemptions concur on the significant issue of Greater than Class C waste; “The new Act defined the waste subject to the ss3116 exemption as that which exceeds the concentration limits for Class C low level waste as set out in [10 CFR 61.55].” “This is the same waste at issue in this case that the district court found to be HLW. [NRDC v. Abraham, 271 F.Supp. 2d at 1265].”¹⁹

“Irradiation of the neptunium-237 targets generates fission products in the targets. The irradiated targets would be cooled for at least 120 days to allow time for the decay of short-lived fission products (e.g., iodine-131). Following the cool-down period, the irradiated targets would be loaded into a shielded cask for transport to the chemical processing facility. They would then be ready for chemical processing to separate the plutonium-238 content and unconverted neptunium-237 from the radioactive waste products.” [PEIS @ 2-6]

“Neptunium-237 purification...decays to protactinium-233...the decay of this protactinium ingrowth would contribute significantly to the radiation doses to workers in the target fabrication line,” [PEIS @ A-5]

Additionally, this neptunium target processing produces **fission product** laden “raffinate” waste would have the same waste characteristics in terms of acids/volatile organic compounds (VOC) as that currently in the HLW tanks. [PEIS @ 2-6] This HLLW (DOE refuses to call it HLW despite the fact it meets the definition) then presumably will be run through INTEC Liquid Waste Management System (ILWMS) that includes HLLW Evaporator, PEWE, and LET&D evaporators, and finally to the percolation ponds. All of the ILWMS are major emission/pollution sources. The State of Idaho is in the process of approving the High-level Liquid Waste Evaporator that is the first in a long series of ILWMS operations. [see endnote # 5]

The INL/INTEC Flourinel and Storage Facility (CPP-666) and its stack (CPP-767) are planned for transfer to the Office of Civilian Radioactive Waste Management during the contract period. If this occurs, the ICP Target Cost and Target Fee will be decreased for the ICP baseline work scope removed through the duration of the contract, per Section B.4(e).

²⁰http://www.id.doe.gov/doiid/RFP_ICP/Final_Docs/SECTION%2520C.doc+Flourinel+RCRA+permit&hl=en

The Office of Civilian Radioactive Waste Management (OCRWM) is a program of the U.S. Department of Energy assigned to develop and manage a federal system for disposing of spent nuclear fuel from commercial nuclear reactors and high-level radioactive waste from national defense activities.

Based on limited information from DOE and other related sources, the public is left with no alternative but speculate on what DOE’s REAL plans are short and long term. For instance, DOE apparently does not need INTEC Flourinel Dissolution Plant (FDP) **right now** (and maybe never since it has not operated since 1988 and likely outdated and dedicated to stainless steel /zirconium clad SNF). DOE apparently will continue with existing aluminum clad neptunium-237 targets and the old SNF reprocessing plants/reactors, until DOE gets funding for

Generation IV high-temp reactors when they'll need stainless steel/zirconium clad targets, and then build a new "state-of-art" replacement for FDP (which by then will be 30-40 years old). See Section VIII below that discusses on-going DOE funding for plutonium production at INL using Environmental Management funding.

According to DOE's 2005 Work Plan for INL site contractor; "While [EPA] Maximum Achievable Control Technology (MACT) upgrades and regulatory permitting would be required to make the Calciner system operational, isolation of utilities is being implemented to facilitate re-connection if the calciner system were to be used for future waste treatment."²¹ Clearly the waste slated for the INTEC Calciner High-level Liquid Waste Evaporator and downstream Liquid Waste Management System (ILWMS) from processing of neptunium-237 targets to extract plutonium -238 at INL already are in violation to EPA emission standards.

Again, DOE must in the new Consolidated EIS fully disclose all of its planning and committed funding that must include previous and future funding diverted from Environmental Management! [See Section VIII below]

The point being, this multi-stage target acid/solvent processing in the production of Pu-238 generates significant quantities of air emissions and solid/liquid waste that then must be treated, resulting in additional toxic air emissions.²² The whole process has all the same problematic environmental, health, and safety issues as previous spent nuclear fuel reprocessing discontinued in 1992 mainly because DOE could not then, nor arguably now, manage the emissions/waste generated.

DOE's most current 2005 Statement of Work, Idaho Cleanup Project for INL Site-wide contractor Bechtel offers yet another view into DOE actual ongoing plans that are not readily available to the public. Apparently DOE intends to shut down some older operations and restart others that would be in-line to handle plutonium processing and therefore must be disclosed in the new EIS. This Statement of Work states; "The contractor shall disposition the following four high-risk facilities listed in Exhibit C.5b.: 1.) CPP-601, Fuel Process Building; 2.) CPP-640, Head End Process Plant; 3.) CPP-603, Wet Basins (three basins); 4.) CPP-648, Sludge Tank Control House. **Consideration should be given to evaluation and utilization of CPP-691 Fuel Processing Restoration (FPR) Building to support SNF repackaging or temporary storage,** [Sodium Bearing Waste] SBW treatment and repackaging, or HLW calcine packaging if economic analysis supports such reuse. [emphasis added]

"The Flourinel and Storage Facility (CPP-666) and its stack (CPP-767) are planned for transfer to the Office of Civilian Radioactive Waste Management during the contract period. If this occurs, the ICP Target Cost and Target Fee will be decreased for the ICP baseline work scope removed through the duration of the contract, per Section B.4(e)."²³

This significant move to transfer CPP-666 over to the "civilian" program could involve Neptunium-237 targets inclusion of the new NASA program for plutonium-238 production. DOE must fully disclose its immediate and long-term plans to the public in the new EIS.

DOE spokesperson, Timothy Frazier's public meeting presentations in Boise and Idaho Falls offered cost estimates for the new Pu-238 production program at \$230 million.²⁴ This cost estimate is in direct conflict with the below PEIS noted below.

**PEIS Table S-2 Summary of Estimated Costs of Non-expanded Infrastructure
Alternatives Excerpts # 2:
Using only Existing Operational Facilities and No New Reactor
(millions of FY-2000 dollars)**

Cost Elements	ATR and FDPF	ATR and HFIR and FDPF
Irradiation Facilities		
FFTF Deactivation One-time Cost (B)	281.2	281.2
Startup: target development, testing (C)	2.0	3.5
Operations Annual (D)	8.1	8.1
Neptunium-237 Storage/Processing		
Total (w/modifications) (F)	37.2	37.2
Annual Operating (G)	6.7	6.7
Combined Irradiation Facilities and Processing		
Total Costs (B+C+F)	320.4	321.9
Annual Operating Costs (A+D+E+G)	14.8	14.8
Plutonium-238 Production and Transportation		
Np-237 from SRS Costs Total (H)	7.1	7.1
Pu-238 Production Annual Shipping and Handling Costs (I)	0.24	0.29
Combined Irradiation , Processing Facilities, Transportation and FFTF Deactivation		
Total Costs (B+C+F+H)	327.5	329.0
Annual Operating Costs (A+D+E+G+I)	15.04	15.09
PEIS Table S-2 Summary [PEIS Vol.2 Appendix page S-5]		

DOE's Total Costs apparently also do not include misappropriated funds from Environmental Management Accounts into Nuclear Energy Accounts. See Section VII below.

Acronyms:

ATR = Advanced Test Reactor at INL

FFTF = Fast Flux Test Facility (Hanford reactor)

FDPF = Fluorinel Dissolution Process Facility at INL

HFIR = High Flux Isotope Reactor at ORNL

**PEIS Table S-3 Summary of Estimated Costs of Expanded Infrastructure Alternatives for
Alternative # 4 that includes Construction of New Research Reactor and
Using Existing INL Processing Facilities (FDPF)
(millions of US Dollars)**

Cost Estimates #	Alternative 4 Construct New Reactor + FDPF
Irradiation Facilities Modifications or Construction and Startup, including target development, testing and evaluation *	312.0*
Deactivation of FFTF (one time cost)	281.2
Total Irradiation Facilities (A)	593.2
Annual Operating Costs (B)	25.0
Pu-238 Production Facilities Modifications and Start up Total Costs (C)	37.2
Annual Operating Costs (D)	6.7
Medical and Industrial Isotope/ Nuclear Research and Development Processing Facilities Total Costs (E)	71.1
Annual Operating Costs (F)	23.3
Combined Estimated Costs Total (A+C+E)	701.5
Annual Operating (B+D+F)	55.0
Pu-238 Production Transportation Total Costs (G)	7.1
Annual Operating Costs Including Medical/Industrial Isotope (H)	3.10
Total Costs (A+C+E+G) #	708.6*
Total Annual Operating Costs (B+D+F+H)	58.1*
Table S-3 Summary [PEIS Vol.2 Appendix page S-6]	

* DOE's numbers (\$312 million) for constructing/permitting a New Reactor are NOT credible and believed to be grossly understated by many orders of magnitude.

DOE's Total Costs apparently also do not include misappropriated funds from Environmental Management Accounts into Nuclear Energy Accounts. See Section VII below.

III. Other Defense Materials for DOE/NASA Program

The PEIS avoided any discussion whatsoever of the use of plutonium-238 by defense and intelligence agencies. As plutonium-238 is apparently used in communication and detection devices used by the U.S. Navy, any possible production in Advanced Test Reactor (ATR) and the other new reactors planned for defense use must be discussed in the new EIS. As no such discussion has taken place in the PEIS, one would be mistakenly led to assume that DOE has ruled out further plutonium-238 production for defense purposes.

However, it is believed that plutonium-238 is used in the Navy's Sound Surveillance System (SOSUS), which consists of hundreds of sea bed monitors. It is also known that the Navy has placed terrestrial devices containing Radioisotopic Thermoelectric Generators (RTGs), which contain plutonium-238, at remote locations for powering instrumentation. [See Tom Clements Comments September 18, 2000]

The Savannah River Site (SRS) HB-Line Update by WSRC explained that the H-Canyon has 4600 gallons of high concentration Neptunium-237 solution and has already begun production of Neptunium Oxide (9 months ahead of schedule). SRS plans to ship 250 kg of Np Oxide to Argonne National Labs by 2006 to make plutonium-238 for NASA.²⁵ The obvious question is; what is ANL's connection to this program and why is SRS waste and emissions not included in DOE's NEPA analysis? The ANL-W connection is spelled out in an internal DOE report that designated INEEL and ANL-W as the lead nuclear energy laboratories, specifically:

- Radioisotope and Reactor Systems for Space Applications
- Related work on Advanced Fuel Cycles
- Nuclear Energy beyond 2010 including Generation IV Initiatives
- Nuclear Power 2010.²⁶

IV. New Research Reactor

The PEIS at E-1 also describes the "New Research Reactor Operations" that would supplement and/or replace the Advanced Test Reactor (ATR built in the 1960s and cannot pass any current NRC structural/containment standards. This new reactor "...was developed to meet USDOE's missions of (1) producing medical and industrial radioisotopes, (2) producing plutonium-238 (**minimum** net annual production of 5 kilograms [11 pounds]), and supporting nuclear energy research and development." [emphasis added] DOE has an obligation to fully disclose what the **MAXIMUM** anticipated Pu-237 production rate will be.

The PEIS describes the New Research Reactor that will use low-enriched uranium with an enrichment of less than 20 percent uranium-235 ... with a reactor core power of 50 or 100 megawatts-thermal that will reduce the amount of neptunium-237 required to meet the plutonium-238 production requirements. [PEIS @ 2-30]

"The Commercial Light Water Reactor (CLWR) targets would have stainless steel or Zircaloy cladding because of the higher operating temperatures. Targets for the new research reactor would also have stainless steel (Incoly-800) cladding for material compatibility [sic]. The post irradiation processing of these targets would be different from the post irradiation processing of the aluminum-clad targets." [PEIS @ 2-6] DOE's plans for new reactors and the

stainless steel Zircaloy fuel cladding to be used, is likely why the department likes INL because it has the only production scale SNF reprocessing operation in the DOE Complex at the INTEC/FDPF plant for stainless steel and zirconium clad Spent Nuclear Fuel. DOE also recently reorganized its entire Complex-wide SNF inventory and consolidated all stainless/zirconium clad fuels at INL. This is another credible indication of DOE's future nuclear material production plans. Historically, most of DOE's problems with long-term storage is related to aluminum-clad SNF that degrades relatively quickly by comparison to the more stable stainless steel/zirconium clad SNF.

This new reactor poses a significant violation to the Non-Proliferation Treaty (NPT) that the US is a signatory to. The new Pu-238 "research reactor" is already slated as a multi-purpose isotope generator, which would never pass the NPT requirements because it could also generate conventional bomb grade material or other already developed radiation bombs (using short-lived nuclides) that only kill people but leave the infrastructure intact. The US would never allow this in Lybia or Iran!

Karl Grossman writes, "The push to use nuclear power in space is illegal. The Outer Space Treaty of 1967, which the U.S. was a principal initiator and original signator, says that states shall not 'place in orbit around the Earth any objects carrying nuclear weapons or any other kinds of weapons of mass destruction...or station such weapons in outer space in any other manner.' As for nuclear devices in space, the Outer Space Treaty declares that states are to avoid uses of space which will lead to 'harmful contamination and also adverse changes in the environment of Earth'. What could produce more 'adverse changes in the environment of Earth' than nuclear poisons raining down on the planet. Also, the Outer Space Treaty declares that 'each state party to the treaty that launches or procures the launching of an object into outer space...is internationally liable for damage to another state party'. Meanwhile, the U.S. through the 1991 'Space Nuclear Power Agreement' between NASA and DOE, has limited U.S. liability to just \$100 million for all other nations and all other people beyond U.S. residents in the event of an accident involving a U.S. space nuclear device."²⁷

Historically, the Hanford bomb grade plutonium production reactors operated in the same way as the new proposed reactor in that Hanford inserted highly-enriched uranium (HEU) slugs in the reactor until the designated irradiation time elapsed, then extracted/reprocessed the slugs. All DOE would apparently need to do with the new reactor is change the insert from neptunium to HEU to produce bomb grade plutonium.

The PEIS states that there are non-proliferation issues and "there is significant uncertainty raised" and "this issue is unavoidable (unless the United States elects to neither produce nor purchase Pu-238)."²⁸

The PEIS acknowledges continued use of INL Advanced Test Reactor (ATR). DOE's Infrastructure Report also states; "The ATR is well positioned to support a number of [Nuclear Energy] NE programs now under consideration. These programs include development of the Super critical Water Reactor System, Gas Fast Reactor System, the Advanced Fuel Cycle Initiative, Series I and II and the Nuclear Space Initiative."²⁹

Earlier documentation on the safety of ATR is on the record with a wide range of unresolved issues such as recurrence rates of these large earthquakes and the impact on INEEL and non-compliance with Nuclear Regulatory Commission current codes otherwise applied to commercial reactors. Specifically, the Advanced Test Reactor (ATR) vessel "spacer bolt loads

and support skirt radial bolt loads exceeded allowable values." Loads on the support skirt bolts were calculated at 76 kips and the yield load of the bolts was 43 kips. [RE-A-78-038 @ 16&18] The ATR's Emergency Firewater Injection System (EFIS) would be inoperable during a design basis earthquake. The purpose of the EFIS is to inject firewater into the reactor core to prevent irradiated fuel elements from being uncovered in the event of a loss-of-coolant accident or a complete loss of coolant flow during reactor operation or shutdown. The ATR was built in 1963 in accordance with national building code standards applicable at that time, but it was not built to earthquake standards. Because the EFIS does not meet current seismic codes and because of the potential firewater piping hanger failure, engineers declared the system technically inoperable. This means the system is functional but documentation does not support operability for the full range of intended safety functions (i.e. earthquakes). [OE-95-35] The ATR also has no containment building currently required around nuclear reactors to contain radioactive releases in the event of an accident.³⁰ The ATR continues to operate today - primarily conducting materials testing for the Nuclear Navy.³¹

DOE's new EIS must discuss the costs to upgrade the ATR to meet Nuclear Regulatory Commission nuclear reactor operating requirements and offer comparative compliance costs for other DOE reactors at ORNL, SRS, and LANL.

V. DOE's Plutonium Containment Non-compliance

Defense Nuclear Facilities Safety Board report "Active Confinement for Radioactive Materials, 15 December 2004, Federal Register 12/15/04 Vol. 69, No. 240. Also see Los Alamos National Laboratory executive summary of a preliminary CDC dose reconstruction study by a German scientist. [pages 3 and 4] to see that local non workers have higher than background plutonium levels on autopsy, AND there is "4-20 times" more Pu-238 laying on ground than expected.³²

DOE's own internal (not readily available to the public) 2003 Infrastructure Task Force (ITF) Report offers a scathing analysis of INL, ANL-W, and LANL readiness/compliance for upcoming agency nuclear mission plans states in part; 1.) "The ITF notes that there are certain facilities, e.g., the Fuel Processing Facility... which significant maintenance challenges exist. These facilities should be abandoned. 2.) ITF observes that if Idaho site facilities are to be used for the proposed missions, e.g., Advanced Fuel Cycle Initiative [at ANL-W] Generation IV Reactors and other nuclear energy work beyond 2010, resources must be provided at appropriate levels; 3.) Some facilities should be shut down or not considered for further development. In our view this includes the uncompleted Fuel Processing Facility (FPF) that we recommend be abandoned."³³

VI. Other Related Nuclear Programs Nuclear Rockets Undergoing Testing

DOE and NASA's Rebecca McCaleb, environmental engineering and management director at the Marshall Flight Center, issued public statements supporting establishing INL as a "Space Port" makes the direct connection to current DOE plans for Pu-238 production for space nuclear power sources.³⁴ The INL space connection is spelled out in a 2003 internal DOE report not readily available to the public that designated INEEL as the lead nuclear energy laboratory, and specifically the following programs:

- “Radioisotope and **Reactor Systems for Space Applications**
- Related work on Advanced Fuel Cycles
- Nuclear Energy beyond 2010 including Generation IV Initiatives
- Nuclear Power 2010.” [emphasis added]³⁵

DOE must fully disclose the reported twenty nuclear rocket reactors built and tested³⁶ in addition to both its plans and related NASA plans and inform the public in its new PEIS about all relevant environmental health and safety impacts required in NEPA.

The Bush administration and the neo-conservative controlled Congress continue to push for the restart of the next generation of nuclear weapons testing in Nevada, and the ongoing development of nuclear rocket testing under the auspicious of NASA’s Glenn Research Center (Cleveland, OH), and the Jet Propulsion Laboratory at Pasadena, CA).

The older nuclear rocket reactor based designs -- “Timberwind” type, or high flying nuke plane - would use either U-235 or Pu-239 in the same way and in similar amounts to those used in Naval reactors. They simply are basically un-shielded reactors, where the reactor is made critical and the propellant -- usually hydrogen -- is then pumped through the very hot reactor, the reactor heats the hydrogen to very high levels turning it into hydrogen plasma which then provides the thrust. “The heart of the rocket engine will be 100 pounds of radioactive Uranium-235 made into black BB’s. The tiny pellets, about on-half millimeter in diameter will be encapsulated in ceramic. When the pellet bed is allowed to get hot during a launch, it will heat the hydrogen propellant to 5,000 degrees Fahrenheit, which will then roar out the back of the rocket and provide thrust.”³⁷

“Dr. Henry Kendall, chairman of the Union of Concerned Scientists and a Nobel laureate, speaking of the ‘Timberwind’ rocket, said that for such a vehicle ‘the needle just goes up to the end of the danger scale and stays there. He said that the rocket would ‘release a stream of radiation’ as it flew and if it underwent an accident and brakeup. ‘you’ve got radioactive material spraying all over the place...the risks are extremely great.”³⁸

The “Timberwind” project morphed into the “Space Nuclear Thermal Propulsion” (SNTP) program under the aegis of the U.S. Air Force after the DOE declined sponsorship.³⁹ Under President Bush, DOE has since been an active proponent/sponsor of nuclear power in space. The Environmental Defense Institute filed extensive formal comments on the Draft SNTP EIS launched by the Air Force in 1992, and later the Final EIS was issued in 1993.⁴⁰

The SNPT 2,000 mega-watt nuclear rocket will use highly enriched (93%) uranium-235 fuel particles. This is the equivalent of two or three conventional nuclear electrical power reactors being run to probable melt-down in a 850 second burst. Despite assertions in the USAF EISs that the SNPT is a second stage rocket (fired after launch once the vehicle reaches orbit) the USAF’s graphics released to the media have all shown the rocket as a single stage. This is a significant discrepancy due to the radioactive blast which will spew out of the rocket during liftoff. Even a second stage within or near the earth’s atmosphere poses a monumental hazard.

For Idahoans, this new space nuclear program is a resuscitation of the earlier INL nuclear rocket tests that spewed between 7 and 8 million curies of radioactivity in the atmosphere. See Attachment A below. The Centers for Disease Control is currently finalizing its

INEEL Dose Reconstruction Health Study that includes estimates for radioactivity release from the site that include the nuclear rocket program emission. EDI is challenging the accuracy of these estimates.⁴¹ Despite this dispute on the actual radiation released at INEEL, the fact remains that an enormous amount of radiation was released from these nuclear rocket tests that is impacting the health of INEEL workers and resident downwinders.

The new ongoing nuclear rocket “ion drive type units”, or nuclear electric, currently being tested in Ohio and California, use the same source of power generation to create the electric power to generate a steady stream of ions, or to make very small continual amounts of high temperature plasma of some kind to use as thrust. They are not meant to be extremely powerful short bursts of thrust like conventional rocket engines, but to be able to produce a steady low level of thrust that over time steadily speeds up the payload over months or years of running a low out put, with the end being that the payload - space craft - eventually reaches speeds far higher than we can do with conventional rocket engines and thus gets a probe to the outer reaches of the solar system in much shorter times.

Here the power source can be a range of nuclear sources from Pu 238 at the lower power requirements end where a lot of electric generation is not required, to new generation of fission reactors using U235 and/or Pu239 where major amounts of power would be required -- large craft.

In addition, power for communications and so on would also have to be generated on any probes using these devices and more Pu238 would be used there. The space probes we have out there now doing NASA's travel films have up to several hundred pounds of Pu238 each! AND that is low power needs.

Karl Grossman's analysis of government reports on the Space-Based Missile Defense System shows “synergistic relationship” between NASA and Star Wars programs. General Electric developed the SP-100 space reactor power system to meet the large power requirements of civilian and military missions planned. These super RPS's can range between 100 kilowatts to 1,000 kilowatts required for laser “guns.”⁴²

The Russians still have enough Pu 238 for sale to handle NASA's needs, BUT we are concerned over being dependent for our "national security needs" and hence want to produce our own. Read carefully the small print on this not being dependent on the Russians as it is another clue to the extent of military requirements planned for Pu 238 usage.

AP news reports from Pasadena - Dec 30, 2003 note “A team of engineers at NASA's Jet Propulsion Laboratory, Pasadena, Calif, successfully tested a new ion propulsion engine design, one of several candidate propulsion technologies under study by NASA's Project Prometheus.

“The event marked the first performance test of the Nuclear Electric Xenon Ion System (NEXIS) engine at the high- efficiency, high-power, and high-thrust operating conditions needed for use in large-scale nuclear electric propulsion applications.

“The NEXIS engine was powered using commercial electrical power. Ion engines used on NASA's proposed Jupiter Icy Moons Orbiter (JIMO) will draw power from an onboard nuclear reactor. The ion engines, or electric thrusters, would propel the orbiter around three of the icy moons orbiting Jupiter, Ganymede, Callisto and Europa, to conduct extensive, close-range examinations and to determine their potential for sustaining life.

“On the very first day of performance testing, the NEXIS thruster demonstrated

one of the highest efficiencies of any xenon ion thruster ever tested," said Dr. James Polk, the principal investigator for the test at JPL. "We expect the NEXIS design to demonstrate both the performance and projected lifetime necessary for the proposed Jupiter mission," he said.

"The test was conducted December 12. It used the same vacuum chamber where the Deep Space 1 ion thruster set the all time endurance record of 30,352 hours (nearly 3.5 years) of continuous operation.

"The NEXIS engine operated at more than 20 kilowatts, nearly 10 times that of the Deep Space 1 thruster. It is designed to process two metric tons of propellant, 10 times the capability of Deep Space 1, and operate for 10 years, two to three times the Deep Space 1 thruster life.

"Team members working on the NEXIS engine also helped develop the first ion engine ever flown on NASA's highly successful Deep Space 1 mission. It validated 12 high-risk advanced technologies, among them the use of the first ion engine in space.

"The NEXIS thruster is a larger, high performance descendant of the Deep Space 1 thruster that achieves its extraordinary life by replacing the metal, previously used in key components, with advanced, carbon based materials," said Tom Randolph, NEXIS program manager at JPL. Unlike the short, high-thrust burns of most chemical rocket engines, the ion engine emits only a faint blue glow of electrically charged atoms of xenon, the same gas found in photo flash tubes and in many lighthouse bulbs.

"The thrust from the engine is as gentle as the force exerted by a sheet of paper held in the palm of your hand. However, over the long haul, the engine can deliver 20 times as much thrust per kilogram of fuel than traditional rockets.

"This test, in combination with the recent successful test of the High Power Electric Propulsion ion engine at NASA's Glenn Research Center, Cleveland, is another example of the progress we are making in developing the technologies needed to support flagship space exploration missions throughout the solar system and beyond," said Alan Newhouse, Director, Project Prometheus.

"We have challenged our team with difficult performance goals and they are demonstrating their ability to be creative in overcoming technical challenges."

NASA's Project Prometheus is making strategic investments in space nuclear fission power and electric propulsion technologies. The technology may enable a new class of missions to the outer Solar System, with capabilities far beyond those possible with current power and propulsion systems. The JIMO mission could launch during the next decade and provide NASA significantly improved scientific and telecommunications capabilities and mission design options.

Instead of generating only hundreds of watts of electricity like the Cassini or Galileo missions, which used radioisotope thermoelectric generators, JIMO could have up to tens of thousands of watts of power, increasing the potential science return many times over.

A team of engineers from JPL; Aerojet, Redmond, Wash.; Boeing Electron Dynamic Devices, Torrance, Calif.; NASA's Marshall Space Flight Center, Huntsville, Ala.; Colorado State University, Fort Collins, Colo.; Georgia Institute of Technology, Atlanta; and the Aerospace Corporation, Los Angeles is developing the NEXIS.

VII. DOE Miss-Appropriation of Funding

USDOE Office of Inspector General issued an Audit Report 5/2003 titled "Idaho National Engineering and Environmental Laboratory's Strategic Initiative Fund." The auditors report: "We found that Bechtel BWXT Idaho, LLC (Bechtel) used the [Environmental Management] Strategic Initiative Fund to supplement the Laboratory Directed Research and Development (LDRD) Program; pay for activities that should have been direct funded; and, pay for questionable activities such as advertising, marketing, and direct selling, that did not directly benefit the site's predominate [environmental management] activity, environmental cleanup efforts. Also the associated costs were not appropriately allocated to benefiting [sic] programs."⁴³

While 68% of the total INEEL Congressional funding is for environmental cleanup, only 17% was actually spent on cleanup. The auditors further note: "The lack of Department policy governing the establishment and use of mission development funds and activities was recognized in 2000, when Congress directed the Department to conduct a review of overhead expenditures at its sites, including INEEL. Among other things, the review highlighted \$7.6 million of program/business development costs at INEEL as an area where spending guidance may be needed and where direct funding would improve accountability."

"The Federal Acquisition Regulation (FAR) requires that any cost that can be identified specifically with a final cost objective shall be directly charged to that objective. We [the auditors] identified instances, however, in which the Strategic Initiative Fund paid for activities that, based on the work performed, directly benefited a specific program or project" unrelated to cleanup. In short, this miss-appropriation of funding is illegal under FAR regulations.

David McCoy's analysis of this Audit notes; "DOE must discuss the **inappropriate shift in Environmental Management cleanup funds** to [Research and Development] R & D activities for the numerous projects slated for INEEL. DOE allowed money for environmental cleanup to be robbed for nuclear development. For example, 'INEEL paid \$755,000 for 'road-mapping' of a Nuclear Energy project from the Strategic Initiative Fund in FYs 2001 and 2002.' In 2003, The DOE Inspector General announced an audit would be performed to determine whether "Environmental Management (EM) is funding research and development activities at the INEEL that do not contribute to EM's mission of reducing risk and accelerating cleanup (A031D030 FUNDING FOR MISSION DEVELOPMENT ACTIVITIES AT INEEL)."

McCoy continues; "The May 2003 DOE Inspector General Audit of the Strategic Funding Initiative was not readily available so I had to call the DOE IG's office directly to obtain the actual audit that linked up with the code A031D030 which was for the proposed audit. It shows DOE has been misappropriating funds for environmental cleanup to use for nuclear energy development. As you may recall, in earlier documents I claimed that the Mission Change was a major commitment of federal funds for nuclear development without the performance of an Environmental Impact Statement or Assessment. Well here is the smoking gun- funds taken out of the \$25 million dollars of misappropriated funds- see pg. 2 first paragraph. While DOE was supposed to be cleaning up the INL they were busy ripping off the funds for more projects. No wonder we are now getting their 'accelerated "quick and dirty cleanup'."⁴⁴

DOE's shifting funding is NOT new but a continuation of past transgressions. A detailed DOE budget analysis for FY-92 by Heart of America Northwest in *The Dirt in the USDOE's Nuclear Waste Clean-up Budget* further revealed how DOE diverted \$547,859,000 from clean-up to subsidize Atomic Energy Defense Nuclear Materials Production programs. "Forty-four % of all 'clean-up account' construction projects were found to be for weapons production and research missions, instead of clean-up."^[Dirt @iii] "The 1992 cost of these projects that do not belong in the clean-up account is actually the tip of the iceberg. Over the course of the complete construction schedules for these projects, they will cost the Clean-up Account \$821.484 million. (Based on the USDOE listed Total Estimated cost, or TEC, for each project)^[Dirt @ 22] INEEL's "clean-up" construction projects supporting defense production missions for FY-92 is \$12,995,000; and \$91,600,000 over the complete multi-year construction schedules.⁴⁵
[Dirt @ 33]

VIII. Risks and Alternatives Must be Fully Analyzed

DOE's new EIS must fully disclose the relative risks related to plutonium-238 production as well as the ultimate use this plutonium will be put to in the space nuclear power programs. Moreover, the accident scenarios related to plutonium dispersion when these units reenter the Earth. To date, three out of the twenty-six U.S. space missions involving nuclear material have ended in mishaps which is a 12% failure rate.⁴⁶

Karl Grossman writes: "Further, the plutonium used in space devices - Plutonium-238 - is 280 times more radioactive than Plutonium-239, the plutonium used as fuel in atomic bombs and built up as a by-product in the operation of nuclear power plants. Plutonium-238 does not fission (split in a nuclear reaction) like plutonium-239. It has a far shorter 'half-life' (the period in which half of its radioactivity is expended) of 87.8 years - compared to 24,500 years for plutonium-239. This more rapid decay is what causes plutonium-238 to be 280 times more radioactive than plutonium-239 - and also to produce considerable heat as it breaks down, When nuclear scientists looked for uses for plutonium in addition to fuel in atomic weapons, they say plutonium-238 and the heat it produces as a source of electrical power. The concept: translate the heat of plutonium-238 into electricity. The downside: this quick decay and 280 times the radioactivity make plutonium-238 and even more intensely toxic nuclear poison."⁴⁷

"But just how likely is such an accident? To date, three out of the twenty-six U.S. missions involving nuclear material have ended in mishaps. The most serious U.S. accident happened on April 21, 1964, when a U.S. navigational satellite, Transit 5BN-3, powered by an [INEEL] SNAP-9A plutonium-fueled [2.1 pounds] radioisotope thermoelectric generator (RTG) failed to achieve orbit and fell from the sky, disintegrating as it burned up in the atmosphere." As a result of this major accident that spread plutonium in the atmosphere, NASA used solar panels to power satellites. NASA is now back to nuclear power despite the tragic history that presumably the agency is hoping the public has forgotten.

"Of special interest - and concern - in Europe was the way the U.S. has limited its financial liability in the event of an accident involving one of its nuclear space systems. In 1991, NASA and the DOE entered into a 'Space Nuclear Power Agreement' to cover U.S. space nuclear activities under the Price-Anderson Act. That law, passed in 1957, supposedly on a temporary basis to spur the development of commercial nuclear power in the U.S., limits liability

for property damage, illnesses or death caused by a nuclear accident. The liability limit was raised amid the controversies through the decades as the Price-Anderson Act was renewed, three times so far. Its is currently \$8.9 billion, still a fraction of what a Chernobyl-level nuclear plant accident, or worse is projected by the U.S. Nuclear Regulatory Commission as causing in damage. But that's only for damage within the U.S. The limit for all damages to other countries and their people was set at \$100 million in 1962 - and remains unchanged.”⁴⁸

DOE must present accident scenarios related to both launch and reentry of these RTG's as well as viable alternatives such as previously developed NASA solar power for its space nuclear radioisotope thermoelectric generator (RTG) program into the new EIS.

IX. Conclusion

DOE must fully discuss the following points in a new comprehensive Programmatic Environmental Impact Statement that covers ALL related programs to include but NOT limited to the above identified issues. Broadly, DOE must conduct environmental studies in a Programmatic Environmental Impact Statement to analyze the types of nuclear development contemplated for the INEEL, including, but not limited to: (1) the types and numbers of facilities, (2) where the facilities will be placed, (3) the use of the facilities, (4) the environmental impacts of each of the facilities, (5) possible alternative locations instead of at INEEL for the facilities, (6) the alternative non-nuclear facilities and (7) the advanced fuels under consideration including non-nuclear alternatives ; (8)) the storage of nuclear wastes; (9) the disposal of nuclear wastes (10) the transport of the nuclear wastes to a repository; (11) processing the nuclear wastes; (12) security issues; (13) militarization of space; (14) accidents; (15) complete emissions and waste characterization related to all stages of the Pu-238 production process; (16) statutory and regulatory permits required under RCRA, Clean Air Act, and Clean Water Act; (17) funding requirements for all programs that fully account for transfers from the DOE's Environmental Management Account over to the Nuclear Energy Account.⁴⁹

Attachment A
Aircraft Nuclear Propulsion Program INEEL Tests 1956 to 1970

Test Number	Dates	Curies Released per RAC w/uranium	Curies Released per SC&A w/o uranium	Curies Released per DOE/HDE w/uranium	Source
IET # 1 and 2				"Cold Runs"	
IET # 3 "HTRE-1"	12/27/55 to 2/11/56	39,300	132,000	46,134.76	B @ A-202
IET # 4 (total)	4/17/56 to 6/29/56	153,000	902,922	1,911,953.21	B @ A-114
IET # 4 A	5/1-5/23/56		7,264.43		D
IET # 4 B	5/24 - 6/29/56		205,772.02		D
IET # 4 C	6/29/56		689,686.73		D
IET # 6	9/24/56 to 12/3/57	13,600	9,000	8,953.12	B @ A-202 E @ 88
Fuel Burn # A	3/20/57	4,500		1.00	B @ A-202 E @ 89
Fuel Burn # B	3/20/57	9,000		74.11	B @ A-202
IET # 8 "HTRE-2"	7/31/57 to 8/28/57	243	1,700	2,152.00	B @ A-121
IET # 10 (Total) # 10 A # 10 B	12/20/57 to 3/6/58 12/20/57 3/1/58	6,900,000	2,220,000 2,740,000	1,650,000.00	B @ A-126 D D
IET # 11	3/20/58 to 4/14/58	3,540	4,200	4,635.00	B @ A-128
IET # 12 "Boot"	4/21/58 to 5/7/58	43,400	4,000	29,070.00	B @ A-132
FPFRT-1	7/25/58			9.80	B @ A-201
FPFRT-2	8/4/58			9.30	B @ A-201
FPFRT-3	8/6/58			9.90	B @ A-200
FPFRT-4	8/14/58			9.60	B @ A-200
FPFRT-5	8/27/58			140.00	B @ A-200
FPFRT-6	9/4/58			115.28	B @ A-200
FPFRT-7	9/17/58			90.79	B @ A-200
FPFRT-8	9/18/58			102.48	B @ A-200
FPFRT-9	9/26/58			10.08	B @ A-200

IET # 13	10/8/58 to 11/18/58	9,500	940	9,730.00	B @ A-137
IET # 14	4/24/59 to 5/19/59	49,700	7,500	13,456.00	B @ A-139
IET # 15 (total) IET # 15 A IET # 15 B	5/27/59 to 6/24/59	3,400	2,000 1,200	3,178.34	B @ A-199 D D
IET # 16	7/28/59 to 10/28/59	76	300	294.42	B @ A-199
IET # 17 (total) IET #17 A IET # 17 B	11/2/59 to 12/12/59	5,600	2,400 2,200	6,202.00	B @ A-147 D D
IET # 18 "HTRE-3"	12/23/59 to 2/8/60	18,600	14,000	14,157.30	B @ A-153
IET # 19 (total) IET # 19 A IET # 19 B	2/9/60 to 4/30/60	14,000	1,200 8,400	11,381.00	B @ A-153 D D
IET # 20	5/1/60 to 6/13/60	26,000	7,500	10,249.00	B @ A-155
IET # 21 "Feet 1"	6/20/60 to 8/8/60	4,700	2,000	3,752.00	B @ A-158
IET # 22	8/12/60 to 8/25/60	404,000	4,100	10,526.80	B @ A-160
IET # 23 "Feet #2"	9/1/60 to 10/14/60	5,500	1,700	2,890.00	B @ A-163
IET # 24 "Lime"	10/17/60 to 10/26/60	340,000	4,800	7,725.90	B @ A-165
IET # 25 (total) IET # 25 A IET # 26 B	11/15/60 - 12/16/60	1,740	2,400 7,800	10,171.26	B @ A-197 D D
IET # 26 (total) IET # 26 A IET # 26 B	12/22/61 to 3/31/61	46,400	7,000 3,100	12,110.00	B @ A-173 D D
7 & 3 Module # 1168 to # 1192	1967 to 1969				C @ 29 to 116
Total IET Runs		8,095,799	6,997,034		
Total Uranium Released				1,635.82 grams	

* Only hot run tests are listed, therefore, missing test numbers indicate cold runs. Curie content of uranium released is not included in the SC&A total curies released. Releases for the 7 & 3 Module are not yet fully analyzed. Between 1956 and 1966 the ANP reactors operated in excess of 3,064.24 hours. During this time the reactors were operated at high power for 1,575.8 hours. [See Endnote # 40]

Endnotes:

¹ Send public comments to: Timothy Frazier, NE 50/Germantown Building, U.S. DOE, 1000 Independence Av., Washington, DC 20585-1290, 1-800-919-3706, or email (not recommended); ConsolidationEIS@nuclear.energy.gov

² United State Court of Appeals for the Ninth Circuit, December 3, 2004, Order, No.03-35470, CV-91-00035-HIR/EJL. The ruling states in part; “Without knowing how much transuranic waste was stored and how much was buried at the time of the agreement, we cannot determine the amount the Department of Energy is responsible for removing. A construction of the agreement that requires the Department to remove an amount far in excess of 65,000 cubic meters would not comport with the intent of the parties, as memorialized in the agreement. We remand the case for the district court to consider the parties’ extrinsic evidence, including the source of the 65,000 cubic meter estimate, in interpreting the contract so as to give effect to the second clause as well as the first.” [page 2 and 3]

³ Robert L. Long, Ph.D. Testimony before the U.S. House of Representatives’ Energy Subcommittee of the Science Committee Hearing on Nuclear R&D and the Idaho National Laboratory June 24, 2004. <http://www.house.gov/science/hearings/energy04/jun24/long.pdf>

⁴ Public Service Co. of Colorado v. Batt, No. CV 91-0035-S EJL (d. Id.) And United States v. Batt, No. CV-91-0065-S-EJL (D. Id.) Settlement Agreement and Consent Order, 16 October 1995, that states in pertinent part: "Treatment of non-INEL wastes. Any and all treatable wastes shipped into the State of Idaho for treatment at the Facility shall be treated within six months of receipt at the Facility, with the exception of two cubic meters of low-level mixed waste from the Mare Island Naval Shipyard which will complete base closure from nuclear work in 1996." [Section E(2)(a)]

⁵ Notification of the Class 3 RCRA permit modification for the New Waste Calcine Facility Evaporator Tank System, 15 December 2004. [CCN-53869]

⁶ Final Programmatic Environmental Impact Statement for Accomplishing Expanded Civilian Nuclear Energy Research & Development and Isotope Production Missions in the US, Including the Role of the Fast Flux Test Facility, DOE/EIS-0310, 12/00, page S-63, hereinafter referred to the PEIS. DOE also refers to this as the Nuclear Infrastructure PEIS or NI PEIS. DOE issued a Record of Decision 1/26/01 that selected NI PEIS Alternative 2 Option 7 [Federal Register Vol. 66, No. 18].

⁷ PEIS Appendix Q. Nuclear Infrastructure Non-proliferation Impact Assessment, For Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the US, Including the Role of the Fast Flux Test Facility, Sept 2000, USDOE Office of Arms Control and Nonproliferation.

⁸ DOE Notice in the Federal Register November 16, 2004 (69 FR 67139)

⁹ Tom Clements, Nuclear Control Institute comments “ The Draft PEIS avoids any discussion whatsoever of the use of plutonium-238 by defense and intelligence agencies. As plutonium-238 is apparently used in communication and detection devices used by the U.S. Navy, any possible production in FFTF and the other reactors for defense use must be discussed in the PEIS. As no such discussion has taken place in the Draft PEIS one must assume that DOE has ruled out

further plutonium-238 production for defense purposes.

¹⁰ DOE Section C, Statement of Work, Idaho Cleanup Project, Implementation date May 1, 2005 for INL Site-wide contractor Bechtel, page 25.

¹¹ U.S. Court of Appeals for the Ninth Circuit, Natural Resources Defense Council, et al, v. Spencer Abraham USDOE, No. 03-35711. Also see Appellees' et al. Petition for Panel Rehearing and Petition for Rehearing in Banc, FRAP 40,35, 15 December 2004 that states in part; "This case challenges DOE's efforts to reclassify nuclear waste under Order 435.1 and dispose of it on-site rather than in a geologic repository." [page 5] This court submittal is in direct response to Congress' new statute (P.L. 108-375 ss 3116, ss 3146 Addendum 1-2) "The scope is narrowed by Congress' grant of a Nuclear Waste Policy Act (NWPA) exemption regarding the radioactive waste only at the Savannah River and INEEL. (42 U.S.C. ss 10101 et. seq., ss 3116(a)).

¹² Proposed Consolidation of Nuclear Operations Related to the Production of Radioisotope Power Systems, Presentation in Idaho Falls by Timothy A. Frazier, Office of Nuclear Energy, Science and Technology, USDOE, Washington, DC, January 2005.

¹³ Report of the Infrastructure Task Force of the DOE Nuclear Energy Research Advisory Committee, Draft Rev. O, January 11, 2003, herein after referred to ITF Report, page 8.

¹⁴ See EDI et al. Petition to EPA/OIG and subsequent comments on RCRA permit application for INTEC Liquid Waste Management System.

¹⁵ EPA/OIG released a "Evaluation Report" No. 2004-P-00006, February 5, 2004, http://www.epa.gov/oig/reports/2004/20040205_2004_00006.pdf

¹⁶ DOE Section C, Statement of Work, Idaho Cleanup Project, Implementation date May 1, 2005 for INL Site-wide contractor Bechtel, page 25.

¹⁷ PEIS, Table 3-26, page 3-81, "a. The data includes all facilities within the [INL] Test Reactor Area, which also includes the ATR.

¹⁸ USDOE Idaho National Laboratory FY-2005 Site contractor Statement of Work Section C, Idaho Cleanup Project [page 25]. <http://www.id.doe.gov/doiid/REP-ICP/final-docs/>

¹⁹ In the US Court of Appeals for the Ninth Circuit, Natural Resources Defense Council, et.al., v. Spencer Abraham, Secretary, USDOE, On Appeal from a Final Judgment of the US District Court for the District of Idaho, Petition for Panel Reheating and Petition for Rehearing en banc FRAP 40.39, Argued and Submitted, 10/5/04, Opinion 11/5/04.

²⁰ <http://www.id.doe.gov/doiid/RFP-ICP/Final-Docs/SECTION%20C.doc>.

²¹ DOE Section C, Statement of Work, Idaho Cleanup Project, Implementation date May 1, 2005 for INL Site-wide contractor Bechtel, page 16.

²² EDI Website ([www.environmental-defense-institute.org/publications/Petitions to Federal and State Environmental Regulators on INEEL Violations](http://www.environmental-defense-institute.org/publications/Petitions%20to%20Federal%20and%20State%20Environmental%20Regulators%20on%20INEEL%20Violations)) listed Petitions to INL Regulators.

1. Review of EPA Region 10 Response to Petition Seeking Withdrawal of Authorization for Idaho's Hazardous Waste Program. July 14, 2004
2. EDI Comments on INEEL Argonne National Laboratory-West RCRA Permit, 5/7/04
3. EDI Comments on INEEL INTEC Liquid Waste Management System RCRA Permit

4/7/04

4. Review of INEEL High-level Radioactive Waste Tank Closure Plans, 1/3/04
5. Snake River Plane Aquifer at Risk , 12/19/03
6. List of Un-permitted INEEL INTEC Waste Tanks, 12/5/03
7. Comments on INEEL High-level Waste Tank Closure Permit, INTEC Tanks WM-184, 185, and 186, 11/25/03
8. Comments on INEEL High-level Waste Tank Closure Permit, INTEC Tanks WM-182 and 183, 7/11/03
 9. Comments on EPA Region 10 Final RCRA Enforcement Authorization to the State of Idaho. (9/5/03) EDI / KYNF / McCoy
 10. Petition to Environmental Protection Agency Inspector General Requesting Expedited Action on its INEEL Investigation and a Stay in the Issuance of Final RCRA Authorization to the State of Idaho. (8/8/03) EDI/KYNF/McCoy
 11. Request to Idaho Department of Environmental Quality for Revocation of INEEL High-level Waste Tank RCRA Closure Permit (7/11/03) EDI/McCoy
 12. Supplemental Information to EPA Petition (2/28/03) on INEEL Title V Clean Air Act Permit,(3/12/03) EDI/KYNF/McCoy
 13. Petition to EPA to Reopen INEEL Title V Clean Air Act Permit (2/28/03) EDI/KYNF/McCoy
 14. Comments on INEEL Resource Conservation Recovery Act Permit (NOD) and Idaho Environmental Quality Review of INEEL Liquid Waste Processing Operations, 2/3/03, EDI/KYNF/McCoy
 15. Supplemental Information to Petition to EPA Office of Enforcement related to Clean Air Act Violations at INEEL, 1/30/03, EDI/KYNF/McCoy
 16. Hazardous Waste Code Discrepancies; letter to EPA Inspector General, EPA Office of Enforcement, and Idaho Department of Environmental Quality (12/27/02), EDI/KYNF/McCoy
 17. Petition to Reopen Public Participation Due to Failure to Meet RCRA Requirements for Addition of the High-Level Liquid Waste Evaporator at INEEL (10/23/02), EDI/McCoy
 18. Request to EPA Inspector General to Review State of Idaho Hazardous Waste Enforcement Authority (7/8/02) EDI/KYNF/McCoy
 19. Petition to Idaho to Reopen Public Comment on High-Level Tank Closure Plan 5/28/02, EDI/McCoy
20. Request to Idaho Department of Environmental Quality for Investigation of INEEL High-Level Waste Tank Farm Closure Plan, (4/18/02), EDI/McCoy
 21. Rebuttal to EPA Region 10 March 7, 2002 Response to the Petition to EPA to Commence Proceedings for Withdrawal of the Idaho Department of Environmental Quality as the RCRA Authority for the State of Idaho (4/2/02) EDI/KYNF/McCoy
22. High-Level Waste Environmental Impact Petition (2/22/02) EDI/McCoy
 23. Rebuttal to Idaho Reply to EDI Petition to Withdraw State of Idaho's

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- Hazardous Waste Enforcement Authority (11/16/01) EDI/KYNF/McCoy
 24. McCoy Petition to EPA to withdraw State of Idaho's Hazardous Waste Enforcement Authority (1/29/02)
25. Petition to EPA on Clean Air Act (MACT) Violations (7/24/01) EDI/McCoy
26. Issues Presented to USEPA Inspector General on INEEL Violations of Environmental Law (2/5/01) EDI/KYNF/McCoy
27. Petition to EPA on Clean Air Act Violations at INEEL(1/17/01) EDI/KYNF/McCoy
28. Request to Environmental Protection Agency Inspector General to investigate INEEL hazardous waste permits (8/8/00) EDI/KYNF/McCoy
29. EDI Process Equipment Waste Evaporator Resource Conservation Recovery Act Permit Comments (12/22/00)
30. EDI INEEL High-Level Waste Disposition: Letter to Regulators (8/14/98)
- ²³ DOE Section C, Statement of Work, Idaho Cleanup Project, Implementation date May 1, 2005 for INL Site-wide contractor Bechtel.
- ²⁴ Proposed Consolidation of Nuclear Operations Related to the Production of Radioisotope Power Systems, Timothy A. Frazier, Office of Nuclear Energy, Science and Technology, USDOE, Washington, DC, January 2005.
- ²⁵ Savannah River Site Citizens Advisory Board meeting minutes November 15-16, 2004
- ²⁶ Report of the Infrastructure Task Force of the DOE Nuclear Energy Research Advisory Committee, Draft Rev. O, January 11, 2003, herein after referred to ITF Report, page 3 and 5.
- ²⁷ Grossman, page 211 and 212 (also see Chapter 7 endnote # 57 reference to "Treaty on Principals Governing the Activities of States in the Exploration and Use of outer Space, including the Moon and Other Celestial Bodies, also referred to as the Outer Space Treaty, entered into force October 1967).
- ²⁸ Nuclear Infrastructure Non-proliferation Impact Assessment, For Accomplishing Expanded Civilian Nuclear Energy Research and Development and Isotope Production Missions in the US, Including the Role of the Fast Flux Test Facility, Sept 2000, USDOE Office of Arms Control and Nonproliferation.
- ²⁹ Report of the Infrastructure Task Force of the DOE Nuclear Energy Research Advisory Committee, Draft Rev. O, January 11, 2003, herein after referred to ITF Report, page 9.
- ³⁰ATR Accidents 1991 to 1999

1991

- May 20; Advanced Test Reactor fuel element fell from handling tool to water storage canal floor.
- June 4; ATR reactor scrammed due to under voltage to coolant pump.
- Aug.13; ATR reactor scrammed due to loss of power to coolant pump.
- Oct.14; ATR reactor scrammed due to low coolant pressure caused by malfunctioning temperature control valve.
- Oct.16; ATR reactor scrammed again due to low coolant pressure caused by another malfunctioning temperature control valve.

1992

- Jan.16; Advanced Test Reactor spilled 350 gallons of sulfuric acid into the "cold" waste pond;

Apr. 12; Advanced Test Reactor was scrammed when a diesel generator supply power failed;
1993

Jan.4; Advanced Test Reactor scrammed. During a IC-W loop experiment, a scram occurred due to loss of flow signal because of an operator error. The operator did not properly follow the procedure and a reset button was depressed which caused the loop pumps to turn off and the reactor scrammed.

Sept. 8; A damaged C cell battery was found in the ATR reactor vessel outside of the core region and removed; a thorough inspection of the vessel revealed no other debris and the vessel was closed up.

Sept. 13; Crushed parts of a flashlight were found inside the ATR reactor vessel, but outside the core region and no debris was found on the fuel. Detailed inspections were conducted including the use of an underwater camera video system, but other missing flashlight parts were not found. Reactor operation was delayed for more than two days and in-vessel inspections will be performed following each nuclear re-qualification testing event.

1994

April 4; During refueling of the Advanced Test Reactor, 19 workers received internal radiation exposure caused by underwater control rod cutting operations in preparations for disposal. Workers using a remote control saw were cutting through a control rod of hafnium and aluminum and either the saw arced or hit the hafnium which got into bubbles of hydrogen and rose to the surface of the pool. The highest dose was 2 mRem. Hafnium has a half life of 45 days. The facility was evacuated. OCAW union said exposure was 1.3 REM and internal uptake of 96 microcurie of hafnium-181.

1995

July 3; Several pipefitters working at the Advanced Test Reactor were exposed to 50,000 counts per minute by over a dozen isotopes because their anti-contamination (anti-c) clothing provided inadequate protection in the work environment. In another event, a DOE Environmental Health Representative was contaminated while conducting an inspection of the check valve work that was the subject of previous pipefitter contamination. In both cases the Pro-Tech 2000 anti-c clothing did not prevent the migration of graphite particles through the material or protect individuals during bending, kneeling, extreme temperatures, or presence of contaminated liquids.

Aug. 24; The Advanced Test Reactor Emergency Fire Water Injection System would be rendered inoperable during a design basis earthquake. The purpose of the injection system is to pump water into the reactor core to prevent irradiated fuel elements from being uncovered in the event of a loss-of-coolant accident or a complete loss of coolant flow during an earthquake.

1997

Feb.24; Advanced Test Reactor accident resulted in 410 pounds of Freon when a scaffold fell on and broke a chiller unit line. Operators attempting to use self-contained breathing apparatus found five to be unusable. Freon, according to NIOSH is immediately dangerous to life or health in concentrations as low as 2 ppm.

Feb.27; DOE imposed \$25,000 civil penalty on Lockheed Martin Idaho Technologies under the Price Anderson Act for multiple failures to maintain radiation exposures as low as reasonably achievable.

Mar.1; A Test Reactor Area Technician received a whole body neutron exposure of 1865 millirem the month of April and the source of the exposure could not be determined.

Mar.13; Two cesium-137 sources containing 27.5 mCi and 12 mCi with a potential dose rate of 111 mrem/hr were lost and a search was unable to

determine their location.

April 27; Advanced Test Reactor spent fuel element fell off handling device during transfer from reactor to storage pool.

Oct 25; Advanced Test Reactor operators discover five holes in gas-tight reactor confinement boundary (during operations) that subcontractors had left unfilled. This breached the reactor gas-tight confinement boundary. A similar event occurred on December 16, 1996 at the same location.

1998

Jan 12; The Advanced Test Reactor at the Test Reactor Area had an uncontrolled shutdown after a secondary coolant line system piping leaked.

1999

Feb. 17; Advanced Test Reactor operators found that a flux trap target capsule holder assembly had been rotated 90 degrees from its intended position since 1994. Miss orientation of the targets could have caused a variation of the neutron flux peaking within the flux trap resulting in operating the advanced test reactor outside its safety authorization basis. March 22; Advanced Test Reactor crane dropped a 400 pound irradiated inpile tube assembly being lifted from the reactor core and narrowly missed hitting a worker. The uncontrolled fall damaged the storage well and docking plate.

³¹ Citizens Guide to INEEL, Environmental Defense Institute, May 1998, page 78

³² See http://www.cdc.gov/nceh/radiation/brochure/pdf/lahdra_draft_rpt.pdf

³³ Report of the Infrastructure Task Force of the DOE Nuclear Energy Research Advisory Committee, Draft, Rev. O, January 11, 2003

³⁴ Associated Press, 10/98 Idaho Space Port

³⁵ Report of the Infrastructure Task Force of the DOE Nuclear Energy Research Advisory Committee, Draft Rev. O, January 11, 2003, herein after referred to ITF Report, page 3 and 5.

³⁶ Grossman, K., The Wrong Stuff, The Space Programs Nuclear Threat to Our Planet, pg 144

³⁷ Grossman, K., The Wrong Stuff, The Space Programs Nuclear Threat to Our Planet, page 146

³⁸ Grossman, K., The Wrong Stuff, The Space Programs Nuclear Threat to Our Planet, pg 128

³⁹ Draft Environmental Impact Statement, Space Nuclear Thermal Propulsion Program, Particle Bed Reactor Technology Development and Validation, U.S. Department of Air Force, August 1992. It must be noted that the Strategic Defense Initiative Organization originally issued a classified Final Environmental Impact Statement 19 September 1991 that EDI gained a copy of, however, it was mostly blacked out. Public outrage forced the USAF to issue the later unclassified Draft EIS for public comment. The USAF issued a Final Environmental Impact Statement May 1993. The whole program then moved back into the "black budget" where the general public has no access to its developments.

⁴⁰ Comments on Space Nuclear Thermal Propulsion Program Environmental Impact Statement, Submitted on Behalf of the Environmental Defense Institute by Chuck Broschious, September 21, 1992.

⁴¹ Comments on Centers for Disease Control and Prevention INEEL Dose Reconstruction, Sanford Cohen and Associates, Aerosol Releases from Idaho Chemical Procession Plant (1957

to 1959) and A Critical Review of Source Terms for Select Initial Engine Tests Associated with the Aircraft Nuclear Propulsion Program, Submitted on behalf of Environmental Defense Institute by Chuck Broschius, January 5, 2004.

⁴² Grossman, Karl, "The Wrong Stuff, The Space Programs Nuclear Threat to Our Planet," page 126. Also see and for copies see; kgrossman@hamptons.com:

- a. K. Grossman Keynote Address "Parallel Atomic Universities" Tomsk, Siberia, 5/24/02
- b. "Bush in Space" Hustler Magazine September 2004
- c. "Bush Lightyear to Infinity and Beyond" The Ecologist July/August 2004
- d. "Plutonium in Space" Covert Action Quarterly No. 73, Summer 2002
- e. "Disgrace into Space" The Ecologist, Vol. 31, No2, March 2001
- f. "Nukes in Space in Columbia's Wake" April 2003/15
 - g. "Spinning the Bomb" News Zero: The New York Times and the Bomb, September/October 2004, by Beverly Ann Deepe Kever, Common Courage Press.
- h. "Gaga for Galileo" Extra, January/February 2004
 - i. "Fire in the Heavens, Bush's Plan to Nuclearize and Militarize" Earth First, Ecostar 2004
- j. "The Nuclear Phoe" E Magazine, November/December 2001
 - k. "Dangerous Nuclear Rocket Revival" Global Net, Summer 2004, www.space4peace.org or email Globalnet@mindspring.com

⁴³ US Department of Energy, Office of Inspector General, Office of Audit Services, Audit Report May 2003, "Idaho National Engineering and Environmental Laboratory's Strategic Initiative Fund," DOE/IG-0601, May 2003. <http://www.ig.doe.gov/pdf/ig-0601.pdf>

⁴⁴ David McCoy email to EDI January 11, 2005

⁴⁵ Dirt; "Dirt In the USDOE Nuclear Waste Cleanup Budget", Heart of America, July 1991, Jerry Pollet, Jim Beard

⁴⁶ Grossman, page 17 and 18.

⁴⁷ Grossman, K., page 14

⁴⁸ Grossman, K., page 198, citing "Memorandum of Understanding between Department of Energy and the National Aeronautics and Space Administration Concerning Radioisotope Power Systems for Space Missions" signed July 26, 1991, by then NASA Administrator Richard Truly and DOE Secretary James Wakins.

⁴⁹ David McCoy comments on DOE scoping EIS , 12/26/04