UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

JUN 30 1976

Mr. Guy A. Arlotto, Director
Division of Engineering Standards
Office of Standards Development
Nuclear Regulatory Commission
Washington, D. C. 20555

DOCKET NUMBER
PROPOSED RULE PR-71,73(40 FR 23768)
Trans. Radio.
Mtls By Air

Dear Mr. Arlotto:

This is in response to your letter of March 24, 1976, inviting the U.S. Energy Research and Development Administration (ERDA) to review and comment on the Nuclear Regulatory Commission's (NRC) Draft Environmental Statement, NUREG-0034, Transportation of Radioactive Materials by Air and Other Modes (March 1976). We have reviewed the statement and have determined that the proposed administrative action will not conflict with known current or future ERDA programs.

We should like to provide you with some general comments for consideration in the preparation of the final statement. Detailed comments are provided in the enclosed staff comments.

This document contains much pertinent information relative to NRC and the Department of Transportation regulations for the shipment of fissile and other radioactive material and reflects considerable work in summarizing information concerning personnel exposure limits and radiological effects. However, it was difficult to verify results presented due to incomplete discussion of the material in the text. Although we are familiar with the subject and the associated technology, we found the organization of the statement somewhat difficult to understand. We would like to suggest that you may wish to revise the organization of the statement for better continuity.

In chapter II (PII-3) where it is stated that ERDA was created by the Energy Reorganization Act of 1974, it would be desirable at this point to describe the role of ERDA in authorizing packaging for use by contractors.

Acknowledged by card 7/2/76

DOCKETED USNRC
JUL 12 1976
Office of the Secretary
Docketing & Service
Section

Because of the subject matter of this statement, we would suggest that a glossary be added at the beginning of the statement. Some examples are transport index, half-life, effective half-life, latent cancer fatality, competent authority certification, and others. We feel that such an addition would be quite helpful to all readers. Furthermore, NRC might wish to consider the use of photographs in the statement to also assist the reader.

Our staff also strongly recommends that a more thorough evaluation be given to the need for decontamination after an accident involving rupture of containment. The ingestion pathway discussed in appendix A should be carefully evaluated for the radionuclides which may cause special problems.

We agree with the general conclusion of the statement that the risk from radioactive material shipments is low compared to other societal risks. However, we are concerned that the accident risk analysis overestimates the transportation accident risk and is too simplified to make valid comparisons of the relative risks between the various radioactive materials. The danger in this, is that people might scale the accident risk results in an attempt to determine the shipping level at which the accident risk would become unacceptable. When and if the industry approaches this shipping level at some future time, the overestimation could lead to unwarranted concern over the accident risk. This point is discussed in the enclosed staff comments.

Thank you for the opportunity to review this draft statement and we would like to request that NRC send a minimum of twelve copies of all draft statements for review and comment and four copies of final statements.

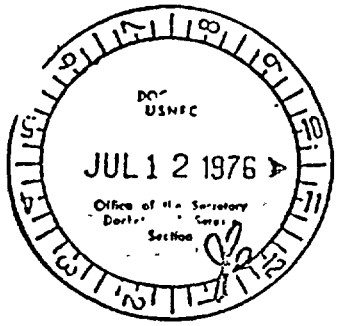
Sincerely,

W. H. Pennington, Director
Office of NEPA Coordination

Enclosure:
Staff Comments

cc w/enclosure:
CEQ (5)

ERDA STAFF COMMENTS
ON THE
NUCLEAR REGULATORY COMMISSION
DRAFT ENVIRONMENTAL STATEMENT, NUREG-0034



1. Page i, Paragraph 3

The first paragraph here gives the person rem per year, but does not give the comparative person rem per year in the U.S. from background radiation. We think it would be appropriate to make this explicit as the conclusion on page v notes the small fraction contributed by the transportation phase. We did not find an explicit number anywhere in the text.

We found no comparison of the excess exposure received by aircraft passengers and crew from cosmic radiation at flight elevation vs. the background radiation they would have received had they stayed on the ground. The comparison of this number with that arising from exposure from packages containing radioactive material carried in the aircraft should be constructive.

2. Page ii, Paragraph 3a

States, ". . . an aircraft carrying a bulk shipment of plutonium oxide. There are presently less than 100 bulk shipments of plutonium per year . . ."

The terminology, "bulk" shipments, may be construed to be loose or unpackaged. We are unaware of any such shipments of plutonium. We suggest that these statements be reevaluated since they may convey a connotation different from that intended in respect to shipment of plutonium.

3. Page iii, Paragraph e

It is not clear in the text, page II-25, whether curve A, B, or C is used. If A has been used in the calculations, then it would be appropriate to state in "e" that no medical precautions are taken.

4. Page iii, Paragraph 4

Another alternative which could be considered is requiring the carrier to survey packages prior to acceptance or loading. If this check and balance had been in effect, we might not have experienced some of the notable exposures in aircraft transportation.

5. Page xxii

What is the basis for the statement "A Factor of twenty decrease in accident risk and consequences seems attainable by this technique (change in physical form) for plutonium shipments."? We agree with the principle but question the technical basis of this factor.

6. Page I-12, Paragraphs 1 and 2

We suggest that these be revised to indicate the following: 1) there are no commercial reprocessing plants presently operating; 2) liquid high level wastes must be solidified within five years of production and 3) an acceptable waste disposal method, not just site approval, is needed before a permanent waste repository will be available.

7. Page I-16 through -18, Table I-1

This table lists shipments which include all nuclear fuel cycle material; however, the statement fails to address U-core, U_3O_8, normal and enriched UF_6, fresh and recycled fuel assemblies, and radioactive wastes. We suggest that these should be addressed in the statement.

We also suggest that the category "Low Level Wastes" shipped from "Fuel Fabricator and Reprocessor" to "Commercial Burial Site" by "Truck or Rail" might be added to this table.

8. Page I-20, Table I-2

We suggest that the category "Fresh Fuel and Radioactive Waste Shipments" be added.

9. Page I-24

What is the basis for the statement that spent fuel shipments represent "a significant transportation risk"? We could find nothing in Reference 7 to support this statement.

10. Page I-24

What is the basis for and meaning of the statement that "a similar risk occurs in the transport of high level radioactive wastes"?

11. Page II-4, Last Paragraph

The statement is made that implies the NRC regulations regarding packaging of radioisotopes are included in 49CFR174-177, clarification of this is in order.

12. Page II-14

In the requirements stated for 49CFR173.395(c)(2), we suggest the wording on the U.S. Atomic Energy Commission be updated.

13. Page III-1, Last Paragraph

The sentence reads as though the range of a "one MeV gamma" is 11 cm in tissue. We suggest that NRC might consider expanding the discussion to correct this impression.

14. Page III-3

The statement and the equation following table III-1 are misleading. Theoretically, the equivalent biological effect can be achieved when the relative biological effectiveness (RBE) of the radiation for each exposure consequence is known. The quality factor is used primarily for radiation protection purposes and in our opinion is not adequate for the purposes of comparing exposure risks from the mixture of sources discussed in this paper.

Furthermore, neither quality factor or relative biological effectiveness are defined; they are not equivalent and should not be used interchangeably, particularly when such diverse effects as acute death and lung cancer are considered. We also suggest that NRC might want to consider expanding the discussion of the rem to rad conversion.

15. Page III-4, First Paragraph

Inhaled naturally-occuring alpha emitters include thoron daughters as well as radon daughters.

16. Page III-9, First Paragraph

We suggest that this paragraph be rewritten since it implies that the MPC (air or water) is a unit of exposure rather than being based on the permissable exposure to critical organs.

17. Page III-12, Table III-6

We suggest that the average or mean effect of radioactive transport be added to compare transport dose effect to background and medical dose effect.

18. Page III-15, Last Paragraph

We suggest that the phrase "specific radionuclide" replace the phrase "radioactive specie" which is used throughout. The latter phrase is confusing since it could refer to animals or plants.

19. Page III-16, Table III-7

For PuO_8 we feel that the biological half-life in liver and bone, as well as in lung must be stated and identified.

For Pu, the biological half-life listed is for the deep lung. The value for bone is 36,000 days. Using the isotopic composition and specific activities found in appendix B, p. B-5 and the dose conversion factors from table III-8, we find the following Pu dose conversion values, in rem/curie inhaled.

	Dose commitment over: 1 y	50 y
Lung	4.2×10^6 rem/ci	1.1×10^7 rem/ci
Bone	1.2×10^5	4.4×10^7

We cannot agree with the value of 2×10^8 listed in table III-7 for PuO_8. Conversion to rem/g yields 50 year dose commitment conversion factor of:

Lung	1.4×10^8 rem/g (inhaled)
Bone	5.4×10^8

These values are closer but still do not agree with that listed in the table. We suggest that the data presented in the table be reevaluated in light of these comments.

20. Page 17, First Paragraph

Is it not the relative risks that are to be compared and not the person-rem?

21. Page III-23, Table III-9

The table has not been correctly copied and adequately referenced. "Whole body" is actually "Total (excluding Thyroid)". Also the table contains those values used in WASH-1400 for external exposure. What was used in this analysis for internal exposure? The risk number shown for the thyroid is surely not a mortality estimate--morbidity maybe, but not mortality. Finally, if the estimates of

table III-9 are based on the absolute model, it should be so noted.

22. Page III-24, First Paragraph and Figure III-2

This figure was taken from p. 9-7 of WASH-1400 appendix VI. However, the referenced figure does not contain a curve for alpha emitters. Any subsequent argument pertaining to acute effects (death) of alpha emitter inhalation is unsupportable without these data and suggest that NRC might wish to include these data.

23. Page IV-13.

Table IV-2 gives population dose to crew and passengers from packages. We suggest that it also include the differential received by same populations as a result of cosmic radiation at flight altitudes. Such a number would be several times the 1400 for Passengers-1* and many times the Crew-1* numbers.

24. Page IV-20, Table VI-4

There is inconsistency between the PuO_2 shipping distance noted in this table and that noted in table V-10 on p. V-37.

25. Page IV-27

Person rem/yr are calculated on this and following pages. We think it appropriate that background exposure doses also be calculated and presented for comparison. For example, the 5042 person rem/yr is a big number to the layman or the person taking data out of context. However, it becomes small when compared to the population background exposure of 22.5 million person-rem/yr.

26. Page IV-33, Section D.3-2

It is assumed that there will be a two-hour "storage" period associated with time spent in rail yards. Is this a realistic figure, particularly where interline transfer is required, or are these transfers taken into account in arriving at this figure.

27. Page IV-40, Section F.1

We feel that transport index system can be based on dosage from the package or the maximum number of packages considering criticality. Hence, the label does not inform as to which of two potential hazards exists. This could be important in accident recovery.

Likewise, the terms Type A, Type B, or large quantity are meaningless to all but a very few persons. Some improvement might be obtained if the labels provided explicit relevant information. We suggest that NRC may wish to study this suggestion as an "alternative" toward reducing mislabeling and mishandling occurrences.

28. Page IV-41, Section F.3

Since 10% of the incidents that involve release are in the Type A category and that these packagings are relatively inexpensive, it seems reasonable that requiring crush and puncture resistance characteristic of service conditions be explored as an alternative.

29. Page IV-43, Section F.5

Appendix C does not provide a deciphering code. However, some of the more notable incidents have derived from packaging errors. We do not feel that this section discusses this matter in proportion to its importance -- either as to requirements or as to cost-benefit or corrective action. It is implied elsewhere that a preconsignment survey of the package would be beneficial in reducing labeling errors. However, the benefit of a quality assurance over-check as to labeling and proper packaging and closure should be considered as an alternate.

30. Page IV-43, Section G

The subject of this section and that of section D.4 (page IV-34) might well be considered in light of the prospect of using ferry barge shipments to circumnavigate cities or states which embargo nuclear shipments or areas where rail carriers are refusing to haul nuclear shipments. We do not feel that the regulations contemplated the casual public in such proximity to nuclear shipments, particularly spent fuel casks, for the typical time period involved. We feel that this situation lends itself to be analyzed in the draft.

31. Page V-8, Equation (1)

We assume this equation was used to calculate accident risks. We have several questions on the methods used to develop numerical values for input into the equation. A primary concern is the term D_{ij} (estimated release fraction for the type of shipment being considered and for the accident severity class). The method of development of D_{ij} appears to be oversimplified. Release fractions used for each

accident severity class are presented in table V-6 (page V-25). Questions are raised for both the values used and the use of the release fraction in the analysis. The statement is made (page V-24) that "Model 1 would be an accurate model if packaging were no better than required by present standards." We disagree that it would be accurate; experience indicates that not all material will get out and become dispersed when a package is breached. We are not sure of the basis for Model II. It was our understanding that the reference testing was under impact conditions. If so, how does one apply the results to, e.g., puncture conditions?

Does a category VII accident in air transport involve the same forces as a category VII accident in truck transport? If not, we would expect different release fractions for different modes (since the same container could be used in any mode).

We would not, in general, expect the same release fraction from an accident involving a category VII impact and one involving a category V impact and a category III fire. According to figure V-6 (Page V-9) the latter is also a category VII accident. Whether or not a category III fire will contribute to a release depends on specific package characteristics and specific contents characteristics.

It is also not clear how the normalized population dose (K_i in Equation (1)) is obtained. We know it involves figure V-11 but there is no reference as to source of figure V-11 nor how the curve was developed.

32. Page V-11, First Paragraph

A fire temperature of 1875°F is referenced. We wonder if it would not be appropriate to discuss the 1475°F used in container (MC 0529, 10 CFR 71 etc.) and the impact of the difference.

33. Page V-15, Section B.2

Crush forces are load dependent. Therefore, if, for example, a shipment is made in a sole use vehicle which contains only a few small radioactive material packages the crush force severity categories (e.g., category VIII, 5% of accidents involve a crush force greater than 500,000 pounds) are likely to be incorrect.

Also it would be appropriate to define the phrase "crush force"

34. Page V-27, Last Sentence

From this statement and the discussion near the top of page III-17, the reader is left with a confused picture. Is the calculation for ^{131}I and ^{137}Cs release consequences based on the milk path or on the inhalation path only? The statements in chapter III imply that only the inhalation was included in which case the consequences for ^{131}I and ^{137}Cs releases are underestimated. This should be clarified in the final statement.

35. Page V-30, Second Paragraph

There is no discussion or reference to explain the model used to calculate the area enclosed by isopleths. When an area as large 10^4 km^2 is involved (see figure VII), the model used for this calculation is very much of interest since this area exceeds by more than four orders of magnitude the areas plotted in Meteorology and Atomic Energy. Also, such a large area would depend more on regional than on local meteorology. The atmospheric stability and wind speed should be mentioned as well as the method by which values of the dispersion parameters σ_y and σ_z are determined.

36. Page V-31, Figure V-10

Figure V-10 is self-explanatory although the normalization dose value of 0.8 rem seems odd and there is no explanation of it in the text. This figure, however, and figure V-11 on page V-38 are inconsistent. From figure V-10 the 10-meter release height curve yields a value of 4×10^6 m^2 at the 95 percentile. Thus, the area enclosed by the 8×10^{-4} rem per g of ^{239}Pu released is 4×10^6 m^2. In figure V-11, however, the ordinate corresponding to 4×10^6 m^2 is 9×10^{-3} rem/g of ^{239}Pu released. This discrepancy should be corrected.

37. Page V-34, Second Paragraph

In the last sentence a cloud height of 10 meters was assumed; however, we feel that atmospheric stability and wind speed assumption should be made and stated.

38. Page V-38, Figure V-11

We do not understand the shape of this curve. The dose should be proportional to the atmospheric dilution factor, E/Q or x/Q' and the area as a function of x/Q' as plotted in Meteorology and Atomic Energy has a concave shape to it, whereas this one (figure V-11) is convex. Since no model is described or

referenced, it is impossible to check. As previously noted, we suggest that the source of this figure and how the curve was developed be referenced.

39. Page V-39, Top Line

A computer code is mentioned. Which code is it? Is it documented? There is an ANSI Standard for computer codes which if followed gives the reader some assurance that the code has been reviewed and checked for accuracy. Has this been done for the codes used in this document?

40. Page V-43, Second Paragraph

We do not feel that taking 20% respirable as a median for 10% and 40% is conservative.

41. Page V-43, Third Paragraph

No support or descriptions are given for either of the two components in the "third factor". The statement "For plutonium this fraction is approximately 11/24" is unsupported as is the statement "ratios of irradiation rates and clearance rates... this factor is approximately unity for plutonium". A geometric standard deviation of 3 (footnote) signifies a very wide range of particle sizes, and a most difficult aerosol from which to derive "irradiation rates". This lack of information renders the entire remainder of this section unsubstantiated and therefore of little value. We strongly suggest that additional information be supplied.

Also, we would like to know what is the significance of 11 and 24 in the fraction 11/24 and is there any reference for these figures.

42. Page V-44, Table V-11

Radionuclide name is missing on first line. We assume this should be ^{239}Pu.

43. Page V-48, Fifth Line

Delete the word "physiological" since it is meaningless as used here.

44. Page V-48, Third Paragraph

We suggest that Equation (1) should be given or referenced.

45. Page VI-49, Table VI-30

Accident LCF reduction in table is by a factor of 23, but the text refers to a 23% LCF reduction. This discrepancy should be corrected.

46. Page V-50, Table V-15

The risk reported in this table of accidents in the shipment of PuO_2 is (for the same annual shipment quantity) at least four orders of magnitude greater than that found in a detailed assessment of the risk of shipping plutonium by truck. (T. I. McSweeney, L. J. Hall, et al. An Assessment of the Risk of Transporting Plutonium Oxide and Liquid Plutonium Nitrate by Truck. BNWL-1846, Battelle, Pacific Northwest Laboratories, Richland, Washington, August 1975.)

We feel that this is extreme conservatism in the accident risk analysis.

47. Page VI-1

One section noticeably missing is a detailed history or "Track Record" of fissile and other radioactive materials during the past 15-20 years and the analysis of that data utilizing the parameters used in this study. This omission is not understood since the first sentence in paragraph 2 on page VI-1 states, "The environmental impact of an alternative in radioactive materials shipments is meaningful only when compared to the impact of the current shipping practice." The evaluation of low consequence events of the past could then be compared to projected consequences of future shipments to assess the method used.

No assessment is made of risks resulting from human error or faulty equipment which could result in dropping or puncturing containers during handling (fork-lifting) operations.

In addition, no mention is made of specialized training for personnel involved in the various facets of fissile and radioative materials shipments and the impact it might have in precluding incidents and accidents.

48. Page VI-2, Table VI-1

We suggest that the annual population dose due to accidents be included.

49. Page VI-10, Table VI-4

Table VI-4 and following give baseline and alternative calculated values then a change usually in percent. Giving this change in percent rather than in absolute value tends to be misleading. This is particularly true when evaluating the sum of LCF for normal and accident. For example, on page VI-22 we find a normal transport LCF increase from 1.166 to 1.195 or 0.029 or 2% while accident LCF decreases 21%. Stopping there it sounds like a substantial overall LCF decrease. But looking farther we see the 21% decrease is from 0.000529 to 0.00044 or 0.000089 decrease off-setting 0.029 increase or a net 0.0289 increase. We recommend showing the change in absolute values throughout this section.

Furthermore, we feel that the text could be strengthened by the addition of narrative which place the differentials between alternate modes in perspective relative to the probable accuracy of the result (i.e., relative to the confidence limits in the data). For example, what is the confidence in, or significance of, the computed 21 percent decrease in latent cancer fatalities due to accidents?

50. Page VI-14, Table VI-6

The annual air cost minus truck cost in dollars for plutonium shipment should be 2.8×10^3, not 3.4×10^3, based on the information in this table. Also, the footnote for this table is confusing since it is indicated that the plutonium shipping distance is 1200 miles but the cost is given for a 2000 mile trip.

51. Page VI-19, Last Paragraph

States, "additional secondary mode mileage..." This is in conflict with statement on page VI-17, B.1-3 which says, "shorter distance in secondary mode."

52. Page VI-30, Section B.1-6.2

The discussion fails to acknowledge the aggravated logistics and increase in facilities and labor required at a reprocessing plant receiving about 5 metric tons of fuel per day by truck relative to rail. This is important also in light of the added potential for operator error, and dosage to plant operating personnel.

Some mention of the efficient utilization of transport fuels is probably appropriate. A 1000 MWe light water reactor might originate 60 spent fuel cask shipments by year by truck or 10 cask loads by rail. Fuel consumption is typically 670 BTU per ton mile by rail; 2400 BTU per ton mile by truck. Assuming a 1000 mile trip (each way), rail shipments would save over 64,000 gallons of diesel fuel per reactor year.

53. Page VI-41, Paragraph 3

States "Restricting trucks to good weather driving..." A restriction of this type would precipitate confusion as to the definition of "good weather driving" and would prevent the driver from exercising discretion as to whether road conditions are safe or unsafe (he should be in the best position to make that determination).

54. Page VI-43, Section B.2-3.3

This section discusses restriction on truck travel on weekends. Since truck costs are based on miles covered, denial of weekend travel would severely escalate costs of shipments by this restriction. Long haul operations that are currently on the road for greater than five days would be severely affected.

55. Page VI-44, Section B.2-4

In view of recent railroad actions, we feel this section deserves more emphasis and perhaps some expansion. Specifically, is there any basis in statistical data to suggest that the addition of special train units (extra's) operating over trackage otherwise scheduled, but at less than normal freight train speed would increase accident frequency or consequences relative to normal freight service?

56. Page VI-47, Table VI-29

This table shows a factor of 10% increase for one item and 100% decrease for another. We suggest consistency in these tables. Some comment applies to table VI-30, page VI-49.

57. Page VI-49, Line 23

States "...Since accidents involving plutonium shipments are expected to produce 98.6% of the total risk..." If this statement is true, then the packaging requirements for all quantities

of plutonium shipments should be upgraded. Perhaps consideration should be given to require all transuranics to have a super classification of containers to be used for all modes of transport.

58. Page VII-1, Third Paragraph

This paragraph indicates, according to the text, that nuclear material is subject to security procedures and safeguards intended to preclude the diversion or theft of nuclear material or sabotage of the nuclear facilities in which it is handled.

This statement in regard to the safeguarding of strategic quantites and types of special nuclear material is misleading and should be revised. There is no option to safeguard special nuclear material in this category. NRC regulations prescribe the safeguarding both at fixed facilities and in transit. Additionally, safeguards and security procedures are not limited to "strategic quantities" but to all special nuclear material.

That part of the paragraph which speaks to radioisotopes, such as cobalt-60 should be eliminated. There are no security and safeguards features in the context within which they are discussed, i.e., to preclude diversion or theft or sabotage, applicable to the handling of radioisotopes by NRC. Mentioning cobalt-60 raises numerous related questions regarding other hazardous radioactive materials not subject to NRC safeguards and security type control (e.g., radium).

59. Page VII-2 B(2) and (3)

Meaning of "Contractors" unclear. Contractors to NRC, U.S. Government, nuclear industry or what?

60. Page VII-5, Second Paragraph

The meaning of "supporting safeguards security systems" requires clarification.

61. Page VII-8, Third Paragraph

We see no reason to specify "escort guards" but would refer to "guards" without the qualification since it is unlikely that guards would be used solely for escort purposes. The same sentence apparently intends to refer to "the transportation mode" rather than "the transportation model."

62. Page B-7, First Paragraph

A portion of material deposited in the tracheobronchial region may also pass directly to blood, depending on initial solubility. The term "reticuloendothelial cells of the alveoli" is ambiguous; it is not clear whether this refers to fixed or mobile pulmonary macrophages.

63. Page B-7, Second Paragraph

"Soluble plutonium" is a thoroughly non-specific term. Translocation half-times and fractions can vary several-fold depending on inhaled particle size, specific chemical form, and isotopes of plutonium. Use of the narrow range "150-200" is misleading and may be dangerous in risk estimates; the unit of time is not even given.

64. Page B-9

This figure is taken directly from publications by J. F. Park and W. J. Bair at Battelle Pacific Northwest Laboratories; reference and credit should be given.

65. Page B-10, First Paragraph

This discussion is not complete; the lethal biological effect of progressive pulmonary fibrosis leading to death by respiratory insufficiency is not even mentioned. We suggest that this section be expanded.

66. Page B-10, First and Second Paragraphs

Terms "high", "low", "lower", and "relatively" should be given values or ranges; "relatively high body burdens (.00007 to .09 microcuries)" spans 3 orders of magnitude. We suggest that ".00007 to .09 microcuries" be changed to "0.005 to 0.420 microcuries". (Reference - WASH-1320, page 25).

67. Page B-11, Fourth Paragraph

It should be pointed out that "increases in urinary excretion in some cases by orders of magnitude" may represent only a decrease of a few percent in long-term lung burden of insoluble plutonium.

68. Page B-12

We suggest that NRC staff may wish to reference Dr. J. N. Stannard's paper "Plutonium Toxicology and Other Toxicology" in The Health Effects of Plutonium and Radium (Jee, W. S. S., ed.). J. W. Press, Salt Lake City, Utah (1976) pp. 363-372 rather than the B. L. Cohen reference. ERDA staff feels the suggested reference to be more current.

69. We are listing the following typo errors to improve the draft:

B-7 - Clearance half-time of 150-200 omitted units.

V-9 - There is a VII just above II and a IIII next to II. Should they not both be III?

V-24 - Last paragraph. Should it not be table V-6?

V-54 - First paragraph, last sentence. Should it not be 0.2 fatalities per year?

70. It has been suggested that the report title be shortened to "The Transportation of Radioactive Materials."

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

DOCKET NUMBER
PROPOSED RULE PR-71,73 (41FR23?

Trans. Radioactive Mtl. by Air

22 JUL 1976

Mr. Robert B. Minogue
Office of Standards Development
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Minogue:

Enclosed are the EPA comments from our review of NUREG-0034, the draft environmental statement on the Transportation of Radioactive Materials by Air and Other Modes.

We are concerned with the implication of Table IV-2. It lists maximum and average doses to individuals on aircraft of 340 mrem/year and 60 mrem/year, respectively, and since there is no accompanying discussion of the subject, it implies that NRC finds these doses acceptable. EPA has issued recommendations to FAA which state that doses to individuals at such levels are unacceptable for aircraft passengers since at least one cost effective method can be used to significantly reduce these doses (i.e., increased shielding). Therefore, we do not consider this exposure situation consistent with current Federal guidance which states: (1) that "there should not be any man-made radiation exposure without the expectation of benefit resulting from such exposure" and (2) that "...every effort should be made to encourage the maintenance of radiation doses as far below this guidance as practicable." We believe actions must be taken to reduce doses of this magnitude to aircraft passengers.

In December 1974, EPA issued its recommendations to the Federal Aviation Administration for a dose rate limit of 0.5 mrem/hour at seat level. EPA estimated that this would yield a dose of 42 mrem/year to individuals in the worst assumed case. In the same recommendations, EPA found that there is at least one cost-effective method readily available to maintain dose levels below 0.5 mrem/hour. Obviously NRC has followed neither the FRC guidance nor the EPA recommendations in calculating the doses given in the statement and, further, has chosen to imply these doses are acceptable by failing to discuss them. With the tremendous number of shipments of radioactive materials per year on passenger aircraft, EPA views this matter with grave concern, and believes NRC and FAA should undertake immediate action to correct this unsatisfactory situation.

Acknowledged by card 7/27/76

A second major problem with this statement involves the analysis of transportation accidents. While the approach taken to evaluate transportation accidents appears reasonable, there is a lack of supporting information to confirm the results of the analysis and the conclusions which are drawn. Thus, these results and conclusions are based solely on engineering judgment. We believe this fact should be recognized and pointed out in the final statement.

In light of our review and in accordance with EPA procedure, we have rated the proposal as EU (Environmentally Unsatisfactory) and classified the draft statement as Category 2 (Insufficient Information). If you or your staff have any questions concerning our rating or comments, please do not hesitate to call on us.

Sincerely yours,

for Rebecca W. Hanmer
Director
Office of Federal Activities (A-104)

Enclosure

Comments on NUREG-0034
The Draft Environmental Statement on the Transportation of
Radioactive Material by Air and Other Modes

General Comments

1. There is a lack of discussion pertaining to the high individual dose equivalent rates to passengers from normal shipments on aircraft. These dose equivalent rates, which are cited in Table IV-2 as 340 mrem/year maximum and 60 mrem/year average, are large fractions of the Federal Radiation Council guidance and are the most significant impact from normal aircraft shipments. In January 1975, EPA issued recommendations to the Federal Aviation Administration which state that doses to individuals at such levels are unacceptable for aircraft passengers since at least one cost-effective method is readily available to significantly reduce these doses (i.e., increased shielding). The action of shipping radioactive materials as described in this statement is not consistent with current Federal guidance which states: (1) that "there should not be any man-made radiation exposure without the expectation of benefit resulting from such exposure and, (2) that "... every effort should be made to encourage the maintenance of radiation doses as far below this guidance as practicable." We believe actions must be formulated and carried out to reduce doses of the magnitude cited being received by aircraft passengers.

2. In December 1974, EPA issued its recommendations to the Federal Aviation Administration for a dose rate limit of 0.5 mrem/hour at seat level. EPA estimated that this would yield a dose of 42 mrem/year to individuals in the worst assumed case. In the same recommendations, EPA found that there is at least one cost-effective method readily available to maintain dose levels below 0.5 mrem/hour. Obviously, NRC has followed neither the FRC guidance nor the EPA recommendations in calculating the doses given in the statement and, further, has chosen to imply these doses are acceptable by failing to discuss them. With the tremendous number of shipments of radioactive materials per year on passenger aircraft, EPA views this matter with grave concern, and believes NRC and the FAA should undertake immediate action to correct this unsatisfactory situation.

3. We point out that EPA has proposed standards concerned with normal operations in the uranium fuel cycle (40 FR 23420) which include doses received during transportation of radioactive materials. These standards would limit individual doses to 25 mrem to the whole body. EPA believes that this will have little or no effect on the economics or operations of the transportation industry because, as it now exists, the dose equivalent levels appear to be less than 1 mrem

per year, well below 25 mrem per year. The fact that EPA has formally proposed standards which would apply to the transportation of uranium fuel cycle materials and yet is not recognized in the draft statement is an oversight which should be corrected.

4. With regard to transportation accident analysis, the relationship of the shipping package test requirements and the performance of the packaging under various accident categories has not been established to our knowledge. Thus, the information on failure rates and release fractions as presented in Table V and the conclusions drawn are based solely on engineering judgment. This fact should be indicated in the final statement.

5. EPA believes that use of the BEIR report in its unmodified form is the most reasonable model to use to calculate health effects in this statement at this time. Since the debate over the health effects model in WASH-1400 is still continuing, it is premature to base this analysis on WASH-1400 premises.

6. With the exception of weapons-related shipments where the country's security might be compromised, we cannot understand the exclusion of government transportation statistics. Since this group of statistics is surely a large collection, the public release of this information is not only desirable but could certainly aid in the assessment of the environmental impact created by the transportation of radioactive materials.

Specific Comments

1. P. III-2, Last paragraph: It should be noted that the length of time over which energy is absorbed is also critical to creating biological effects.

2. p. III-3: Since there were 5.5 million examinations in 1972 using technetium and the most useful form cited was used a mere 120,000 times, it is not clear what happened with the other 5,380,000 examinations.

3. p. III-9: The statement, "The dose limits proposed by NCRP and adopted by EPA..." is not correct. EPA is currently operating under the 1960 guidelines of the Federal Radiation Council (FRC). The EPA is currently working in an interagency effort to review and update the FRC guidelines; the NCRP dose limits are being consulted in this effort but have not been adopted.

4. p. III-13: We suggest rewriting the sentence beginning "Technetium-99m can be given..." as, "Technetium-99m can be given in relatively large amounts with little radiation exposure." "Relatively" emphasizes comparison with other isotopes and "amounts" eliminates

possible confusion resulting from using the word "dose" which is used in a medical context rather than the radiological context in which it had previously been used.

5. p. IV-12, sec. D. 1-1: It is stated that tiers 6, 7, and 8 in figure IV-3 schematically illustrate the procedure that the FAA employed to arrive at the various dose estimates in their assessment, reference IV-2 in the statement. However, tiers 7 and 8 do not appear in figure IV-3. They should be added in the final statement.

6. p. IV.-34: We feel that the water transport discussion was not thorough enough. The only reason cited for this treatment is a "paucity of information" concerning water transport. However, the discussion in the draft statement on the manufacture of floating nuclear power plants (NUREG 75/113) provides a brief but much more adequate discussion of the subject. If it is believed that a projection to 1985 is too uncertain this is understandable and should be so stated, but a more thorough discussion would be more informative for the public and would not as likely appear to be a sidestepping of the issue. Therefore, further basic discussion of water transport and an explanation for its exclusion in the further analyses is warranted.

7. p. IV-41: In the second paragraph of section F.3, there is no factual basis cited for the statements leading to the 0.5 mrem/year "expected" dose rate. This section needs to be more thoroughly documented to indicate which radionuclides were considered and in what proportions. Further, information on whether certain types of packages are damaged more frequently than others and, if so, which, is certainly of importance to the analysis in this section.

8. pp. IV-42-43: The method of modifying equation 2 to arrive at the given equation is not clear, further elucidation is requested.

If there are records indicating "an average of 5 losses per year over the last 9 years," it seems there might also be records indicating for how long these packages were lost. Such information would eliminate another estimate, i.e., the "7-days lost" figure, to allow a more precise appraisal of possible population doses.

9. p. IV-44: The discussion shows that it is currently possible for workers to exceed 500 mrem/year simply handling shipments. It is clear that if the number of shipments increase as they are projected to do that these workers will routinely exceed 500 mrem/year. Any provisions which have been made to prevent this from occurring should be indicated. Furthermore, if the doses mentioned on p. IV-44 do not include unnecessary doses (e.g., sitting on or standing near radioactive

cargo), which they apparently do not, the problem becomes worse than estimated on p. IV-44. We believe that if unnecessary exposures are indeed a fact of life, they should be included in the environmental impact assessment. Any plans underway to mitigate or eliminate these unnecessary exposures would be of interest also.

10. p. V-13: The scheme of the de-rating of aircraft accidents seems somewhat unrealistic in one sense and quite arbitrary in another. First, airline routes do not blanket the entire country uniformly, especially flights carrying radioactive materials. It would seem much more realistic to determine the proportion of flights carrying radioactive cargo over the various land surfaces and then de-rate the accidents. Second, the reasons for choosing the number of accident severity classes by which accidents are de-rated are not apparent. The arbitrary nature of the statements brings them into immediate question.

11. p. V-24: EPA previously stated and still believes that a technical analysis should be performed relating packaging test requirements to the forces a package may experience in an actual accident environment since primary protection in transportation is currently provided by the packaging itself. Special attention would be given to the probable extent of damage expected to be suffered by the package and the resulting quantity of radioactive materials which may be released to the environment under the various accident conditions. In developing this analysis, it is important to use as much test data as possible rather than relying on unverified engineering models. EPA is encouraged that data is now being gathered from actual tests, however, it appears that insufficient data makes it too early to use "Model II" in Table V-6. In our opinion, Model I should be used as the basis for the risk assessment at this time, with Model II used only as a comparison.

12. p. VI-40, Table VI-25: The discussion on the mitigation of accident consequences which precedes this table in this section indicates a decrease in the "Accident L.C.F." rather than an increase as given in Table VI-25. The reason for this seeming inconsistency should be explained.

13. p. VI-46, B.3-1; 2nd paragraph: Correction of the term "ny" is necessary to clarify the sentence's meaning.

14. Appendix B: The list of references should be more specific where appropriate when only one part of a book or one article in a collection is used. Other references need to give more information to be complete, such as numbers 5 and 12.

On p. B-7, the first paragraph, the movement of particles captured in the mucoid lining is more properly termed transported not sloughed.

In section E, we have several comments. On page B-10, to prevent confusion, a beta particle is not an ion and it is confusing to describe its nature as ionic, its nature is more properly termed that of a charged particle; also, beta particles can travel much further than a few microns in body tissue, in fact into the centimeter range. In the cited case of the Los Alamos personnel, the draft statement indicates that "...none of these people has shown any evidence of radiation injury." It seems this statement is probably too broad and could be optimistic. We doubt that all possible indicators have been checked and even if they have it is quite unlikely that there has been no radiation damage. This statement, if taken literally, would indicate that the NRC has adopted a threshold model for radiation effects. If this is true, the decision should be documented.

In section E.3, first, there are no references cited for the information given; second, there are apparently symbols missing from the amounts of plutonium cited, 0.5 curie Pu-239/gram of lung is the same as 8.2 grams Pu-239/gram of lung.

The discussion in section F on chelating agents does not mention any side-effects of their use, e.g., possible deposition in other organs, rather than excretion, which could create worse problems.

And, finally, the comparisons given on p. B-12 are too simplistic. Nowhere is it stated that the effect of these materials depends on innumerable factors, e.g., exposure time, time between intake and effect, condition of the victim, and how the material acts in a biologic system. This should be corrected in the final statement.

15. Appendix C: The listing of incidents as presented is hard to follow since there are neither dates indicating when incidents occurred nor meanings of the abbreviations used. Such data needs to be included in the final statement.

Editorial Comments

1. p. IV-24: In the "Dose to Crew" equation the "D_c" factor is unnecessary. Its inclusion squares the dose rate.

2. pp. V-9 and V-20: The squares listed for the following figures are apparently mislabeled: Figure V-6: 0-0.5 hour fire, 30-55 mph and, 0.5-1 hour fire, 11-30 mph; Figure V-20: 1-1.5 hour fire, 40-60 mph.

3. p. VI-1: The act referred to as the National Environmental Protection Act is correctly cited as the National Environmental Policy Act of 1969.

4. p. B-7, middle paragraph: The clearance time for soluble plutonium needs to have units added to it.

DOCKET NUMBER
PROPOSED RULE PR-71,73(40FR23709)

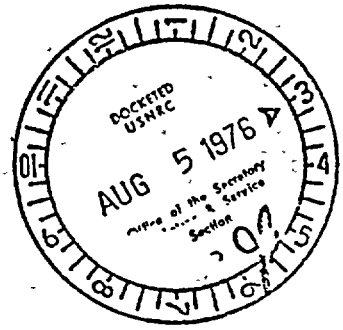
Office of Planning and Budget

Executive Department

James T. McIntyre, Jr.
Director

GEORGIA STATE CLEARINGHOUSE MEMORANDUM

TO: U.S. Nuclear Regulatory Commission
Office of Standards Development
Washington, D.C. 20545



FROM: Charles H. Badger, Administrator
Georgia State Clearinghouse
Office of Planning and Budget

DATE: July 29, 1976

SUBJECT: RESULTS OF STATE-LEVEL REVIEW

Applicant: U.S. Nuclear Regulatory Commission

Project: The Transportation of Radioactive Material by Air and other Modes

State Clearinghouse Control Number: 76-04-14-05

The State-level review of the above-referenced project has been completed. As a result of that review process, the project is recommended for further development with the following recommendations for strengthening the project:

1. The draft EIS deals with the transportation of all types of radioactive materials, including pharmaceutical as well as spent fuel. It is broad, general, and non-specific. Because of the way it is organized and presented, it is practically impossible to sort out the real issues and impacts associated with an area of prime interest such as the transportation of spent fuel. The NRC should seperate out the issue of spent fuel and do a seperate detailed and factual EIS on its transportation aspects.

2. Throughout the document, the dose estimates are related to the average exposure to population in man rems. The NRC should also include dose values based on the maximum exposure to individuals.

Acknowledged by card 8/5/76

3. With reference to accident analysis, the EIS seems to look at alternatives in a broad, general context and only related to the average exposure concept. It is questionable as to whether some of these same alternatives would still be valid if the maximum exposure concept were used.

4. In addition to the general considerations of transportation of nuclear materials throughout the United States, specific consideration must also be addressed with regard to large metropolitan areas such as Atlanta, posts of entry, and other large transportation centers. NRC has a definite and specific responsibility in the development and application of proper procedures for the transportation of nuclear materials through such areas in order to insure the complete protection of the citizens of the area. Such procedures must be useable and acceptable by the States that are impacted.

5. In general, the EIS is too general and non-specific to be of much use as a planning tool for specific areas. As was stated in (4) above, NRC has the obligation and responsibility to issue a report that is useable by the States.

The State of Georgia asks that the final environmental impact statement prepared for the project contain a greater degree of specificity when addressing the aforementioned areas of concern.

cc: ...ce Osborn, Executive Department, Office of Planning and Budget
...i Walden
Leonard Ledbetter, Department of Natural Resources
David Tundermann, Council on Environmental Quality
Ray Siewert, Department of Natural Resources

DOCKET NUMBER
PROPOSED RULE PR-7173 (40 FR 23760)

STATE OF NEW YORK

LOUIS J. LEFKOWITZ
ATTORNEY GENERAL

DEPARTMENT OF LAW
TWO WORLD TRADE CENTER
NEW YORK, N.Y. 10047
TELEPHONE: 212-488-7562

PHILIP WEINBERG
ASSISTANT ATTORNEY GENERAL
IN CHARGE OF
ENVIRONMENTAL PROTECTION
BUREAU

August 4, 1976

Director
Office of Standards Development
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Comments on the Nuclear Regulatory Commission's Draft Environmental Impact Statement on the Transportation of Radioactive Materials (NUREG - 0034)

Dear Sir:

Recently it was announced by the U.S. Energy Research and Development Administration ("ERDA") that it will take over the transportation of all strategic amounts of non-weapons special nuclear materials ("SNM") by October 1 of this year. ERDA stated that the takeover was being made because a "higher degree of security is essential." Nuclear News, June 1976, p. 125, copy attached. According to affidavits filed by ERDA and the NRC in the federal case of the State of New York v. NRC, et al., 75 Civ 2121 (WCC) (SDNY), these shipments had been made until now by commercial transport. We are unaware of any action by the NRC to similarly remove from commercial transport SNM shipments by its licensees although it has been stated by the NRC and ERDA that:

> "As a matter of ERDA and NRC policy the control measures imposed on plants and transportation of ERDA license-exempt contractors and of NRC licensees are either the same or comparable." Presidential Report to the Congress Regarding Laws and

Acknowledged by card 8/17/76

Regulations Governing Nuclear Exports and Domestic and International Safeguards, March 31, 1975, prepared by ERDA & NRC.

ERDA's recent finding that a higher degree of security is essential indicates the vulnerability of ERDA and NRC controls on commercial air and related connecting transport to terrorist action as is thoroughly discussed in the comments of this office on the above-referenced environmental impact statement ("EIS") and the prior comments and enclosures dated July 2, 1975 and August 12, 1975, submitted by this office in this administrative docket as originally noticed at 40 Fed. Reg. 23768 (June 2, 1975). (See especially comments of Messrs. Mason and Leamer, submitted by letter dated May 17, 1976, and copies of affidavits of Messrs. Mason and Leamer, dated November 30, 1975 and January 20, 1976, resubmitted by letter, dated August 3, 1976, to J. Corr, NRC Office of General Counsel).

This new development and the anomalous situation which it creates must be publicly addressed by the NRC in a direct and prompt manner.*

The NRC is now once again urged to recognize that the continued commercial transport of SNM runs an unacceptable risk of diversion or loss of SNM. More secure modes of transport must be immediately designed and implemented. As this office has previously stated it is our view that the NRC should require that shipments of plutonium be made by military surface transport and that shipments of uranium**

* Additionally, the Final EIS on transportation should, of course, reflect the NRC response to ERDA's concern over the inferior control measures which are not capable of providing an adequate degree of security for the transport of SNM.

** Other than uranium enriched in the isotope U-233.

be made by military air transport, using military bases as points of shipment and interim storage for all SNM.

It is requested that this letter be docketed and made part of the record of this proceeding.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JFS:rab

JOHN F. SHEA, III
Assistant Attorney General

APPENDIX "A"

safeguards

SNM

ERDA to assume shipments by October

Because it says a "higher degree of security is essential," the U.S. Energy Research and Development Administration will take over transportation of all strategic amounts of non-weapons special nuclear material by October 1. These shipments are now being made via private shippers. One of them, Edlow International, of Washington, D.C., had objected to ERDA's plan before it was made final.

Following a meeting with Edlow, ERDA reasserted its position. Alfred D. Starbird, a retired Army lieutenant-general and now ERDA's assistant administrator for national security, said, in a letter to the shipper, "Based on our analyses we are convinced that significantly greater security will be provided at an earlier time by expansion of the existing ERDA system" to cover the strategic quantities of SNM.

An ERDA spokesman later emphasized that the agency will continue to study the situation, even as it implements its plan.

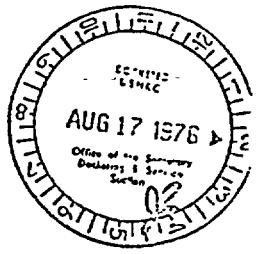
October 1 was picked as the deadline after considering the time required to obtain shipping materials and work out security procedures. Contracts with the private shippers will be terminated or adjusted by that date.

LOUIS J. LEFKOWITZ
ATTORNEY GENERAL

STATE OF NEW YORK
DEPARTMENT OF LAW
TWO WORLD TRADE CENTER
NEW YORK, N.Y. 10047
TELEPHONE: (212) 488-7562

PHILIP WEINBERG
ASSISTANT ATTORNEY GENERAL
IN CHARGE OF
ENVIRONMENTAL PROTECTION
BUREAU

DOCKET NUMBER
PROPOSED RULE PR-7173(40FR23768) August 3, 1976



Janice K. Corr
Attorney
Office of the General Counsel
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Comments on the Nuclear Regulatory Commission's Draft Environmental Impact Statement on the Transportation of Radioactive Materials (NUREG-0034)

Dear Ms. Corr:

Judge Conner has ordered that the seal on the affidavits of Messrs. Mason and Learner, dated November 30, 1975 and January 20, 1976, submitted in State of New York v. NRC, et al., 75 Civ. 2121 (WCC) (S.D.N.Y.), be broken.

In accordance with our previous discussions, I enclose copies of those affidavits for submission in conjunction with the other comments of this office which have already been accepted for consideration by the NRC in preparing the final environmental impact statement.

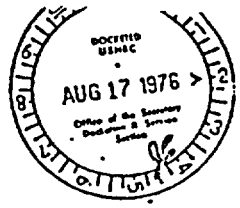
Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JOHN F. SHEA, III
Assistant Attorney General

JFS:dg
Encl.

Acknowledged by card 8/12/76



UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

THE STATE OF NEW YORK,	:	
Plaintiff,	:	
-against-	:	AFFIDAVIT
THE NUCLEAR REGULATORY COMMISSION, et al.,	:	75 Civ. 2121 (WCC)
Defendants.	:	

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

THEODORE T. MASON and ROBERT R. LEARER, being duly sworn, depose and say:

Purpose of the Affidavit

1. This affidavit is submitted in support of plaintiff's motion for a preliminary injunction and motion for summary judgment, and is made with regard to the possibility of terrorist activities directed toward destruction or seizure of special nuclear material or SNM.

2. This affidavit augments and refines the affidavit of 16 June, 1975 submitted by Theodore T. Mason and Robert R. Learner in support of the position that there is a substantial likelihood that a motivated, trained and equipped group of terrorists could be successful in destroying or seizing SNM in the course of its transportation by commercial air and related connecting ground services. The principal purposes of this affidavit are to address (1) the air transport of uranium as opposed to plutonium, (2) and the vulnerability of commercial air transportation systems currently employed industry-wide as compared to a variety of military assisted air transport systems. Plutonium constitutes a threat as a toxic dispersant and therefore a terrorist might well seek to

destroy a plane transporting it. On the other hand uranium, other than U_{233}, constitutes a threat only as an explosive and requires a terrorist action plan of seizure and escape for later explosive deployment.

4. Each of the following military assisted transportation alternatives for enriched uranium is considered less vulnerable to terrorist action than current commercial practice. The least vulnerable alternative is presented first, the most, last:

(1) long haul military air cargo, leaving from and flying into a military airfield, and connecting with short haul military helicopter service between the airfield and the origin/ultimate destination;

(2) same as (1) but with military surface transport service between the airfield and the origin/ultimate destination;

(3) long haul commercial air cargo, leaving from and flying into a military airfield, and connecting with short haul military helicopter service between the airfield and the origin/ultimate destination;

(4) same as (3) but with military surface transport service between the airfield and the origin/ultimate destination;

(5) long haul commercial air cargo, leaving from and flying into a military airfield, and connecting with commercial surface(truck) service or commercial air(helicopter service between the airfield and the origin/ultimate destination.

5. Nature of the Threat

Since the terrorist objective will be to seize and escape with the enriched uranium in contemplation of later actual o threatened explosive deployment, he has only limited courses

of action:

a. hijack the aircraft;

b. theft at the airport;

c. inception and theft between the airport and the origin/ultimate destination.

The threat of destruction of the long haul aircraft in the air, upon landing, or in parking position is minimal as it is quite unlikely to facilitate a uranium seizure and escape. Complete destruction of short haul transport, either air or surface, is also unlikely for the same reason. The uranium must be seized intact and not destroyed or lost in the process of bringing down the aircraft.

6. Evaulation Criteria

In our affidavit of 16 June, 1975, the earlier planning steps and subsequent destructive employment steps were found to be within the capability of terrorists. Vulnerability of competing transport systems to the threat described in previous paragraphs can be assessed in terms of the relative likelihood of terrorist success in accomplishing steps (5) through (11) under paragraph 8 of our previous affidavit dated 16 June, 1975. These steps are:

(5) acquisition of information on material location, protection and movement;

(6) external penetration of facility (airport);

(7) access to interim storage facility (if applicable);

(8) control of vehicle (aircraft/truck);

(9) access to container (or material);

(10) manipulation of container (or material);

(11) removal of material (from area/authorized control).

7. Assessment of Alternatives

A number of action plans which terrorists might implement to gain their objectives were identified in our affidavit dated 16 June, 1975. A transportation system alternative may be considered vulnerable if implementation of those or similar action plans are likely to allow a terrorist to effect the steps enumerated in paragraph 6 above.

8. A summary vulnerability assessment of each military assisted transportation system alternative described in paragraph (4) above is provided below. The commercial air transport system currently employed industry-wide was found highly vulnerable in our affidavit of 16 June, 1975, and it is not reevaluated herein. Each military assisted transport system considered below is superior to(less vulnerable than) the current commercial system. Varying degrees of military assistance are evaluated in order to show that there is a range of policy options yielding varying degrees of lower vulnerability.

Alternative (1) - All Military with Short Haul by Helicopter

9. Hijacking -- considered remote because the military cargo aircraft would load enriched uranium at and depart from a military airfield. Security at a military base is generally quite rigorous, making access to the base, and the airfield, and then the aircraft, rather difficult. Additionally, military communications can be made very secure, so that terrorist access to critical information on the nature and timing of enriched uranium movement would be quite difficult.

10. Destruction of long haul aircraft--not an appropriate action plan since terrorists must gain physical control of enriched uranium for later use in a bomb.

11. Seizure of enriched uranium at destination military airfield considered remote for following reasons:

--difficulty of accessing military airport;

--military police are armed, motivated and likely to prevent terrorist escape even if a seizure is effected;

--all base personnel can be placed upon immediate alert in the event of an incident;

--military communications are excellent and additional response capability is generally available;

--information on enriched uranium movements can be made extrerely difficult to acquire. .Secure and controlled communications are central to military operations;

--temporary storage or hold over of enriched uranium at military airports is unlikely since a military helicopter responsible for the short haul leg to a final destination is not likely to be assigned other functions which would delay or conflict with the SNM delivery mission;

--established and tested procedures for secure handling of nuclear weapons have been in use for some time.

12. Seizure of enriched uranium during short haul helicopter transit to or from the ultimate origin or destination -- considered difficult because:

--information on aircraft movement can be made very difficult to acquire;

--the aircraft's route to destination may be made deliberately erratic and such a route clearly is not constricted to available roads as in the case of surface transport;

--it is not appropriate to shoot down the aircraft, since it does not assure the terrorists that they will reach the crash site, find the cargo,

and successfully escape before being apprehended (assuming cargo remains intact);

--the aircraft may fly over water in many instances to minimize both the land based ambush opportunities, as well as render difficult unauthorized recovery of enriched uranium if the aircraft went down. Additionally, the potential for crashing in populated areas is minimized;

--aircraft (helicopter) may deliver enriched uranium directly into the destination's secured zone without interim use of even limited surface transport.

Alternative (2)--All Military with Short Haul by Convoy

13. This alternative preserves high security during the long haul transport and at the airport, but sacrifices the extreme flexibility of helicopters for the short haul transport. Relative to commerical surface transport, the military convoy advantages under this alternative are:

--avoidance of population centers associated with large commercial airports;

--information on planned convoys and actual movements are within military structure and hence are highly secure;

--military convoy practices anticipate ambushes and plan accordingly, making use of decoys, advance and rear guard escorts, deliberately erroneous movement information, adequate armed personnel, quick response assistance teams, etc.

Alternative (3)--Commercial Long Haul Cargo Aircraft Using Military Airfields with Military Air Transport for the Short Haul Transit. Alternative (4)--The same as (3) Except Using Military Surface Transport for the Short Haul Transport.

14. These alternatives preserve a measure of security during long haul transport and at the airport, but increase the

possibility that planned movement information will be more widely disseminated and/or that inflight communications will be handled in a less secure manner.

It is anticipated that any commercial aircraft departing fr a military field would be searched for stowaways prior to departure (to avoid hijacking) and would not land at any commercial field before unloading its enriched uranium cargo. Either military air (helicopter) or military convoy would be employed for the short haul transit, each with its attendant security posture.

Alternative (5) Commerical Long Haul Cargo Aircraft Using Military Airfields with Commercial Air or Surface Transport for the Short Haul Transit.

15. This alternative preserves a measure of security during the long haul transport, and at the airport, but greatly increases the possibility of movement information (i.e. air and surface related) being more widely disseminated and/or subject to in-transit monitoring as more commercial interface is necessitated. Also short haul commercial ground or air transit is highly vulnerable for some on all the reasons set forth in our affidavit of 16 June, 1975 and below in paragraph 16.

Concluding Comment

16. Any of the military assisted transportation system alternatives presented are considered more secure than the current commercial practice. The military assisted alternatives to the present commercial air transport cycle for enriched uranium are less vulnerable to terrorist action because of:

(1) [illegible] dissemination of movement information, [illegible] control;

(2) more secure in-transit communications;

(3) personnel with security training and clearances;

(4) appropriate selection of weapons and vehicles

(5) superior reaction capability;

(6) physical remoteness of airfields and facilities;

(7) reliable and highly motivated personnel;

(8) psychological deterrent of a U.S. military protective force.

17. Although the entire affidavit thus far has addressed itself to enriched uranium transport, one comment regarding plutonium transport is worth making. A recent report by Ensign Dwight L. Gertz, USN, in Terrorist Weapons and the Terrorist Threat, "U.S. Naval Institute Proceedings," October, 1975, pp. 113, 114, confirms our conclusion expressed in our 16 June, 1975 affidavit that the terrorist motivation and threat to destroy aircraft is real and the weapons are readily available. In a recent instance, five Arabs rented an apartment in Ostia near Rome, 4 miles from Leonardo da Vinci Airport, directly underneath the North-South runway approach, and were only hours away from initiating a planned attack on a commercial airliner. They were equipped with two Russian made Grail missile launchers and a supply of missiles. In a second recent instance, when authorities were informed that terrorists in the Brussels area had been shipped Grail launchers, hundreds of troops were called out to cordon off airports in Brussels and London. The Grail is combat proven and available to Soviet supplied nations and some "neutral" countries. The missile is heat-seeking. The launcher is hand held and simple to use.

In-transit dispersion of plutonium oxide in many instances would be both a highly effective terrorist act and one of far lesser difficulty than seizure and escape. Hence the threat becomes one of destruction of the aircraft in order to breech the plutonium oxide containers and disperse their contents.

THEODORE T. MASON

ROBERT R. LEAMER

Sworn to before me this
30th day of November, 1975

Contents

Terrorist Weapons and the Terrorist Threat

By Ensign Dwight L. Gertz, U.S. Navy, Patrol Squadron Nine

Dozens of airlines and governments operate the big jets which take off from the airport in a steady stream. The departure of each is punctuated by the roar of engines and the flashing of lights as it roars into the sky. The pilots and passengers can make out only hints of the city that bustles below. Hundreds of thousands of men and women live in the sprawling blocks of apartment buildings underneath the flight path of the ascending aircraft. In one fourth-story apartment, three young men open a closet door and remove something which would remind a movie buff of the bazooka he had seen in a late show war movie. They slide the window open and watch the [illegible] TWA, and [illegible] marked representative of an [illegible] nation. As the marked aircraft arches overhead they take aim at the looming silhouette . . .

The professional naval officer spends a great deal of his time and work eyeing the ships, hardware, and properties of his potential enemies. In recent years, this attention has focused, for U.S. naval officers, on the rapidly improving Soviet Navy. In our concern for this massive challenge, we must guard against a tendency to forget that the goals of war are political and that these goals may be achieved by forces other than the regular military establishments of the combatants.

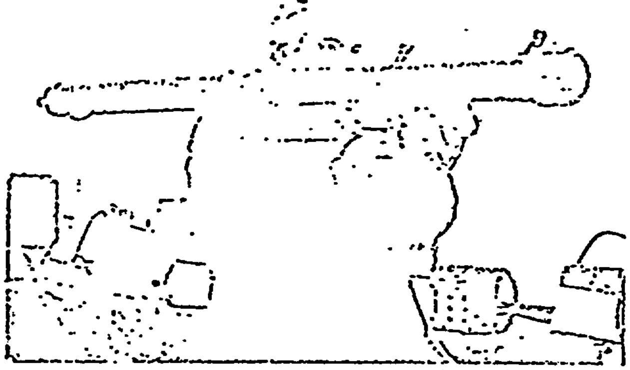
In the gray area between peaceful politics and war live numerous organizations capable of contributing to the achievement of national goals. Although this has never been a secret, it is sometimes forgotten that these organizations are improving their tactics and arms inventories in much the same manner as the world's more conventional mili[illegible]

[illegible] embarrassing loss on an individual company [illegible], or it can be an attack on a [illegible] to the [illegible] alter the political environment in which the conventional [illegible] operates. For this reason, it may be interesting to see what sort of improvements have been made in the terrorist's arsenal.

It would not hopelessly threaten plausibility to discuss the possibility of nuclear weapons or other exotic weaponry falling into the hands of a terrorist group. Both the spy thrillers and [illegible] military analyses have brought this problem to light. Effective weapons do not have to be exotic, however. The conventional arsenals of the major military powers contain plenty of weapons for the terrorist which do not saddle him with the technical or political burdens inherent in the use of nuclear, chemical, or biological weapons.

One such conventional weapon is the Soviet built SA-7 Grail surface-to-air missile. The Grail's launcher tube, which is about the size of a World War II [illegible], fires a missile which [illegible] infrared radiation from [illegible] engines. It is considered comparable to the U.S. built Redeye missile which is about four feet long and [illegible] at supersonic speeds for a considerable distance in pursuit of a low flying airplane.

The simplicity and [illegible] [illegible]



This view demonstrates just how easy it is to take [illegible] with the SA-7.

weapon (POW) make it a prime candidate for deployment with the armed forces of the Soviet Union in a variety of applications. It can be lugged by foot soldiers, mounted on vehicles, or carried on board naval combatants. The technology involved is simple enough to lend itself to mass production.

One reason for heavy Soviet investment in the Grail is that it is a combat-tested system. Use of the Grail against U.S. aircraft in Vietnam was first reported in the spring of 1972. It downed several aircraft at that time and seriously disrupted reconnaissance and helicopter operations, close air support missions, airborne artillery spotting, and other low altitude aviation operations.

U.S. countermeasures, most notably the use of hot flares to mislead the missile's infrared guidance system, held the casualty rate down but also provided the users of the Grail with a laboratory situation in which to test improvements. The October 1973 Arab-Israeli War offered yet another opportunity to test modifications to the system. As a result, [illegible] improved [illegible] cations to one of the many miniaturized radar systems in production, he can be ready for an enemy aircraft before it even comes into view.

The successful record of the Grail has created a demand for the antiaircraft missile in traditionally Soviet-supplied nations and some "neutral" nations. Several countries already have the Grail system, and as the number of countries increases so do the chances that the link will be created in the chain which will lead to terrorist possession of the deadly missile.

From its Soviet origin, the missile might proceed by any number of circuitous routes on its way to a terrorist organization. The missile might begin as part of an arms shipment to a Soviet-supplied nation such as Syria. Syria, like several of its Arab allies, arms and supports the Palestine Liberation Organization (PLO). This "group" includes several factions, each with varying degrees of loyalty to the central command and differing concepts of the most effective means of obtaining Palestinian goals. It is not too difficult to imagine the possibilities by which a radical faction such as the Black September might obtain weapons from more conservative groups in the PLO by [illegible], theft, defection of personnel or sheer mismanagement.

Another possible pipeline exists in [illegible] missiles or directly. The Qadhafi regime in Libya, recently the recipient of large quantities of Soviet military hardware, has been suspected as the source of Grail shipments to terrorists on at least two occasions.

In the first case, Italian police apprehended five young Arabs who had rented an apartment in the seaport city of Ostia, near Rome. The apartment was four miles from Leonardo da Vinci Airport and directly underneath the [illegible] pattern for the North-South runway. Cached in their apartment were two Grail launchers and a supply of missiles. The Italian press reported that the terrorists were only hours away from a planned attack on a commercial airliner.

This demonstration of the [illegible] the Grail threat led to a dramatic reaction by Western European governments when they were informed that Grails had been shipped to terrorists in the Brussels area. Hundreds of troops were required to throw up a special security cordon around airports in Brussels and London. The Grail attack never materialized, but the security measures necessary to protect against it illustrate the type of response required to counter a threat posed by a small group of people equipped with a very small, but effective, weapon.

Different activist groups in nearly every part of the world would [illegible] like to acquire weapons like the Grail whether they planned to employ them or not. Groups in Ireland, Quebec, Black Africa, Asia, and even the United States have resorted, for political reasons, to tactics which emphasize quick, spectacular actions. Spectacular attacks have become recognized as important facets of numerous successful revolutions or "wars of national liberation." The embryonic revolutionary can look to the histories of Israel, Cyprus, Mozambique, Vietnam, and a host of other countries to see places where terrorism helped spawn either a conventional war, or a political victory without large scale military action.

With the respect generated by these successes, terrorist and guerrilla movements are gaining support daily. With money, influential support, and a feeling of [illegible] their new weapon [illegible] in existence in the coming months and years.

Editor's Note: *The views expressed are those of the author and do not necessarily represent the position of the U.S. Department of Defense or the U.S. Government.*

UNITED STATES DISTRICT COURT
SOUTHERN DISTRICT OF NEW YORK

----------X

THE STATE OF NEW YORK,

Plaintiff,

-against-

THE NUCLEAR REGULATORY COMMISSION, et al.,

Defendants.

----------X

AFFIDAVIT IN SUPPORT OF PLAINTIFF'S MOTIONS

STATE OF NEW YORK)
: SS.:
COUNTY OF NEW YORK)

THEODORE T. MASON and ROBERT R. LEAHER, being duly sworn, depose and say:

Introduction

1. The purpose of the affidavit submitted by ourselves dated 16 June, 1975 was to (1) demonstrate that there is a substantial likelihood that a highly motivated group of terrorists could be successful in destroying, or seizing for destructive use SNM in the course of air transport, or related connecting transport, notwithstanding existing safeguard regulations and/or actual practice, and (2) argue that the military has the current safeguard capability to move SNM by surface transport which is significantly less vulnerable to terrorists than commercial air transport and related connecting transport.

2. The purpose of the affidavit submitted by ourselves dated 30 November, 1975 was to augment and refine the affidavit of 16 June, 1975, principally by addressing the question of the transport of uranium as opposed to plutonium and the vulnerability of commercial air transportation systems currently employed industry-wide as compared to a variety of military assisted air transport systems.

Purpose of This Affidavit

3. The purpose of our current affidavit is to restate our positions as outlined in the two above-noted affidavits and, further, to (1) respond to arguments raised in the defendants' answering affidavits insofar as they relate to the vulnerability of transportation alternatives to the threat of terrorist action, (2) provide an assessment of the impact of recent changes in Part 73 of Title 10 of the Code of Federal Regulations, and (3) present recent information contributing to the argument that there exists alternative military SNM transport capability that is less vulnerable to terrorists than the current commercial system.

J. Edlow, Affidavit of January, 1976

4. In paragraph 6. of his affidavit, J. Edlow's reference to "strategic" quantities of SNM misses the point. Apparently Edlow is referring to the fact that CFR Sec. 73.30 sets minimum requirements for NRC licensee shipments of certain amounts of SNM computed by formula, which include 5,000 grams or more of U_{235} enriched to 20 per cent or more, or 2,000 grams or more of plutonium. This regulation fails to cover various significant dangers. For example, any amount of PuO, if used as a dispersant, could cause death and injury. Also, the psychological aspects of SNM seizure are almost equally as real whether the material is low or highly enriched, or in small or large quantities. Any amount of SNM in the hands of a terrorist group would be of great blackmail value and could certainly be used to their advantage. Finally, the factor of multiple thefts must be taken into consideration, with the possible stockpiling of seized SNM.

5. In paragraph 8. Edlow's concurrence with his father's recommendation of "expediting" falls short of accomplishing the task of deterring a determined terrorist group

from successful seizure of SSNM. The statement that "[t]his method and this method only will provide early notice that shipment is astray or diverted" is somewhat after the fact and does not preclude the possibility of diversion by seizure or hijacking. The only reaction to the discovery, or "early notice, that a shipment is diverted, is to notify the NRC or "an appropriate law enforcement authority." This is not security in the prevention sense and unless a more secure mode of transport is provided at the same time, seizure is not prevented and potential for recovery may be meager.

6. As we have indicated in our earlier affidavits, one of the weakest links in the current security chain with respect to prevention of successful terrorist action is the wide dissemination of advance shipment information. "Expediting," as described by Edlow, is directed toward loss through misrouting or casual theft. However, such programmed pre-scheduling of times, routes, mode of transport, etc., provides precise information on shipment movement and unless access to such information is strictly limited, may add to a successful terrorist act. According to Peter N. Skinner, affidavit of April 29, 1975, a minimum of 124 people had knowledge of the details of the arrival of a specific shipment of plutonium before it arrived at J.F. Kennedy Airport from Brussels on February 25, 1975. As can be seen, the question of knowledge prior to shipment is one of the greatest short-comings of the civilian transport mode and one of the advantages of the military mode. Mr. Edlow at paragraph 15 of his affidavit stated categorically that "SSNM cannot be lost or diverted under current regulations . . . ." Such an unqualified statement raises questions about his expert objectivity. We would not categorize the current system as failsafe.

7. In paragraph 11, Adler's reference to the two principal additions to the regulations which "prevents the possibility of loss or misrouting of SSNM while being transported", i.e., "continuous visual surveillance" and "frequent communications," again oversimplifies terrorist and related security problems. Adherence by shippers to these two requirements is intended to provide a degree of protection against misrouting and casual theft, but standing alone, it is inadequate protection against determined terrorist attacks and organized theft.

8. Further, a report prepared for the NRC, released only in December, 1976 (MITRE Technical Report 7022, September, 1975, The Threat To Licensed Nuclear Facilities ["MITRE Report"] para. 3.12.3, page 88) points out the inadequacy of current communications systems, "One weakness in the operation of these private firms involves the communication system and the difficulties incurred during communication blackouts. Vehicles equipped only with a radio-telephone to handle communications to a base station are subject to periodic blackouts due to terrain and atmospheric conditions. Thus, to comply with a necessary two-hour check with headquarters [10 CFR Sec. 73.31] the driver must on occasion leave his vehicle and use a hand-line telephone. During these blackout periods and during the time the driver leaves his truck to use a telephone, the potential for a hijacking or theft is increased."

9. Regarding Adler's statements (Aff. paras. 12-14) concerning delivery by armored truck with armed guards, one should note that the MITRE Report, para. 3.12.4, page 89, points out:

> "It should be noted that armed guards of an interstate shipment have no statutory authority to carry weapons in states other than the one in which they are licensed or across state lines, yet regulations require that they carry weapons in exercising their primary duty of protecting SNM in their custody. These guards are probably often in violation of both state and federal laws."

In other words, the fact that a guard is armed, and in an armored truck, is not necessarily a strong deterrent to terrorist or organized attack; the guard probably knows that he may be in violation of a state or federal statute or law, and, when faced with an armed attack situation, may simply not use the weaponry available for fear of legal, as well as physical, consequences to himself.

10. The MITRE Report confirms and augments the observations and conclusions stated in this and our earlier affidavits regarding the inadequacies of the requirements regarding visual surveillance and communications and armed guards, as outlined by NRC's 10 CFR Part 73, of April, 1975.

Captain James A. Eckols, Affidavit of 28 November, 1975

11. Captain James A. Eckols' affidavit of 28 November, 1975 recounts numerous terrorist acts occuring aboard commercial aircraft and/or associated with commercial air facilities and installations. The MITRE report itemizes no less than 20 commercial aviation-related terrorist acts in the last 6 years. These findings are consistent with the view expressed in our earlier affidavit that successful terrorist action against

commercial aviation is feasible. We believe that transport of SNM in commercial aircraft provides the terrorist with particularly attractive incentive for action.

Assessment of 10 CFR 73 through 73.36 and 73.72 as Amended

12. At paragraph 56 of our affidavit of 16 June 1975 we stated that the regulations as republished on December 20, 1973 were not adequate to prevent or deter a determined group of terrorists from succeeding with their mission. Those regulations were the regulations in effect on March 4, 1974. A review of 10 CFR 73.1 through 73.36 and 73.72 as amended through December 15, 1975, was made to determine whether amendments after March 4, 1974 would substantially alter our assessment of the vulnerability to terrorist action of SNM carried in commercial transport.

13. Our assessment has not changed. The thrust of these Part 73 regulations remains that of protecting against loss, misrouting and casual commercial theft. Assuming full compliance with the letter and spirit of those sections of Part 73 by all responsible parties (an assumption with which we disagree), the amended regulations do not provide for adequate personnel, equipment or procedures to effectively deter and prevent successful terrorist action or organized theft.

14. The requirements of Part 73 which may give the appearance of providing good security are grossly inadequate. Among the inadequacies are:

(1) shipments of less than 5000 grams of SNM are not covered;

(2) though plans for selecting, qualifying and training guards as well as for specially-designed trucks are called for, neither minimum standards or implementation dates are specified;

(3) the number of guards provided for and their arming is minimal;

(4) communication requirements in terms of the frequency of communication in transit as well as the number and capability of communication channels is inadequate.

15. The Mitre report states: (para. 3.12.5, pp. 89-90)

"a. A wide dispartiy (sic) presently exists in the various screening techniques used in selecting guard personnel and in the training they receive.

b. So long as contact is not always possible with vehicles carrying high security material, the present communication system will contain weaknesses. Response capability suffers accordingly.

c. Armored vehicles used to transport SNM currently vary in construction and in the extent of denial and immobilization features.

d. The present regulations do not provide a sound legal basis for the carrying or emergency use of weapons by guards transporting SNM across state lines.

e. Escort vehicles on overnight and long distance hauls frequently have no sleeping accommodations; thus occupants must rest

16. The Mitre report contains extensive corroboration of numerous points made by us in our current and previous affidavits e.g.:

Terrorists -- 54 pages directed to the history, tactics, capabilities, affiliations, motivations and recent activities of terrorists operating throughout the world. (Mitre Report, pp. 1-55)

Transport Industry -- 10 pages devoted to the extensive role of crime, corruption, employee colusion, and international influences in undermining industry services. (Mitre Report, pp. 55-64)

Weapons -- 6 pages citing types of weapons, their availability and recent employment by terrorists. (Mitre Report, pp. 65-70)

Conclusions reached include "terrorism has become commonplace in the Western World and weapons of large caliber and full-automatic fire can be easily procured," and "a veritable army of criminals and hoodlums in this country is waiting and willing to undertake any activity, including murder, if the profit justifies it."

17. It is apparent that the conditions in the commercial transportation industry described by Sam Edlow in the 1969 speech attached to J. Edlow's affidavit as Exhibit 1 have not substantially improved. Sam Edlow characterized the industry as untrustworthy (Exhibit 1, p. 3) and incompetent (Id. p. 9) and the environment in which the industry operates as one of criminality (Id. p. 6). Indeed he felt that the most that might be accomplished by strengthening requirements within the commercial industry might be early detection and recovery, rather than prevention (Id. pp. 6, 10, 11, 12). As pointed out above in paragraphs 5, 6 and 7 current regulations regarding

what Sam Nelson called "expediting" reflect a goal of detection, rather than prevention, of diversion.

18. As to demonstrating that the commercial air system is potentially unsafe from the terrorist threat viewpoint, the recent bombing of LaGuardia Airport is indicative of a level of vulnerability to terrorist activity which far exceeds the vulnerability of military controlled systems, vehicles and installations.

Recent Information

19. We note that in a January 12, 1976, p. 11, col. 1 New York Times article by David Burnham, the following was reported:

> "The commission [NRC], however, is considering recommending the possibility that an existing Defense Department agency such as the Army's special forces be given training to enable it to react to a situation where a terrorist band seizes and holds a nuclear facility for a relatively long period of time."

Moreover, it was stated in the New York Times, January 18, 1976, News Of The Week in Review, p. 3, col. 2:

> "The Federal Nuclear Regulatory Commission is preparing to recommend that Congress consider, instead of creating a special police force to guard nuclear power plants, training Army units to prepare for attacks on the installations by terrorist groups."

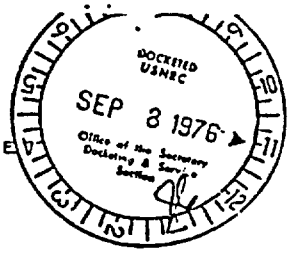
It is clear that even defendant NRC now considers military safeguards against terrorist attack against nuclear facilities and materials to be necessary and desirable.

THEODORE T. MASON

ROBERT R. LEAGUE

Sworn to before me this
20th day of January, 1976

Assistant Attorney General
of the State of New York



LAW OFFICES OF
LEBOEUF, LAMB, LEIBY & MACRAE
1757 N STREET, N.W
WASHINGTON, D.C. 20036
TELEPHONE 202 457-7500
CABLE ADDRESS
LEBWIN, WASHINGTON, D.C.
TELEX 440274

LEON A ALLEN, JR
JOSEPH E BACHELDER III
ERNEST S BALLARD JR
G.S PETER BERGEN ♦
DAVID P BICKS
TAYLOR A BRIGGS
KEITH BROWN
CHARLES N BURGER
WILLIAM O DOUB*♦
JACOB FRIEDLANDER
DONALD J GREENE
JAMES A GREER, II ♦
JOHN L. GROSE ♦
DOUGLAS W HAWES
CARL D HOBELMAN
MICHAEL IOVENKO
JAMES F. JOHNSON, 4TH
RONALD D JONES
LEX K LARSON*♦
GRANT S LEWIS

CAMERON F MACRAE ♦
CAMERON F. MACRAE III ♦
GERARD A MAHER
SHEILA H MARSHALL
JAMES O MCELROY
JAMES P McGRANERY, JR.*♦
L MANNING MUNTZING*♦
JAMES O'HALLEY, JR ♦
J MICHAEL PARISH
PAUL G RUSSELL
HAROLD M SEIDEL
CHARLES P SIFTON
HALCYON G SKINNER
JOSEPH S STRAUSS
SAMUEL H SUGDEN
EUGENE B THOMAS JR*♦
LEONARD M TROSTEN*♦
HARRY H VOIGT*♦
H RICHARD WACHTEL
GERARD P WATSON

RANDALL J LEBOEUF, JR 1929-1975
ADRIAN C LEIBY 1952-1975

OF COUNSEL
ARVIN E UPTON

140 BROADWAY
NEW YORK, N.Y 10005
TELEPHONE 212 269-1100
CABLE ADDRESS
LEBWIN, NEW YORK
TELEX 423416

*RESIDENT PARTNERS WASHINGTON OFFICE
♦ADMITTED TO THE DISTRICT OF COLUMBIA BAR

(96)

DOCKET NUMBER
PROPOSED RULE PR-71,73

August 31, 1976

The Hon. Samuel J. Chilk
Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Re: NUREG-0034 - Draft Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes, NRC Docket No. PR-71, 73 (40 FR 23760)

Dear Mr. Chilk:

On August 26, 1976, the United States Energy Research and Development Administration transmitted to you for inclusion in the above the evidentiary record to date in Docket No. 36325, Radioactive Materials, Special Train Service, Nationwide, now pending before the Interstate Commerce Commission.

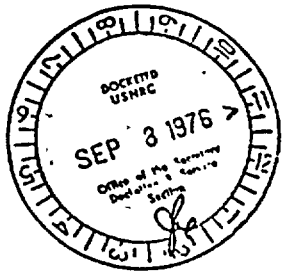
Since August 26th, the shippers other than Federal agencies which are parties to the pending Interstate Commerce Commission proceedings involving the transportation by rail of certain radioactive materials filed comments on a Draft Environmental Impact Statement prepared by the Office of Proceedings of the Interstate Commerce Commission, served July 21, 1976. A copy of those comments is enclosed for consideration by the Nuclear Regulatory Commission in its pending evaluation of the environmental impact of radioactive material shipments.

Very truly yours,

L. Manning Muntzing

Enclosure

Acknowledged by card 9/8/76



Before the

INTERSTATE COMMERCE COMMISSION

Docket Nos. 36307, 36307(Sub. 1),
36307(Sub. 2) and 36307(Sub. 3)

RADIOACTIVE MATERIALS, MISSOURI-KANSAS-TEXAS
RAILROAD COMPANY, ETC.

Docket No. 36312

U.S. ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
v.
THE AKRON, CANTON & YOUNGSTOWN RAILROAD COMPANY, ET AL.

Docket No. 36313

ALLIED-GENERAL NUCLEAR SERVICES, ET AL.
v.
THE AKRON, CANTON & YOUNGSTOWN RAILROAD COMPANY, ET AL.

Docket No. 36330

GPU SERVICE CORPORATION, ET AL.
v.
THE AKRON, CANTON & YOUNGSTOWN RAILROAD COMPANY, ET AL.

Docket No. 36335

COMMONWEALTH EDISON COMPANY, ET AL.
v.
THE AKRON, CANTON & YOUNGSTOWN RAILROAD COMPANY, ET AL.

Docket No. 36336

GENERAL ELECTRIC COMPANY
v.
THE AKRON, CANTON & YOUNGSTOWN RAILROAD COMPANY, ET AL.

Docket No. 36325

RADIOACTIVE MATERIALS, SPECIAL TRAIN SERVICE, NATIONWIDE

Comments of Shippers Other Than Federal Agencies on the Draft Environmental Impact Statement by Office of Proceedings.

Comments on the Draft Environmental Impact Statement prepared by the Office of Proceedings of the Interstate Commerce Commission, served July 21, 1976, ("the Draft EIS") hereby are submitted by the following parties to the above-listed proceedings:

Allied-General Nuclear Services
Carolina Power and Light Company
Commonwealth Edison Company
Duke Power Company
Exxon Nuclear Company, Inc.
General Electric Company
GPU Service Corporation
Houston Lighting & Power Company
Kansas City Power and Light Company
Kansas Gas and Electric Company
Niagara Mohawk Power Corporation
NL Industries, Inc.
Northern States Power Company
Pacific Gas and Electric Company
Pennsylvania Power and Light Company
Philadelphia Electric Company
Power Authority of the State of New York
Public Service Company of Indiana, Inc.
Rochester Gas and Electric Corporation
Southern California Edison Company
Union Electric Company
Vermont Yankee Nuclear Power Corporation
Virginia Electric and Power Company

TABLE OF CONTENTS

SUMMARY OF COMMENTS

I. The Draft EIS contains fundamental errors as shown by the following statement:

> This Impact Statement is generic in nature and can be used by the Commission in any proceeding in which the issue is the health and safety aspects associated with special rather than regular train service.

This threshold statement creates problems throughout the entire Draft EIS. First, it mistakenly assumes that all three types of proceedings currently before the Commission concerning the transportation of radioactive materials involve special versus regular trains when in fact only one of the proceedings involves that issue; and secondly, it states that any action to be taken or not to be taken by the Commission is on the basis of health and safety issues, in spite of the fact that the Congress has given this responsibility to the Nuclear Regulatory Commission (NRC) and the Department of Transportation (DOT).

II. The Commission should rely on the expertise of other governmental agencies in areas in which the Commission is not expert in preparing Environmental Impact Statements. However, the manner in which the Commission has relied on the Draft Environmental Statement of the Nuclear Regulatory Commission in this case is inappropriate. That

approach tends to obscure the issues in these proceedings and could easily lead to misunderstanding of the impact by persons who are not sufficiently familiar with the subject areas to separate what is relevant from what is irrelevant. The manner in which the NRC document is used is inappropriate because that document is directed primarily to radioactive materials other than spent nuclear fuel and wastes and is concerned primarily with modes of transportation other than rail or highway. Further, the document is in draft form subject to change and the Commission does not really know what the final document will be or the conclusions which it will reach. While we do not believe it to be inappropriate to use such information as a base, the Commission's Environmental Affairs Staff, alone or with assistance from experts in the field such as NRC, should rewrite the Environmental Impact Statement using only the relevant portions of that and other documents, supplementing that information where necessary for these proceedings.

III. The properties of the spent nuclear fuel and radioactive wastes should be explained more fully in the Environmental Impact Statement in order to better assess the consequences of normal and accident conditions. The referenced descriptions which are in the Uniform Freight Classification 12 (I.C.C. 8) are primarily for identification purposes only and do not describe characteristics of

the materials essential for evaluating environmental effects.

IV. The containers are designed to meet rigorous standards set by NRC and DOT Regulations for performance under both normal and accident conditions. These regulations are very comprehensive and the containers undergo extensive evaluation to determine that they satisfy the conditions imposed on them. Substantial testimony by Government and other shipper witnesses in these proceedings indicate that these casks can survive any conceivable railroad accident. Conversely, the railroads have made no quantitative analysis of either accident conditions or of the effect of such conditions on these containers.

V. The Draft EIS consideration of alternative modes is inadequate because it does not consider in sufficient detail the impact of those modes of transportation. As described in testimony before the Commission, truck is not a viable mode for spent nuclear fuel and for most wastes because the containers, suited for regular train service, are too heavy to be transported by truck. While small truck casks could be used, they would increase the number of shipments by a factor of seven to ten. This would greatly increase the number of miles traveled, and the number of people involved in handling the cask at the reactor, reprocessing plant, and waste disposal site. It also would require

extensive changes to facilities (many already built) to accommodate the smaller casks.

VI. The definition of special-train service relied on by the Environmental Affairs Staff in the Draft EIS is not part of any published tariff nor is it binding in any manner on the railroads. Under the Special Freight Train Service Tariffs, the railroads could handle a shipment in whatever manner might suit their convenience.

VII. The Environmental Affairs Staff has improperly concluded that special trains will add some increment of safety. These is extensive evidence in the record that the risk of transporting radioactive materials in regular trains is no greater than in special trains.

VIII. The treatment of the commitment of future resources in the Draft EIS is inadequate. This commitment of future resources is dismissed as "infinitesimal in relation to total material resource consumption". The waste of natural resources which would be involved in the mandatory use of special trains is substantial today and will increase greatly in the future as additional reactors are put into service.

IX. The Draft EIS is incomplete because it does not include a balancing of the costs of the actions against the benefits allegedly to be derived therefrom. Based on a

balancing of the cost of the special-train service against the reduction of risks associated with the shipments, the imposition of mandatory special-train service is not justified even if such special-train service could completely eliminate the risks involved in the shipments, which it cannot do. We believe that a meaningful cost-benefit balance must be included as a part of the Final Environmental Impact Statement.

In order to assist the Environmental Affairs Staff in the preparation of an Environmental Impact Statement, detailed comments have been provided in the following sections.

I. Introduction

A. What is before the Commission

The Draft EIS prepared by the Environmental Affairs Staff of ICC Office of Proceedings ("the Staff") lists in the caption seven proceedings now pending which involve the transportation of radioactive materials by rail. It correctly notes that those proceedings are of three different types but it makes no effort to identify the specific environmental issues in each type of proceeding. On the contrary, it states:

> This impact statement is generic in nature, and can be used by the Commission in any proceeding in which the issue is the health and safety effects associated with special rather than regular train service. (Summary Sheet).

Underlying this threshold statement are two fundamental errors: (1) It incorrectly assumes that the environmental issue in all the pending proceedings (and in unidentified future proceedings) relates to the question of special trains versus regular trains. (2) It identifies as the environmental issue (and the only environmental issue) before the Commission in these cases the "health and safety effects associated with the special rather than regular train service" for the carriage of the radioactive materials involved, which is not an issue on which this Commission can properly pass. Moreover, the issues which are presented by each of

the three types of pending proceedings are more complex than the Draft EIS suggests.

One type of pending proceeding ("the Eastern railroads complaint proceedings") involves the refusal of the Eastern railroads to publish tariffs for the carriage of spent nuclear fuel and radioactive waste materials as those materials are defined in Items 80762-A and 80764-A of Uniform Freight Classification 12 (I.C.C. 8).[1/] These proceedings (Dockets 36312, 36313, 36330, 36335 and 36336) were commenced when five individual or groups of complainants, including the United States Energy Research and Development

1/ Item 80762-A defines spent nuclear fuel to be: "Fuel elements, nuclear reactor, irradiated and requiring protection shielding, also irradiated parts or constituents, in containers required by I.C.C. regulations, . . . , shipped to Atomic Energy Commission-owned or licensed sites for chemical reprocessing."

Item 80764-A defines radioactive waste to be: "Waste materials having no reclamation value, requiring protection shielding, or requiring radioactive-materials labeling, marking or placarding, in containers required by I.C.C. regulations, . . . , shipped to Atomic Energy Commission-owned sites or to sites operated by contractors or licensees of the Atomic Energy Commission for disposal."

Due to changes in the law, the references to the regulatory authority of the Interstate Commerce Commission and Atomic Energy Commission should be changed to the Department of Transportation and the Nuclear Regulatory Commission, respectively. References to Atomic Energy Commission-owned or contractor operated sites should be to Energy Research and Development Administration-owned or contractor operated sites.

Administration ("ERDA"), filed complaints against the Eastern railroads under Section 13 of the Interstate Commerce Act.[2] The Commission has consolidated these five proceedings, which present the single issue of the Eastern railroads' status as common carriers of spent nuclear fuel and radioactive waste materials.

A second type of proceeding now before the Commission is Docket 36307, Radioactive Materials, Missouri-Kansas-Texas Railroad Company, 36307(Sub. 1), 36307(Sub. 2) and 36307(Sub. 3) ("the M-K-T proceedings").[3] The M-K-T proceedings involve that single railroad's announcements in the form of published tariff "flag-outs" that it would no longer participate as a common carrier in the rail transportation of spent nuclear fuel, radioactive waste materials, and other radioactive

2/ At page 3, the Draft EIS notes that the initial flag-outs were not protested. Most of these flag-outs occurred in 1962 and were not protested at that time because the nuclear reactor industry had not developed, as it has today, to the stage where reliable common carrier railroad service had become essential. The U.S. Government at that time was the only shipper of spent nuclear fuel and wastes, and it had separate arrangements with the railroads under Section 22. The flag-outs of the Chicago, Rock Island and Pacific Railroad Company and the Soo Line Railroad Company occurred more recently, but were not caught by interested shippers at the time. In fact, the Rock Island flag-out occurred on only five days notice.

3/ The Draft EIS does not mention Sub Nos. 1, 2 and 3 of Docket 36307. We assume this was inadvertent and that it was the intention of the Staff to include those sub-numbered proceedings as well. Sub No. 1 is entitled Empty Containers for Radioactive Materials, Missouri-Kansas-Texas Railroad

materials and containers therefor on which no other railroad has flagged-out. Similar to the Eastern Railroad complaint proceedings, the M-K-T proceedings present the single issue of the M-K-T's status as a common carrier of the involved radioactive materials and containers therefor.[4/]

The third type of pending proceeding is Docket 36325, Radioactive Materials, Special Train Service, Nationwide ("the Southern and Western railroads special train proceeding" or "the special train proceeding"). As accurately described in the Draft EIS (at 3), this proceeding involves the investigation of the Southern and Western railroads' proposal to impose a mandatory special train requirement upon

---

Company and is the M-K-T's flag-out from empty radioactive materials shipping containers if previously used to ship radioactive materials. (Item 20907 of Supplement 5 of Uniform Freight Classification 12 (I.C.C.8)).

Sub No. 2 is entitled Restricted Usage of Containers and Cars, Non-irradiated Cores and is the M-K-T's flag-out from cores or core assemblies or fuel blanket assemblies, nuclear reactor, not irradiated, with non-irradiated fuel or without fuel, in packages when shipments are made in containers and/or cars which have been used previously to ship radioactive material. (Item 30818 of Supplement 8 of the Uniform Freight Classification 12 (I.C.C. 8)).

Sub No. 3 is entitled Restricted Usage of Cars, Radioactive Materials and is the M-K-T's flag-out from radioactive material shipping cars moving on their own wheels unless such cars are empty and have not been used previously to ship radioactive materials. (Item 81295-C of Supplement 10 of the Uniform Freight Classification 12 (I.C.C. 8)).

4/ The Illinois Terminal Railroad, in Supplement 12 of Uniform Freight Classification 12 (I.C.C.8) has published its flag-out from spent nuclear fuel and radioactive wastes to be effective August 31, 1976. On August 26, 1976, the Suspension and Fourth Section Board voted to investigate this matter and assigned it Docket No. 36307(Sub. 4). A number of protests were filed.

all shippers of spent nuclear fuel and radioactive waste materials. The shippers would be required to request and pay for special train service as provided for by the special freight train service tariffs published by the Southern and Western railroads. As also noted in the Draft EIS, the Southern and Western railroads are not seeking to deny their common carrier status for transporting radioactive materials.

B. What the Commission Must Assess

An environmental impact statement generic to all the pending (and possible) Commission proceedings involving the transportation by rail of radioactive materials must consider a range of effects and alternatives. See 42 U.S.C. § 4332(C)(iii). The Draft EIS (at 3) thus is in error when it states that in the three types of pending proceedings ". . . the same basic question is presented, i.e., whether environmental and safety considerations justify the railroad's (sic) proposed requirement that spent nuclear fuel and radioactive waste materials move in special trains as opposed to regular train service." This basic misconception of the issues pervades the entire Draft EIS.

First of all, the issue of regular train service versus special train service is presented directly only in the Southern and Western railroads special train proceeding.

In that proceeding, the Commission, in assessing the environmental ramifications of mandatory special train versus regular train service, must consider a broad spectrum of impacts. For instance, the Commission must consider the immense added costs and the need for additional railroad equipment and other resources that would be irretrievably committed by the requirement of mandatory special trains. In addition, the availability of alternate transport modes must be considered (especially if costs of rail transportation encourage shippers to change modes). An essential element of this evaluation involves taking notice of compliance with the safety regulations established by the Department of Transportation ("DOT") and the Nuclear Regulatory Commission ("NRC") governing the transport of radioactive materials and the fact that such regulations govern the transport of radioactive materials.[5/] Needless to say, through the vehicle of an environmental impact statement, the ICC has not suddenly gained authority which it does not otherwise have to evaluate safety considerations and impose additional regulations.

5/ The correction of deficiencies in such regulations, if there are any, are for the DOT or NRC, the agencies empowered by law with exclusive authority to act in the public interest in the area of safe transportation of radioactive materials. See 10 C.F.R. § 2.802 (1975) and 49 C.F.R. § 170.11 (1975) (providing, respectively, that any person may petition the NRC or the DOT to issue, amend or rescind any regulation).

The M-K-T proceedings and the Eastern railroads complaint proceedings present different issues for the Commission to assess.[6/] These two types of proceedings will not decide what should be the characteristics of the respective railroads' operations in transporting any radioactive materials (such as by special train or otherwise), but will determine only whether those railroads have a common carrier duty to perform those operations. The ICC will be presented with the special train issue therein only if it determines in those proceedings that these railroads are common carriers of the involved radioactive materials and then only if these railroads seek to include a provision for mandatory special train service in their published tariffs[7/] and only if the Commission were to decide that the flag-out railroads must participate in the presently published tariffs. In these cases, the shippers seek a Commission determination that

6/ When the railroads in the Eastern railroads complaint proceedings filed their pleading in Docket 36313 entitled "Motion to Require the Commission to Prepare an Environmental Impact Statement," that motion was opposed by complainants. While the parties hereto are filing these comments, they have not abandoned their position that the railroads have not demonstrated how the mere resolution of the legal issues presented by both the M-K-T proceedings and the Eastern railroads complaint proceeding will constitute a major Federal action significantly affecting the quality of the human environment requiring the preparation of an environmental impact statement.

7/ If the M-K-T is denied the right to flag-out, it would remain subject to the existing tariffs applicable to the Western railroads (unless it deviated therefrom). If the Commission finds that the M-K-T and/or the Eastern railroads are private carriers and therefore that their flag-outs are lawful, the Commission will lose any power to control what the railroads may then do in connection therewith.

the railroads be required to carry the involved radioactive materials as common carriers. The alternative to be assessed is the denial of that relief, in which case there would be no tariff in effect requiring that these materials be shipped in either regular or special trains. In that case, the railroads could refuse altogether to transport these materials. In these two types of proceedings, the Commission should assess the potential impacts of permitting the respective railroads to refuse to serve as common carriers. The Commission should consider what the results of that alternative would be if shippers turned to truck transportation, which in itself might require basic changes in the entire nuclear fuel cycle. (A possible alternative result could be that shippers, in some cases, could arrange for transportation by the railroads in private carriage under conditions and at costs as to which one can only speculate.)

In assessing the environmental impacts in all three types of cases, the Commission needs to examine the extensive record being developed in the pending proceedings. Examination of this record will enable the Commission to reach more informed judgments about complicated issues which (especially in the nuclear field) may be outside the scope of the Commission's usual experience and expertise. Reference to the record also will serve to avoid inconsistencies.

C. What the Interstate Commerce Commission Lacks Authority to Implement

Regardless of the environmental impacts which may be associated with the instant proceedings, the Interstate Commerce Commission must be mindful of the fact that it lacks statutory authority to establish safety standards or to allow any common carrier (by rail or otherwise) to do so. The Federal regulatory framework governing the safe shipment and carriage of radioactive materials has been prescribed by the Congress, which has vested exclusive control over those activities in the Department of Transportation and the Nuclear Regulatory Commission.[8] It is those two agencies and not the ICC or individual carriers which have been given authority to establish regulations and criteria to insure the safety of the public, including carriers and carrier personnel, as to the transportation of radioactive materials.[9]

[8] The Draft EIS (at 6) has incorporated by reference the entirety of Chapter II of the NRC's Draft Environmental Statement on the Transportation of Radioactive Material by Air and Other Modes, NUREG-0034 (March 1976) ("the NRC's DES"). Chapter II of the NRC's DES summarizes the Federal regulations pertaining to the transportation of radioactive materials, and notes that such transportation is regulated by the NRC and the DOT. See NRC DES, pages II-1 to II-2. Some of the undersigned during the course of hearings previously held in the pending proceedings have submitted a memorandum of law which contains a detailed description of the comprehensive safety regulations promulgated by the NRC and the DOT (M-K-T Proceedings Exh. 1; Special Train Service Proceeding Exh. 1).

[9] The memorandum of law referred to, supra, note 8, contains a discussion of the Price-Anderson Act insurance

The railroads' basic position in the three types of proceedings is that, whether or not radioactive materials are tendered to them in compliance with applicable government regulations, they nevertheless may impose their own standards or refuse to transport the materials because they are unwilling to accept whatever risk their transportation might involve. This contention must be put in perspective. Radioactive materials are hazardous and their transportation involves some degree of risk (as does the transportation of other hazardous and even non-hazardous materials), but the hazards of transportation can be (and have been) reduced to acceptable levels.

The Congress could have determined that the risks involved are unacceptable and could have prohibited the development and use of atomic energy for peacetime purposes. After weighing this question very carefully, the Congress determined that the hazards could be controlled and that the benefits from its peacetime use would outweigh the risks involved in the development of a properly controlled nuclear industry. See 42 U.S.C. §§ 2011 et seq. The policy of the

---

policies and indemnity agreements whose "omnibus" features protect rail carriers without payment of premiums by the railroads. For the reasons stated in the memorandum, the ICC may not sanction the railroads' actions on the ground that the availability of the Price-Anderson insurance-indemnity system provided for in the Atomic Energy Act of 1954, as amended, together with other available insurance, might not adequately protect the railroads against risk of loss or liability.

Atomic Energy Act of 1954, as amended, and the Energy Reorganization Act of 1974 is to encourage the development of atomic energy by (1) providing for the steps necessary to reduce the hazards to an acceptable level and (2) making sure that it will not be burdened, in the name of safety, with restrictions on its use having little or no safety value but imposing a financial burden which would limit its development and use. To accomplish this objective, the Atomic Energy Act established a comprehensive system of licensing by the Atomic Energy Commission (now NRC). E.g., see 42 U.S.C. § 2201 (b).

Congress also understood that, if atomic energy were going to be developed, radioactive materials would need to be transported under regulations designed to accomplish the twin objectives of encouraging its development and reducing the hazards connected therewith to acceptable levels.

Section 834 of Title 18 U.S.C. at one time authorized the ICC to formulate regulations for the safe transportation within the United States of explosives and other dangerous articles, including radioactive materials. The authority conferred by the Transportation of Explosives Act, of which 18 U.S.C. § 834 is a part, has since been transferred

to DOT. 49 U.S.C. § 1651 et seq.[10] It is abundantly clear that, since passage of the Department of Transportation Act of 1966, the ICC has had no statutory authority to set transportation safety standards based on the hazardous nature of radioactive materials[11] and that it may not--directly or indirectly--undercut the jurisdiction of the NRC and DOT to establish such standards by allowing common carriers to deviate from the regulations established by those agencies.[12] That is exactly what the railroads would have the ICC do.

10/ The regulatory authority conferred on DOT was expanded and strengthened by the Transportation Safety Act of 1974, 49 U.S.C. § 1801 et seq.

11/ The Interstate Commerce Act, as amended, 49 U.S.C. § 1 et seq. (1970) contains no such authority. It is axiomatic that agency action cannot exceed or extend the scope of its statutory authority. Trenton Chemical Co. v. United States, 201 F.2d 776, 778 (6th Cir. 1953). In other words, the power of an agency "is circumscribed by the authority granted" by Congress. Stark v. Wickard, 321 U.S. 288, 309 (1944). The "authority granted" is determined in turn by the language of the statute and by its "aim and nature." FTC v. Bunte Bros., 312 U.S. 349, 351 (1941).

12/ In Burlington Truck Lines v. United States, 371 U.S. 156 (1962), the Supreme Court warned of the possible dangers when a Commission action intrudes upon another agency's jurisdiction. In examining an ICC case that involved the authority of the National Labor Relations Board, the Court stated:

> Implicit in this analysis is a recognition that if either agency is not careful it may trench upon the other's jurisdiction, and, because of lack of expert competence, contravene the national policy as to transportation or labor relations . . . the Commission must act with a discriminating awareness of the consequences of its action.

371 U.S. at 173, 174. Because the ICC unjustifiably intruded upon the NLRB's jurisdiction, the Court set aside the order of the Commission there at issue.

Congress has not only made it clear that DOT and the NRC are the sole Federal agencies granted statutory jurisdiction to regulate in this area; in both the Atomic Energy Act and the Transportation Safety Act it has specifically legislated that there are to be no varying or inconsistent regulations. Certainly, the railroads' position is at variance with the DOT and NRC requirements.13/ It would make no sense for Congress to have expressed itself in the fashion it has if it had intended to allow carriers of hazardous materials to engage in regulation of the transportation of such materials.14/ Thus, the ICC lacks authority to allow the railroads to establish their own regulatory framework for the transportation of radioactive materials.

* * * *

13/ It should be noted that carriers of hazardous materials have in the past imposed general restrictions on that carriage through the mechanism of a tariff in conformance with DOT requirements. Such restrictions must first be promulgated as regulations by the DOT (or the NRC) before being filed or accepted as tariff material. The nation's railroads have in the past followed this procedure in publising tariffs containing safety requirements. See, e.g., Rule 39 of the Uniform Freight Classification 12 as supplemented: R. M. Graziano's Tariff No. 29, I.C.C. 29. Particular operating restrictions for a limited time period may, of course be imposed in specific circumstances. See 49 C.F.R. § 174.575 and 49 C.F.R. § 1006.1. Cf. Airline Pilots Association, Int'l. v. C.A.B., 516 F.2d 1269, 1275-76 (2d Cir. 1975).

14/ That this is the course which the railroads must follow is pointed out in Kappelmann v. Delta Air Lines, Inc., No. 75-1830 ____F.2d____(D.C. Cir., April 16, 1976). In that

In the following sections, we shall discuss the various matters which the Commission should consider in further assessing the environmental impacts associated with the transportation by rail of radioactive materials. These comments are an attempt to place the issues in focus and to eliminate misconceptions and inaccuracies which may have found their way into the Draft EIS.

---

case, the plaintiffs sought an injunction requiring the defendant airline to give warning to prospective passengers on airplanes carrying a significant amount of radioactive materials. After reviewing at some length the legislative history of the Hazardous Materials Transportation Act, the Court sustained the judgment of the District Court which dismissed the complaint, stating:

> In conclusion, we hold that the trial judge properly invoked the doctrine of primary jurisdiction. The need for uniformity and a tribunal of special competence have been shown. It also appears that rulemaking is a more appropriate means of resolving the problems presented than is adjudication. Therefore, we affirm dismissal of the requests for injunctive relief. If appellants in the future desire to impose their suggested regulations upon any interstate common carrier of this limited category of hazardous materials, they must in the first instance request that the Secretary of Transportation or his delegate undertake a rulemaking procedure under section 105 of the Hazardous Materials Transportation Act, 49 U.S.C. § 1804 (1974 Supp.). Slip op. at 16-17.

Even in Delta Air Lines, Inc. v. Civil Aeronautics Board, Nos. 74-1984, et al. __F.2d__(D.C. Cir. June 22, 1976) where the Court determined that Congress had left in the Civil Aeronautics Board certain residual safety responsibilities, the court stated that the CAB ". . . should defer to the safety expertise of its sister agencies and accept the FAA/DOT position of safety as establishing both an inner and an outer limit in its safety jurisdiction." (Slip op. at 22.)

II. The Draft EIS Has Improperly Relied on a Nuclear Regulatory Commission Draft Environmental Statement Which (1) is Directed Primarily at Radioactive Materials Other than Spent Nuclear Fuel and Wastes and at Transportation Modes Other than Rail, and (2) is Still in Draft Form.

The Draft EIS has incorporated by reference the entirety of Chapters II through VII of the NRC's DES. While some portions of the NRC's draft document are pertinent to the issues before the ICC in these proceedings, most of the material is not pertinent to such issues.

The NRC's DES, which was published in March 1976, originally was prompted by concerns about the air transportation of radioactive materials. Even more to the point, the NRC's DES is addressed to concerns about the transportation through populated areas of radioisotopes and of plutonium and other special nuclear materials.15/ Most of the calculations in the NRC's DES deal with these particular elements in the form of pure elements in a readily dispersible form. Although these elements are found in small measure in spent nuclear fuel and some wastes, they are tightly bound in the fuel matrix or are otherwise diluted and incorporated in a non-dispersible form. For this reason, neither

15/ The term "special nuclear material" ("SNM") is used to describe plutonium, and uranium enriched in the isotope 233 or in the isotope 235. See 42 U.S.C. §§ 2014aa ard 2071.

the tables reproduced in the Draft EIS nor the related discussion sheds light on the issues now before this Commission.

Wholesale inclusion, without explanation, of material from the NRC's DES, by reference or otherwise, obscures the information related to spent nuclear fuel and radioactive wastes and confuses persons who do not have sufficient background in this subject to recognize the distinctions between the commodities and the issues considered in the NRC's DES and those before the Commission in this proceeding. Therefore, to avoid the confusion which has been created by the incorporation by reference of large portions of the NRC's DES, the ICC should edit the NRC's DES and include only those portions which are pertinent to the radioactive materials involved in these proceedings. Further, editing alone will not suffice without additional work and the rewriting of some portions to provide the necessary framework and background for understanding the results set forth in the remaining portions of the NRC's DES. Moreover, even if the NRC's DES were pertinent, it is not final and is subject to change. For that reason alone, caution should be used whenever parts of it are referred to.

In addition to material in the NRC's DES which is relevant herein, detailed information, findings and conclusions about the rail transportation of spent nuclear fuel and radioactive waste materials are set forth in Environmental

Survey of Transportation of Radioactive Materials to and From Nuclear Power Plants, WASH-1238 (December 1972) (hereinafter "WASH-1238"). This document was prepared after a rulemaking by the former Atomic Energy Commission. It since has been supplemented twice by the NRC.[16/] Much of the material in WASH-1238 and its supplements is directly pertinent herein, so the Commission should consider incorporating it or, for clarity, quoting it in the final EIS.

Listed below are comments on the portions of the NRC's DEC which are germane and applicable to the rail transportation of the involved radioactive materials as well as comments pointing out which portions of the NRC's DES are not relevant or applicable. These comments include specific references to WASH-1238 and its supplements, including further information which should be considered:

1. Chapter II of the NRC's DES, while generic, contains much discussion that is neither relevant nor applicable to the present proceedings. The irrelevant discussions include the discussion of exempt quantities, low specific activity ("LSA") materials, Type A packages, shipment by aircraft, and safeguarding of special nuclear material ("SNM").

16/ WASH-1238 is Exhibit 15 in Docket 36325 and Exhibit 2 in Dockets 36307 et al. The first NRC supplement, NUREG-75/038 (April 1975), is Exhibit 16 in Docket 36325 and Exhibit 3 in Docket 36307 et al. The second NRC Supplement, NUREG-0069 (July 1976), has not been introduced formally in these proceedings at this time.

The Draft EIS should include a discussion of only those portions of the regulations applicable to the commodities covered by these proceedings, i.e., spent nuclear fuel and radioactive wastes, the package types for those commodities, and the modes of transport likely to be used, i.e., rail, highway and possibly water. Any discussion of or reference to Section J of the NRC's DES should be eliminated in its entirety because spent nuclear fuel is exempt from such requirements due to the high radiation levels associated with the unshielded spent fuel (NRC's DES page II-32) and radioactive wastes are not considered to contain sufficient SNM to require safeguarding. Guidance as to appropriate discussion of the regulations pertaining to these shipments can be derived from reference to the verified statements and cross-examination of ERDA and Industry Witnesses R. F. Barker, R. W. Peterson and W. E. Potts in Docket No. 36325.

2. Chapter III of the NRC's DES is also mostly generic but needs substantial revision to eliminate the references to radioisotopes and plutonium and to include the properties of spent nuclear fuel and radioactive wastes, the materials of concern in the proceedings now before the ICC. Specifically Table III-7 as now presented is totally inappropriate as it nowhere even mentions spent nuclear fuel and

radioactive wastes. Also, references to plutonium isotopes on page III-24 and in Figure III-2 (page III-26) of the NRC's DES are not applicable to the present proceedings, and thus should be deleted.

3. Only those portions of Chapter IV of the NRC's DES which are applicable to transport of spent nuclear fuel and radioactive wastes should be included in the Draft EIS and the sections now dealing with rail and highway transport should be rewritten to reflect the differences between the handling of spent nuclear fuel and radioactive wastes and the handling of plutonium and small packages of radioisotopes that now permeate the entire discussion. Specifically, the Introduction except for page IV-7 and portions of page IV-11 are pertinent. Section D-1 should be eliminated. The balance of the Chapter is a good outline if rewritten to reflect realistically the shipment of spent nuclear fuel and radioactive wastes. For example, the analysis should be based on a mid-1980's projection (i.e., 200-1000 MWe reactors), the known geographical locations of the reactors, that at least two reprocessing plants will be operating, and the waste disposal sites presently contemplated by ERDA. In addition, the TI in Table IV-7 (page IV-32) is too high and not representative of spent nuclear fuel and waste shipments by rail.

To the extent that the Draft EIS addresses the truck alternative, the radiation exposure penalty to the public from truck transportation should be quantified.

4. To the extent that Chapter V of the NRC's DES is generic with respect to risk analysis, it may be used. For example pages V-1 through V-8 may be used except that the figures on pages V-5, V-6 and V-7 should be modified or replaced with figures appropriate for the transportation modes of interest in the proceedings now before the Commission. In Section B (pages V-8 through V-26) only the Introduction and Subsections B.2 and B.4 are germane to these proceedings and they should be revised to assure that they properly reflect transportation of spent nuclear fuel and radioactive wastes. Section B.6, while good in theory, is not applicable in actual practice because of the extensive differences between the containers for radioisotopes and special nuclear material and those for spent nuclear fuel and radioactive wastes as well as the differences between the contents of such containers. Furthermore, the treatment of probability and consequences of accidents in special train vs. regular train service is totally inadequate for use in these proceedings. The Draft EIS suggests the conclusion that special train service will lead to lower risk. For reasons stated elsewhere in these comments, we believe this is misleading and without soun basis.

In Table V-6 of the NRC's DES (page V-5), Model I release fractions should be deleted from the Draft EIS: Both the spent nuclear fuel and radioactive waste casks referenced in the present proceedings far exceed Model I containment capability assumptions. Furthermore, on page V-26, NRC's DES states that ". . . typical containers are probably better than Model II would indicate." The analysis of consequences of rail accidents in WASH-1238 when updated by Supplement II is a reasonable but conservative estimate (design of the spent fuel casks that have been described in the present proceedings preclude possibility of the accident involving loss of fuel assemblies described on page 87 of WASH-1238). None of the references to other modes of transport and other commodities contained in this Chapter of the NRC's DES should be included in the Draft EIS. Tables V-1, V-2, V-3 and V-5, for example, deal with accidents involving aircraft, trucks, delivery vans and helicopters.

The references to plutonium (pages V-30 through V-53) are irrelevant and misleading in this proceeding. Tables V-16 and V-17 (pages V-52 and V-53) clearly show plutonium to be 98-99+ percent of the total transportation risk with the risk from spent fuel being from negligible to 0.1 percent of the total risk.

The NRC's DES Curie content and dose calculations for spent nuclear fuel in Tables V-8 (page V-35) and V-11 (page V-38) and related latent cancer fatalities (LCF) in Tables V-14 through V-17 (pages V-49 to V-53) appear to have been made prior to the calculations reflected in WASH-1238 Supplement II, which was published in July 1976. Therefore, the calculations in the NRC's DES need to be updated to reflect this later input. Tabulations such as Table V-18 (page V-58) of the NRC's DES should be deleted or revised to reflect spent fuel and wastes only. In general, as stated above, the individual dose calculation in WASH-1238 is more meaningful than the population dose and LCF calculation in the NRC's DES.

5. Applicable portions of the discussion of Alternatives in Chapter VI of the NRC's DES could be included in the ICC statement. Particular attention should be given to the discussion in the NRC's DES of use of special trains for spent nuclear fuel at pages VI-44 to VI-45 which indicates that the use of special trains does not appear to be cost effective for such shipments and that any alleged safety improvement is problematical at best and therefore does not support the ICC Staff's conclusion on special train safety benefits.

Potentially applicable sections of Chapter VI would include Section A Introduction (pages VI-1 through VI-4) provided that numbers are changed to reflect spent nuclear fuel and wastes. In Section B the only applicable parts are B.1-6 (pages VI-27 through VI-30), B.2-3 and B.3-4 (pages VI-41 through VI-45) and B.4 (pages VI-47 through VI-52) and then only if the discussion is limited to those parts applicable to spent nuclear fuel and radioactive wastes. Section C on the radiological effects of the alternatives would need extensive rework to separate the very small effects due to spent nuclear fuel and radioactive wastes from the effects of the other items. For example, only a single line in Table VI-31 through VI-33 is applicable to spent nuclear fuel shipments.

6. Inclusion in the Draft EIS of Chapter VII of the NRC's DES was improper. Security and safeguards requirements are not applicable to spent nuclear fuel and radioactive wastes. The NRC's DES (at page VII-1) specifically notes that there are only two groups of nuclear material that may require safeguarding: (1) certain strategic quantities and types of special nuclear material (SNM) such as highly enriched uranium and plutonium and (2) a few radioisotopes such as cobalt-60. Moreover, spent nuclear fuel is exempt from the safeguarding regulations by 10 C.F.R. 73.6(b), as specifically noted in the NRC's DES at page II-32.

III. A More Complete Description of the Properties and Characteristics of the Radioactive Materials Being Shipped is Needed Than That Provided in the Draft EIS.

The Draft EIS (at 1) references the definition of the principal radioactive materials involved in these proceedings in railroad tariff terminology as set forth in Items 80762-A and 80764-A of the Uniform Freight Classification 12. A more complete technical description is required for a proper assessment of possible environmental effects of both normal transportation and accident conditions.

The principal commodities covered in the proceedings are spent nuclear fuel and four types of radioactive wastes: namely, Low-Level Reactor Wastes, General Trash (GT), Hulls and Non-Fuel-Bearing Components (NFBC) and High-Level Waste (HLW).[17] These materials are described below to assist the ICC in preparing a more complete definition of the commodities before the Commission in these proceedings.

A. Spent Nuclear Fuel

Spent, or irradiated, nuclear fuel as shipped consists of bundles of round zircalloy tubes filled with UO_2

[17] The M-K-T proceedings, as described in greater detail in note 3, supra, also involve both empty containers and cars used previously to ship radioactive materials and cores (cold fuel) or core assemblies. By any reasonable standards, the risk associated with the shipment of these commodities is even less than that associated with spent nuclear fuel or radioactive waste materials.

pellets (fuel pins), which tubes are seal-welded and mechanically bound together into a square assembly. The assemblies range in size from 5 to 9 inches square by 11 to 15 feet long and weigh up to 1,600 pounds. The tubing or fuel pins are retained in the square array by stainless-steel end fittings and intermediate inconel spacer grids.

The UO_2 fuel in the fuel pins consists of pressed and sintered ceramic-like pellets which have a high density (about 10-11 grams/cubic centimeter), high-melting point (about 4,000°F) and which are insoluble in water. The UO_2 is neither flammable nor explosive. Initially, the pellets are enclosed in the fuel-pin tubing in a helium atmosphere; during operation small quantities of fission-product gases such as krypton, iodine and tritium accumulate within the void spaces in the fuel pins. All other fission products remain tightly bound in the fuel pellets. The fuel pins are designed to withstand the external and internal pressures experienced during operation in the reactor. Radiation and heat release from spent nuclear fuel are such that both shielding and heat dissipation are required during handling and shipping.

B. Radioactive Waste Materials

1. Low-Level Reactor Wastes

Low level reactor wastes consist of radioactively contaminated resins and sludges which typically have been

solidified at the reactor by the addition of concrete or other materials such as urea formaldehyde and packaged in 55-gallon steel drums. These wastes are the residues left over from handling large volumes of very slightly contaminated water from such sources as reactor coolant, spent fuel storage pool water, and collection from floor drains in areas where potentially contaminated water could leak. The resins' principal function is to demineralize water and consequently to pick up radioactive minerals and contamination as well. The sludges result from evaporation of large volumes of water, thereby reducing the volume of wastes which must be disposed of. As indicated, these reactor wastes are in solid, immobile form packaged in steel drums with low radioactive material concentrations such that heat dissipation is not a significant problem.

2. General Trash (GT)

GT consists of a variety of dry solids which have become contaminated with radioactive materials in nuclear reactor and spent fuel shipping, handling and reprocessing operations. Such materials include metal, wood, paper, glass, plastics, clothing, shoe covers, wiping cloths or paper and air filters. Prior to shipment these materials will be classified and sorted according to subsequent disposition method

and destination and enclosed in steel drums. Since radiation levels from these materials are generally very low, most drums will not require shielding. Heat generation will be negligible in these shipment.

3. Hulls and Non-Fuel-Bearing Components (NFBC)

Hulls consist of short pieces of zircalloy fuel tubing remaining after chopping the fuel assembly into a dissolver tank and chemically removing the UO_2 fuel. The stainless-steel end fittings and spacer grids also remain with the hulls along with other non-fuel-bearing reactor components which may be received with the spent nuclear fuel. Occasionally, failed process equipment may also be included with the hulls. These materials are contaminated from reactor operation and are handled and enclosed in stainless-steel containers. While radiation from these materials is sufficient to require shielding, heat release is not a problem.

4. High-Level Waste (HLW)

HLW is the residual elements (fission products) remaining after chemically removing the uranium and plutonium from the spent nuclear fuel. The material is removed in liquid solution, but a special process will solidify the material and fix the elements, most likely in borosilicate glass. This glass will then be encapsulated in stainless-steel canisters for handling, shipping and disposal. The

glass is very stable, has a melting point of about 1,800°F and is insoluble in water. The stainless-steel canister provides further containment integrity during handling and shipping. Stainless-steel has a melting point of about 2,600°F). Radiation from the canisters requires shielding and heat release is such that heat dissipation is required during handling and shipping.

IV. Casks Designed to Meet NRC and DOT Regulations Will Withstand Severe Railroad Accidents.

The Draft EIS (at 4) cites the railroads' contention that the stress and accident tests performed on casks for the rail transportation of radioactive materials are not adequate in that the circumstances under which they are tested "do not approach actual railroad operating conditions." This conclusion cannot be supported as testimony in the special train proceeding indicates.[18/]

This section will discuss the regulatory requirements for these casks, the evaluations to which they are subjected, an analysis of how the casks will stand up in a railroad accident environment, and a description of the requirements for operation and maintenance of the casks.

A. The Federal Regulatory Program

1. DOT and NRC Regulations

The regulations of the Nuclear Regulatory Commission (10 CFR Part 71) and the regulations of the Department of Transportation (49 CFR Parts 170-179)[19/] contain stringent standards

---

[18/] For example, see Exhibits 18-20 and 54-59 and associated testimony in the transcripts in Docket 36325.

[19/] An outline of some of the more important DOT regulations is attached as Appendix I.

and requirements designed to assure that the transportation of spend (irradiated) and/or fresh (unirradiated) fuel and radioactive waste from nuclear facilities will be carried out in a safe manner. These regulations, which are applicable to nuclear facility licensees and their carriers, place primary reliance on packaging to assure safety in transport. The regulations rest on the premise that most shipments of radioactive material move in routine commerce on conventional transportation equipment and are subject to the same transportation environment, including accidents, as non-radioactive cargo, and that the conditions of the transportation environment, including the probability of the shipment being involved in an accident, are, for the most part, beyond the shipper's control. The regulations are also premised on the principle that the public is best protected by making certain that only those shipments of radioactive materials which are safe enough to withstand transportation hazards are delivered to a carrier for transport.

The basic objectives of the regulations are to protect employees, transport workers and the public from external radiation in the transport of radioactive material under normal conditions and to assure that the packaging for radioactive materials is designed and constructed so that, under both normal and accident conditions, the radioactive material is unlikely

to be released from the packaging, or, if the container is not designed to withstand accidents, the contents are so limited in quantity as to preclude a significant safety problem if released. In accordance with these objectives, the regulations contain stringent standards and requirements to assure that radioactive material packages are designed and constructed to maintain, over their useful lifetime, the necessary design integrity (considering the type, form and quantity of radioactive contents) to prevent a significant loss of radioactive material from a package or a significant increase in radiation levels from a package, to assure nuclear criticality safety and to provide adequate heat removal. The regulations also place limitations on radiation levels on the outside of packages of radioactive material and include stowage and segregation provisions.

Irradiated fuel and nuclear waste must be shipped in Type B packaging, that is packaging which must be designed to withstand normal transport conditions without any impairment of normal operating capability and without loss of contents, increased radiation (levels) or reduction of heat dissipation capability and to suffer not more than the specified loss of contents, or increased radiation levels if subjected to the sequence of severe accident damage test conditions specified in 10 CFR Part 71. Those test conditions make up the design basis

accident for Type B packages, i.e., package designs which meet the criteria under these test conditions are considered by the NRC and the DOT to provide completely adequate protection to the public and operating personnel in transportation accidents (as well as under normal operating conditions).

2. Licensing of Packaging

Before these materials can be shipped, a "Certificate of Compliance" (COC) must first be obtained from the NRC on the packaging design and operational plans and then a license must be obtained from the NRC authorizing the user to deliver the material specified in the COC to a carrier for transport in the packaging. The NRC, through its office of Inspection and Enforcement, audits packaging manufacturers and users (licensees) to assure compliance with its regulations and with the specific conditions in the COC covering the packaging.

The COC is obtained only after an extremely rigorous and thorough safety analysis by the Applicant and independently by the NRC to assure that the packaging will withstand both normal and accident conditions in the transportation environment without creating radiological hazards which could cause death, injury, extensive property damage or unacceptable environmental impact. When necessary, analysis is augmented by testing of systems and components to achieve the desired level of confidence in the packaging design. In the case of the packaging to be used for shipping spent nuclear fuel, the

safety analysis proceeding between the NRC and the Applicant has taken many years for each packaging design and has resulted in thousands of pages of documentation. This indicates the degree to which the applicant and the NRC consider protection of the carriers and the public in general in transportation of these materials. At present, only six designs of casks have been approved by NRC for shipment of commercial irradiated nuclear fuel. The model numbers of those approved for shipment primarily by rail are the IF 300 (General Electric Company) and NLI 10/24 (NL Industries, Inc.). The packaging for radioactive wastes will undergo the same rigorous safety analysis prior to its approval for use.

There are many detailed requirements in the NRC and DOT regulations on structural integrity and containment. However, the principal requirement is that it must be demonstrated by analysis and/or testing that adequate containment is assured under both normal and accident conditions.

To satisfy normal condition requirements, the packaging must withstand continuous exposure, i.e., equilibrium conditions, to direct sunlight at an ambient temperature of 130°F in still air and continuous exposure to an ambient temperature of -40° in the shade in still air. See 10 CFR Part 71, Appendix A (1975). It must also withstand rough handling which is typified by a one-foot free-fall on an unyielding surface in an

attitude that produces maximum damage or other conditions representative of rough handling, and vibrations normally incident to the mode of transport.

Under these normal conditions (which are really fairly severe abnormal conditions) no release of radioactive material or coolant is allowed and shielding effectiveness must not be reduced. In addition, contamination of liquid or gaseous primary coolants must not exceed certain specified low levels.

Accident condition requirements are much more severe. The packaging must withstand very severe impact, puncture, fire and immersion in water test criteria. Impact is defined as a 30 foot free-fall onto an unyielding surface in an attitude that produces maximum damage. Puncture is represented by a 40 inch free-fall onto a 6 inch diameter pin, mounted on an unyielding surface; at an attitude to produce maximum damage. Fire resistance requirements are that the package withstand an exposure to an all-enveloping thermal radiating environment at 1475°F for 30 minutes and no external cooling for 3 hours thereafter. The package must also withstand immersion in water. The regulations require sequential application of the above conditions. The cask must be able to withstand immersion in water after it has been subjected successively to impact, puncture and fire conditions as described above.

Under these accident conditions, no release of radioactive material is allowed except for very small quantities of gases and contaminated coolant with the quantities allowed to be released based on the form and relative biological hazard of each isotope. In addition, shielding effectiveness must be maintained such that radiation levels do not exceed one REM/HR at three feet from the package.

While the packaging and transportation of spent fuel has been treated in great depth by NRC, ERDA and by the industry in the present proceedings, it has not been possible (nor necessary) to treat radioactive wastes in the same manner. This is primarily because detailed primary containment specifications and repository acceptance criteria have not been finalized by ERDA. Accordingly no final packaging designs have been developed and manufactured nor will there be any need to transport these materials for 2-3 years. However, we can nevertheless conclude at this time that the risks related to radioactive waste transportation will be even less than for spent fuel for the following reasons:

1. Fissile content is low.
2. Radiation levels from the wastes are lower because of smaller quantities of radioactive materials and longer delay times in the case of fission products from spent fuel. Accordingly, shielding requirements are less.

3. Heat release from the wastes is lower in the case of HLW and insignificant in the case of HULLS, NFBC and GT.

3. Operations and Maintenance

The NRC requires detailed procedures for initial acceptance testing, loading and unloading, routine testing prior to each shipment and periodic retesting of the packaging. These procedures are designed to assure that the packaging meets performance requirements initially, is loaded and prepared for shipment properly, and is adequately maintained. In particular, the packaging is inspected for any signs of damage, closure seals and valves are inspected, presence of reactivity control materials required in the design is confirmed and leak tightness is checked prior to each shipment. In addition, internal pressure and temperature are measured to assure that design limits are not exceeded and coolant activity and external radiation and contamination levels are measured to assure compliance with regulatory limits prior to each shipment.

B. Analysis of the Casks in a Railroad Accident Environment.

The environment existing during a rail accident is at best complex and one might ask how well the qualification tests contained in 10 CFR Part 71 duplicate those conditions. The tests are not intended to duplicate the environment, but rather

to produce damage equivalent to the most extreme and unlikely accidents. Because of unfamiliarity with the behaviour of structures during impact, misconceptions exist about the severity of the 30-foot drop test. It is important to emphasize, in the description of that test, that the cask must impact upon an "essentially unyielding target." An "essentially unyielding target" is defined by the International Atomic Energy Agency in Safety Series No. 6, Para. 708, as a "flat, horizontal surface of such a character that any increase in its resistance to displacement or deformation upon impact by the speciman would not significantly increase the damage to the speciman." In practice that has come to mean a target with a total mass at least ten times that of the object being tested with an upper surface covered by a minimum of 2 inches of armor plate. In addition, the concrete mass must be thick enough to prevent failure of the concrete upon impact. Tests conducted at Sandia Laboratories in New Mexico demonstrate that concrete alone is not an unyielding target and the use of concrete only for a target in contrast to steel covered concrete greatly will reduce the effective damage to the package.

In a test to evaluate the damage to packages which impact on realistic surfaces, as contrasted to the specified test surface, a 16,500 pound cask was dropped 2,000 feet onto undisturbed soil at a location just east of Albuquerque, New Mexico. The soil in this particular locality is

predominantly clay that has been undisturbed for a minimum of 25,000 years covered by a thin layer of very fine dust. Attempts to use a shovel on such soil are totally fruitless. The cask that was dropped landed upright on the soil and penetrated a distance of about 4 feet. The result of this test was essentially zero damage to the cask which was still serviceable, although there was some minor compaction of the lead. (Compaction of the lead occurs when the lead deforms to fill numerous small voids between the lead and the steel shells of the cask as the result of the large forces exerted on the lead during impact.) The result of this compaction was that the lead inside the cask moved away from the upper, flat surfaces of the cask by a distance of approximately 1/8 inch.

An identical cask dropped 30 feet onto an unyielding surface at Oak Ridge, Tennessee, showed more damage, including some weld damage, bulging, and lead compaction.[20/] While the cask dropped 30 feet onto an unyielding surface at Oak Ridge was not longer serviceable, it should be noted that the cask itself was not breached. Had it contained radioactive material, no material would have escaped. Had an accident causing damage of this severity occurred in actual use, there would have been no exposure of the source and thus no harmful radiation exposure to those people in the vicinity of this cask.

20/ Note that this was an obsolete cask. Modern designs are stronger.

To understand why the 30-foot drop test is so severe, it is necessary first to understand (1) that what produces damage is peak deceleration and (2) that peak deceleration is a function of both the velocity of the object and the hardness of the target. In the 2,000-foot drop test, the shipping cask hit the ground at a velocity of 325 ft/sec (about 220 MPH) giving it a kinetic energy of about 2.71×10^7 foot-pounds. In contrast, when the same container was dropped on an "essentially unyielding surface," from a distance of 30 feet the kinetic energy of the cask was only 4.97×10^5 foot pounds. In other words, the cask dropped 2,000 feet had about 54 times the kinetic energy of the one dropped 30 feet. Since the cask with the lower kinetic energy suffered the most damage, damage must be due to a factor other than kinetic energy. That factor is peak deceleration.

It is difficult, in simple terms, to calculate peak deceleration but we can talk about average deceleration and the two are closely related. The average deceleration of an object impacting a surface in such a way as to absorb all of the kinetic energy involved, is equivalent to the square of the velocity divided by twice the stopping distance. Again, considering the two cask tests, the 2,000-foot drop onto undisturbed soil stopped the cask in about 50 inches while the elastic deformation (and thus the stopping distance) of the

"essentially unyielding target" in the second case was estimated to be about 1/10 of an inch. Thus, the calculated average deceleration for the 2,000-foot drop is 12,675 ft/sec^2 while the 30-foot drop resulted in an average deceleration of 116,160 ft/sec^2 or an average deceleration about nine times as great. Since it is the force exerted on the cask to produce the deceleration that causes the damage, there was more damage from a 30-foot drop onto an unyielding target that the 2,000-foot drop onto soil. Equating the 30-foot drop onto an "essentially unyielding surface" to the impact of a cask involved in an 80 mph railroad accident, the average decelerations would be equal only if the stopping distance in the accident case were about one-third of an inch' To stop in such a short distance is obviously incredible.

For realistic targets such as bridge abutments, natural rock outcroppings, etc., the fact that the surfaces of these targets are not flat, but have projections on them, can strongly influence the amount of damage caused. During the impact, these projections are loaded to the point of their failure, thus slowing down the container before its major impact with the surface. Such progressive failure of a target reduces the peak deceleration forces involved and, therefore, reduces the damage experienced by the container. In the railroad environment, there are simply no unyielding surfaces available. Even granite outcroppings do not approach the

unyielding nature of the targets used in these tests. Limestones and sandstones are even further from unyielding.

Equally as important is the fact that railroad equipment does not present an "essentially unyielding surface" for the transmission of energy during accident impacts. While it is true that a moving railroad train has enormous kinetic energy, that fact must be put into perspective. The enormous kinetic energy of a train traveling at high speed is absorbed without damage in the normal process of stopping the train by using its brakes. It is only when the forces causing the deceleration exceed the structural strength of the objects involved that damage begins to occur. An impact between a shipping cask and a locomotive will not produce significantly more damage to the fuel shipping cask if the locomotive is trailing a string of cars than if the locomotive alone hits the cask. One reason, for this is that the train is made up of loosely connected units, and not all of that kinetic energy can be brought to bear on a single point. Another reason is that the kinetic energy is dissipated by the crushing of the locomotive structure at the point of impact, by collapse of the column of cars, and by crushing of the softer structures within the train (i.e., railcars and crushable containers).

With respect to puncture or piercing conditions, the force developed in the design condition by the 6 inch diameter

steel pin varies from 1.5 to 4 million pounds. Again, there are no objects in the rail transportation environment of such small cross-sectional area and high strength that are so rigidly supported that they would not buckle or otherwise fail rather than inflict significant damage on the cask.

In the case of fire, initial flame temperatures of 2000°F are not uncommon in fires involving flammable liquids or gases and it is conceivable that sufficient quantities of such liquids in the general area of an accident could burn for more than one-half hour. However, the temperatures quickly fall to approximately 1600 degrees Fahrenheit because of the fuel-rich mixture in this type of all-enveloping fire. The overall average temperatures would be approximately 1500 degrees Fahrenheit which is quite close to design requirements. It is hard to conceive of a set of conditions in which the cask would be suspended in and completely enveloped by flames at higher temperatures such that the heat input to the cask would exceed that from the design condition. More realistically, the cask would still be on the car along the right-of-way and there would not be sufficient flammable liquids in the area of the car beneath or around the cask to fully envelop the cask in a fire. Even if the cask did come to rest in a large depressed area filled with a flammable liquid, the fully developed fire would be well above the cask and the area under and around the cask would be relatively cooler.

While the torching condition from a ruptured LPG tank car could create higher localized heat input, the overall effect on the cask would be no more severe than the all-enveloping test required by the regulations.

With respect to closure head and seal design, the NRC regulations, which require no release under normal conditions and allows release of only gases or coolants under accident conditions, results in very high integrity closure designs. In spent nuclear fuel casks, special metal seals are used and bolting arrangements can withstand internal pressure up to 7,000 psi before failure. The force required to fail the bolts and dislodge the closure head in these casks in 4 to 8 million pounds. It is inconveivable that such internal pressures or forces can be developed and cause release of spent nuclear fuel from the cask. Because casks for hulls, non-fuel-bearing components (NFBC), and high-level wastes will be designed to the same requirements, the same degree of containment integrity applies to containers for those wastes also.

The requirement that the containers withstand immersion in at least three feet of water for not less than eight hours following the other accident requirements is intended to assure that fissile material packaging (to which it is limited) would remain subcritical, even if subjected to immersion in water following the drop, puncture and fire tests. The test

is not intended as a requirement that the containers withstand external pressure. As a practical matter, the spent nuclear fuel and most radioactive waste containers have capabilities for withstanding external pressure that far exceed those which would be imposed by the tests because of the materials of construction and other design requirements. For example, spent fuel casks are routinely loaded and unloaded under approximately fifty feet of water. With the design features that are necessary to meet other requirements, the casks will withstand pressures several times those indicated by this test.

Thus it is clear that the casks can withstand any conceivable railroad accident. Because there are no "unyielding surfaces" in the real world, the stress and accident tests subject the casks to greater forces than they would receive in rail accidents. These tests are thus more than adequate to assure safety in transporting these materials.

V. The Diversion of Rail Shipments to Alternate Transport Modes is Impracticable, Would be Inefficient, and Would Involve an Unwise Use of Resources.

While the Draft EIS lists modal shifts as an alternative, it is not covered adequately either in the statement or by reference to the NRC's DES.

A. The Radioactive Materials Involved

1. Spent Nuclear Fuel and High-Level Waste

Due to the size and weight of shipping casks, rail has been recognized as a necessary mode of transportation for spent nuclear fuel and radioactive waste materials. Trucks cannot carry most of the containers required for these materials in the volumes necessary in the near future. Therefore, they must be shipped by rail. To ship the equivalent amount of spent nuclear fuel or high-level wastes contained in one rail cask by truck would require 7 to 10 cask loads. This results in an added expense not only in transportation but also in reactor and reprocessing facility operations. In addition, the overall transportation risk to the public would be increased because of the number of shipments and the increased miles traveled. For these reasons, large spent fuel casks have been developed which can be transported only by rail.

A commercial reprocessing plant is already located in Barnwell, South Carolina, and one is planned for Tennessee. The most cost-beneficial safe means of transportation must be available to move spent fuel from the reactor to these reprocessing plants, and that method in most instances is regular train service.

To design a reactor or reprocessing plant, it is necessary to know well in advance during the conceptual design stage, and certainly at the detail design stage, what containers and shipping casks are to be shipped and/or received and at what rate. This planning concerning transporation is started at least eight to ten years prior to the start-up of a plant. From the beginning, this planning has relied on the availability of economic rail transportation. This is necessary to get the cask and container shipping and receiving rate up to a plant throughput rate that is economically justifiable.

Reprocessing facilities today have been built to receive casks shipped primarily by rail. They cannot handle the additional number of smaller casks that would result from the truck transport. It would require a larger receiving and handling area along with more basins at the reprocessing plant. In fact, the AGNS commercial reprocessing facility at Barnwell, South Carolina, was designed and built according to such requirements for shipping spent fuel and high-level wastes

primarily by rail and the new, large reprocessing plant under consideration by Exxon Nuclear Company, Inc. for possible construction in Tennessee likewise plans to rely primarily on rail shipments.

A large reprocessing plant, like the Barnwell Plant in South Carolina or the Exxon facility, will have a reprocessing capacity of about 1,500 metric tons per year. They each will provide reprocessing services for services for 50 to 60 light water reactors, distributed over large areas of the United States. The investment to build such a facility would be about $1 billion today.

Insight into the amount of needed transportation can be obtained by considering the number of shipments needed per year for a 1,000 megawatt reactor. The 1,000 megawatt reactor is typical of reactors being built today and is used in calculations to obtain a magnitude of the shipping required per reactor year. At the ratio of 7 to 10 truck shipments to equal one rail shipment, about 60 shipments per year of spent fuel are required if trucks are used and about 6 to 9 shipments per year if rail is used. The ratio would vary slightly depending on the fuel elements shipped.

At a large reprocessing plant, this ratio becomes critical. For illustration, if truck shipments were used exclusively at a plant such as the AGNS Barnwell facility,

over 3,000 shipments per year, or 10 a day, of a 25-ton truck cask must be received and a corresponding number of empty casks shipped out. If the larger rail casks are used, those shipments drop to a reasonable number of only about 300 per year or 1 per day.

When waste shipments are added, this aggravates the already substantial logistic problem in moving these materials, adding to the larger cost of transportation containers, facilities and manpower. In addition, denial of rail service for transportation of spent fuel and wastes could jeopardize nuclear energy as a strong energy option for the United States.

Water transportation is an alternative that may be employed in the 1980's in connection with rail service. There are 115 reactors on navigable waters, but present and planned reprocessing plants will require rail service to get from the water to the reprocessing plant. There are isolated cases where neither rail nor water service is available and intermodal (truck-to-rail here) transportation will be required. Again, the rail option must be available for intermodal service. Because of the container size and weight, air transport is not an alternative.

2. Low-Level Waste

The only radioactive waste now moving is low-level waste in steel drums. ERDA's rail shipments of this commodity

even now exceed its spent nuclear fuel shipments. Truck transportation of low-level waste possibly could be an alternative. However, the truck alternative may not be as efficient in many cases, and should not be forced on the shipper by the unneeded and costly requirement of special trains for these shipments.

For example, Mr. Davidson of the Tennessee Valley Authority ("TVA") testified in Docket No. 36325 that by 1986, TVA alone could require shipment of 500 train car loads per year of these wastes. If these same wastes were shipped by truck, the number of shipments and the miles traveled would increase by a factor of two to three. Thus it is apparent that while truck shipments can and will be used for some shipments of these materials, there is substantial impact if the nuclear industry and the Nation should have either to rely exclusively on truck transport or to pay an exorbitant premium to use rail shipment. This is especially so when TVA's projections are extrapolated to include the entire Nation's requirements for low-level waste shipments.

B. The Waste of Resources

The use of truck transport rather than regular freight train service would be a waste of our natural resources. If all spent fuel traffic were shifted to truck, the diesel fuel waste compared to regular train service would be 10 million gallons

per year. Handling radioactive waste in this manner could be expected to double these estimates of diesel fuel waste. Regardless of the percentage of our total national consumption which these numbers represent, it is an unnecessary waste of energy at a time when energy and fuel supplies need to be conserved. Even in the context of our "total natural resource consumption," this can hardly be dismissed as "infinitesimal." Cf. Draft EIS at p. 19.

VI. The Elements of Special Train Service As Described in the Draft EIS Are Not Contained in Any Tariff.

The Draft EIS (at 4) lists what it finds to be the "major elements" of the special train service which the railroads are demanding as a mandatory requirement for transporting spent nuclear fuel and radioactive wastes. These "major elements" are described as follows:

1. "The carrier provides an engine, crew, and caboose. . . .;

2. "No other type of freight is handled. . .;

3. "Special trains generally operate on a thru-service basis, by-passing freight yards and avoiding normal switching between railroads;

4. "Special train shipments have the flexibility to be routed around major population centers where feasible;

5. "When a train handling one of these shipments passes or is passed by another train, one train must come to a standstill while the other moves past; and

6. "Special train speeds are restricted to 35 miles per hour."

The provision in Supplement 3 of the Uniform Freight Classification 12, which imposed special train service on spent nuclear fuel and radioactive wastes, does not mention these "major elements". All it says is: "NOTE 5. - Ratings are applicable only on shipments moving in special freight

train service subject to provisions of applicable Special Freight Train Service Tariffs." 21/

From this, it should be expected that the "major elements" of the special train service would be set forth in the Special Freight Train Service Tariffs referred to, but such is not the case. None of the "major elements" of special train service is contained in the railroads' Special Freight Train Service Tariffs, even though these Tariffs state the charges the railroads will exact for providing that service. These Tariffs say only that the railroads will furnish special train service "upon request" and "at their convenience". They define special train service only to mean "a train which is operated on an expedited schedule at a charge in addition to the applicable class or commodity rates". 22/

These Tariffs do not articulate or require any of the "major elements" of special train service as described in the Draft EIS. For the Draft EIS to find that these "major

21/ This is Item 80769.5 of Supplement 3 to Uniform Freight Classification 12, ICC 8. It is quoted at Tr. 282-3 of the proceedings in Docket 36325.

22/ Southern Freight Tariff Bureau Tariff S-842-N, ICC S-1155, Item 120, 130; Western Railroads Freight Tariff 1-B, Items 120, 130. These Tariffs are attached to the Verified Statement of Walter E. Potts, which is Exhibit 24 in Docket 36325. Items 120 and 130 of these Tariffs are also quoted at Tr. 281-282 in Docket 36325. It should be mentioned that there is no definition of "expedited schedule" and no penalty if the scheduling is not expedited. Any implied assurance of expedited service is cancelled out by the provision that the trains will be operated at the carrier's convenience.

elements" will characterize the railroads' special train service is to write on sand that may shift in many different directions depending on the railroads' "convenience" in particular situations. Yet, in an effort to save themselves from a violation of Section 6 of the Interstate Commerce Act, the railroads have made clear in Docket 36325 that their special train service for spent nuclear fuel and radioactive wastes will be furnished only under those Tariffs.[23] In fact, the railroads have sought to characterize such "major elements" as being merely operating practices or rules that normally are not published and that railroads are free to add to, subtract from, or totally ignore based on their sole discretion without any right of the shipper to object thereto.

Thus, those Tariffs are the railroads' mode of fixing the charges the shippers must pay for special trains, but they do not specify the service which the shippers will receive for their money. Shippers must therefore be content with what, in particular circumstances, proves to be at the

---

23/ This was stated by Counsel Phillips: "Your Honor, this proceeding is only concerned with special trains as defined in the tariff. If a particular road calls something else a special train, they cannot charge under the special train tariff, for it is against the law for any railroad to charge, except what is provided in the tariff. . . ." (Tr. 235).

The trouble is that these Tariffs are evidently designed to accomodate shipper request for special service and carrier and shipper joint agreement on the particulars of that service. The railroads are here putting those Tariffs to a purpose--mandatory, unilaterally defined special train service--for which they obviously were not intended and are not appropriate.

railroads' "convenience" in accordance with those Tariffs. That this is so is demonstrated on the record in Docket 36325 (see the testimony of the railroads' witnesses at Tr. 368 and 472 in that proceeding). That the shippers also are not likely to receive "expedited scheduling"--this being the one characteristic of special train service that is stated in the Tariffs--is also indicated in that record (see e.g., the railroad witnesses' testimony at Tr. 107 and 481 explaining when it will be the "special train" that will stop when it meets another passing train).

Doubt whether the "major elements" of special train service will actually materialize is increased by the ignorance which the railroads' witnesses displayed in Docket 36325 concerning the contents of the Special Freight Train Service Tariffs. Their testimony reveals their appreciation of special trains only in terms of operating practice, instructions to trainment, and the like, not derived from or confined by any tariff specification of the service (see, e.g., Tr. 106, 130-1, 150-1, 233, 302-3, 356, 425, 471).

For these reasons, the Draft EIS should be revised to state that there is no assurance that the described "major elements" of special train service (other than added charges) would in fact be provided in view of their absence from any publication in any tariff.

VII. There is no Substantial Evidence that Special Trains Add Any Increment of Safety.

The Draft EIS concludes that, because the accident probability is so small, the associated environmental impacts are not significant but that speical trains would provide "a small safety dividend" because they have an incrementally lower accident potential. The Draft EIS makes a number of assumptions regarding the nature of special train service and safety advantages of special trains, but no authority is cited for any of these assumptions. Apparently they are based, to a large extent, on the self-serving position paper issued by the Association of American Railroads referred to at footnote 7 of page 6 of the Draft EIS.

The nature of special train service and the relative safety of a cask car being transported in regular and special train service have been the subject of extensive testimony in Docket 36325. The picture there developed differs in essential respects from the unsupported assumptions in the Draft EIS.24/

24/ Reference is made specifically to Exhibits 27, 28, 60 and 61; the cross-examination of witnesses Garrick, Sperry, Eldridge and Power at Tr. 794 et seq., Tr. 1204 et seq., 1241 et seq., and 1131 et seq.; and the portion of the cross-examination of witness German at Tr. 140-152. It is also noted that, in response to a request by the attorney for the Southern Railway Company (Tr. 1138-1143), Westinghouse Electric Corporation has supplied data which shows that accidents have occurred in at least 20 Westinghouse shipments handled in special train service for the period August 1, 1970 to April 30, 1976.

Page 4 of the Draft EIS lists what the authors assume to be "the major elements of special train service". These are listed below, together with our comments:

1. The carrier provides an engine, crew and caboose. The radioactive material is contained in a 100-ton cask loaded on a flat car between the engine and the caboose.

This statement is reasonably accurate. However, where the movement is over more than one line, each carrier provides an engine, caboose and crew. It is possible, moreover, for more than one cask car to be carried in a special train.

2. No other type of freight is handled on these special trains, in order to prevent contamination of other freight being transported with the radioactive material. It is also possible that highly explosive or other hazardous materials, if transported with radioactive materials, might cause additional safety hazards.

It may be true that no other type of freight would be handled on the special trains, but the statement that the purpose is "in order to prevent contamination of other freight being transported with the radioactive material" has no basis ordinarily.[25/] The reason that other materials ordinarily would not be handled in the special trains is that there would be no occasion for doing so. If some other material were to

---

25/The Special Train Service Tariffs permit the railroads to add cars of other commodities.

be transported from the same origin to the same destination at the same time, there would be no reason for not sending it by the special train. Not even the railroads have argued that the prevention of contamination of other freight is the purpose or effect of using special trains.

The suggestion in the last sentence that special trains are safer because highly explosive or other hazardous materials are not transported in them with the cars of radioactive materials, likewise has no foundation. In regular trains, highly explosive or other hazardous materials are separated from cars of radioactive materials. DOT regulations prohibit the carrying of cars of explosives or other hazardous materials in close proximity to such cars in regular train service.

3. Special trains generally operate on a thru-service basis, by-passing freight yards and avoiding normal switching between railroads.

There is no basis for this statement. Special trains are operated at the convenience of the railroads. They must, moreover, change crews at regular terminal change points and locomotives and cabooses must be serviced where fuel, water, etc., are available. Further, much additional switching of these special trains could be required because of the speed or passing restrictions the railroads have indicated may be imposed on the special trains.

4. Special train shipments have the flexibility to be routed around major population centers where feasible.

Regular trains can be, and frequently are, routed around major population centers to avoid congested terminal areas. There is no reason to assume that special trains would avoid major population centers any more than regular trains do.

5. When a train handling one of these shipments passes or is passed by another train, one train must come to a standstill while the other moves past.

As already noted, there is no such requirement in the special train tariff and this may or may not be done. Even when done, it provides no additional safety, as discussed hereinafter.

6. Special train speeds are restricted to 35 miles per hour.

This requirement, likewise, is not contained in the tariffs and may or may not be observed. It is, moreover, an unnecessary restriction, as hereinafter set out.

Section 2.4 (page 7) of the Draft EIS cites a number of reasons why "institution of special train service may result in a reduction in the severity of accidents." The reasons cited are discussed below.

1. Because of the exclusive nature of the shipments, special trains have the flexibility to be routed around population centers. In the event that a nuclear

> incident occurred in transit, the amount of the population exposed to radiation might be significantly less if a special train, rather than a regular train, is involved. Special trains will operate on a thru-train basis and will avoid switching yards where possible. This will eliminate the need for cars carrying nuclear materials to wait at classifications yards or to sit on a siding until a full train is made up. By continuously moving, there will be less likelihood of theft or sabotage. Finally, establishment of thru-trains will decrease the total amount of time required to transport the shipments, thus reducing the statistical probability of accidents.

As already noted, there is no reason to assume that special trains would be routed around population centers any more than regular trains are. Regular trains avoid congested areas to the extent that they can do so feasibly and it must be assumed that special trains would follow the same routes. If the assumption herein is that special trains would be shipped over extremely circuitous routes in order to avoid population centers which trains must pass through when using normal routes, the result would be additional mileage and additional switching, with a concomitant increase in the risk of accident, costs and delays. Also, many of the secondary routings that undoubtedly would be used are not maintained in as good condition and, as indicated in the Draft EIS(p. 9), many accidents occur on such secondary track.

Moreover, the type of accident which occurs in moving through a congested area is generally minor in nature and the risk of a nuclear incident occurring in such an accident is so infinitesimal as to be non-existent for all practical purposes. The more severe accidents occur in the open country, and circuitous routing of a special train would increase not only the risk of accidents but the severity of accidents which might occur.

Special trains might avoid some switching but they require the same crew and locomotive changes as regular trains. Assuming that the special trains operate at slow speeds and stop to permit other trains to pass, the amount of switching to and from sidings could well exceed any amount of other switching avoided by their use.

The suggestion that there is serious danger in having a car of nuclear materials waiting in a classification yard is wholly without merit. Cars requiring special handling receive from railroad police a high degree of protection against theft and sabotage. They also receive a high degree of protection from switching accidents by reason of the careful transportation practices accorded them as set out in the railroads' Book of Rules and Special Instructions, including, for example, no humping, no switching without a locomotive attached, etc.

There is no basis for the conclusion that a car of radioactive materials will be transported more quickly

in a special train than in a regular train. Such trains are operated at the convenience of the railroad, and railroads with heavy traffic may encounter very substantial delays as scheduled trains are given priority. Moreover, as the number of spent fuel shipments increases and more and more special trains are required, situations undoubtedly will be encountered where locomotives and crews are not always available as needed.

2. As stated previously, special trains will be considerably shorter in terms of length than regular trains. This will enable train crews located in both the engine and the caboose to constantly observe the flat cars containing the radioactive material, something which is not possible on longer regular trains (due to track curvature). Other important factors to be considered are the type of equipment and the mixture of lading. Inasmuch as special trains do not haul different kinds of cargo and different equipment on the same train, there is less likelihood of a derailment or accident. The absence of other kinds of freight eliminates the possibility of radioactive contamination of other commodities. This also prevents the transportation of other hazardous or combustible materials with nuclear materials, which could result in excessively hot and long-lasting fires which might affect the protective casks containing the nuclear material.

Special trains will be shorter than regular trains but this does not mean that cars containing radioactive materials will receive any better surveillance. Such cars are not placed in the middle of long trains. The established

practice is to place them immediately before the caboose or with a buffer car between the radioactive car and the caboose. Occasionally such cars would be placed at the front end of the train behind the locomotive. In either case, the car would be subject to surveillance. There would be no necessity to have two crews in a position to observe it.

Whether the risk of derailment is greater on a regular train is speculative. A derailment rarely involves more than 15 or 20 cars and is more likely to occur near the front or middle of a train. If 80 cars pass safely over a section of track, it is unlikely that the 81st car will suffer derailment. It follows that a car at the rear end of a long train is relatively safe from derailment accidents. On the other hand, the possibility of derailments on special trains is increased if these trains are required to enter and leave side tracks frequently in order to permit other trains to pass. 26/

As previously discussed (see note 25, supra, and accompanying text), special trains might carry other material as well. Regulations do not permit radioactive materials to be placed in close proximity to cars containing hazardous or combustible materials. Moreover, the protective casks

---

26/ The data supplied by Witness Power identified 27 derailments of 17 Westinghouse special trains for period August 1, 1970 to April 30, 1976. One shipment sustained 7 derailments.

are so constructed as to withstand any credible fire, further reducing any conceivable risk due to mixture of lading.

3. Many of the main line tracks in the Nation permit train speeds up to 70 mph. It is obvious, however, that a derailment or other accident will be much more serious in terms of damage to the cargo at higher speeds than at lower speeds. It is for this reason that special trains will be restricted to speeds no greater than 35 mph, thus reducing both the theoretical potential for accidents and the resulting damage. Although the vast majority of derailments occur at speeds less than 45 mph, derailments are most closely related to track conditions rather than to train speed (although trains operating over poor track are usually subject to slow orders). Consequently, most derailments occur on light density lines which exhibit poor track conditions.

It is true that accidents are more serious at higher speeds but the cask cars here involved are constructed to withstand the forces involved in a 70 mile per hour accident. Moreover, there is no occasion to ship cars of radioactive materials at such speeds. Most freight trains travel at speeds lower than 70 mph, and there is no reason why cars of radioactive materials cannot be handled in regular service on trains which move at normal speeds.

4. Another major cause of rail accidents is collision. Even though special trains will operate on rail lines which handle other trains, the railroads are requiring that when a special train passes or is passed by a regular train, one of the trains must come to a complete halt. The purpose of this precaution is to reduce the potential

for accidents which may occur as a result of train sway, and objects which fall or hang from regular trains.

The risk of damage from collision to a car of radioactive materials is substantially greater in special trains than in regular train service. In special train service, such a car is in a vulnerable position whether the collision is a head-on or a rear-end collision. In regular train service, if the car is at the rear of the train, it is as vulnerable to a rear-end collision as if it were in a special train, but it is protected from the effects of a head-on collision by the cars in front of it. Conversely, if placed at the front of the train, it would be as vulnerable as in a special train in the event of a head-on collision but would be protected from the effects of a rear end collision. In crossing accidents, where a train hits a truck or other object in the crossing, the car at the rear end of a regular train is, of course, protected, whereas it is vulnerable in a special train. If the car is hit from the side in a crossing accident, the type of train makes no difference.

Stopping a special train to permit others to pass is a precaution which is used only where the special train has an excessive width or an excessively high center of gravity. In such cases, there is a danger that train sway

could cause a collision. Cars of radioactive materials do not pose such a danger; they are not oversize and they do not have a high center of gravity so the danger in passing a train going in the opposite direction is no greater than for any other equipment.

If the risk of a wreck as a result of "objects which fall or hang from regular trains" had any substance (except where oversize loads are involved), this precaution would be required for most trains, regardless of the nature of the lading. Surely, if the danger from this was real the railroads would not be permitted to have passenger trains and freight trains pass each other at combined speeds of over 150 miles an hour, as they do, since the wreck of a passenger train under such conditions would be catastrophic.

To sum up the foregoing, there is no basis for the unsupported assumption in the Draft EIS that the use of special trains for radioactive materials would provide a "small safety dividend." If <u>all</u> the factors carefully are weighed, the conclusion might well be that transportation of radioactive materials in special trains is less safe than in regular trains.

VIII. The Mandatory Use of Special Trains Will Involve a Large Commitment of Resources in the Future.

The Draft EIS (at 19) notes that use of special trains instead of regular trains is "less efficient," but inappropriately dismisses this as having an "infinitesimal" effect on our total natural resource consumption. Contrary to this unsupported conclusion, two factors need to be considered:

1. Railroad equipment and manpower.

2. Differential fuel consumption via rail.

With respect to utilization of railroad equipment and manpower, which even now is in short supply, special trains will be wasteful. Furthermore, looking to the future, Volume 1 of the Federal Energy Administration's Project Independence Task Force Report entitled "Analysis of Requirements and Constraints on the Transport of Energy Materials" (November 1974) has identified as a critical uncertainty the railroads' capability to handle the necessary increased coal traffic. The FEA Task Force Report makes it clear that the railroads will be called upon to handle about twice the volume of coal by 1985, and it cites the uncertainty in the availability of equipment, manpower, and diesel fuel. It must be concluded, therefore, that the unnecessary and wasteful practices in the transportation of spent nuclear fuel

and wastes being proposed by the railroads at the same time they are being called upon to double their capability to handle coal is, to say the least, counterproductive and not in the national interest.

While it is not known exactly what a "special train" would be, the waste of equipment and manpower that such would involve is obvious. It takes the same locomotive, caboose, and crew to handle a special train as a multi-car regular train. The addition of a car of radioactive materials to a regular train would result in only an incremental increase in cost. In most cases, no additional crew or equipment would be required, and very little additional fuel would be consumed. It follows that use of fuel (and other resources) via special trains would be many times greater than in regular freight train service. Regardless of the percentage of our total national consumption which this use would represent, it is an unnecessary waste of energy.

IX. The High Added Costs of Mandatory Special Train Service Cannot be Justified When Compared to the Difference in Risk, if Any, Between Using Special Trains and Regular Trains for the Carriage of Radioactive Materials.

An essential part of an EIS such as that being prepared by the Commission's Environmental Affairs Staff is a balancing of the benefits to be derived from, or claimed for, the proposed action against the costs of implementing the proposed action. Such an analysis should be as objective as is achievable, free of emotion and other biases. In this connection, as quantitative a cost-benefit analysis as possible should be prepared in order to reach an objective decision.

In the instant case, the benefits claimed by the railroads (both of which are disputed by industry) are reduced risks resulting from accidents and expedited service. We have not attempted to quantify any benefit from expedited service since, in our opinion, it is problematical at best that any expedited schedules could be achieved with the restrictions, i.e., speed limits and stopping, that the railroads have stated they intend to impose.

In this section, a quantitative cost-benefit analysis is presented that shows the cost incurred for the shipment of spent fuel from nuclear power plants by special trains as

opposed to regular service [27/] and the benefits, measured in reduction of risk, if any, that result from such expenditures. This cost-benefit analysis shows that special trains cannot be justified on the basis of risk reduction.

The risk calculations are based on an assumed average distance of 1,000 miles from a reactor to a reprocessing plant. Using that same 1,000 mile from a reactor to a reprocessing plant. Using that same 1,000 mile shipment, the added cost of the special-train service would be about $20,000 per trip at the current cost of about $20 per mile even if special trains are required only for the loaded movements. This would add millions of dollars per year to utility operating costs. These additional costs, when applied to both spent fuel and radioactive wastes and when escalated to 1986 dollars, could amount to more than $600 million annually by 1986.[28/]

By comparison, using the NRC published value of $1,000 per man rem as the cost of radiation exposure, the total calculated risk using the very conservative values in Table 3 below is less than $1,000 per shipment for regular train shipments. The value of special-train service must then be measured against the reduction of risk, if any, that could be achieved by the

---

[27/] In light of the discussion of the differences between spent nuclear fuel and radioactive waste material at pages 29-33. supra, it must be concluded that the potential radiation hazard to the public from the rail shipment of other radioactive materials is substantially less than that from the rail shipment of spent nuclear fuel. This section, therefore, will focus its calculations on spent fuel.

[28/] See testimony of Witness Peterson on July 30, 1976 in Docket 36325 (Tr. 1250).

use of special trains. In our opinion, it is doubtful that the use of special trains would result in any reduction in this risk, but even if special trains could eliminate this risk entirely (which they cannot), use of special trains still would not be justified based on a balancing of the costs to be borne against the alleged benefits to be derived.

A detailed explanation of the derivation numbers follows. In all cases, bases have been used which tend to overestimate the risks and which realistically reflect the costs involved.

Cost of Special-Train Service

The added costs of mandatory special trains contain a number of variables. For example, these variables include special train charges; cask use charges; rail freight tariffs; location of future reprocessing plants, storage facilities, and reactors; round-trip travel times; turnaround time for containers; frequency of container pickup and delivery by the railroad; container utilization; container capacity; and number of cars per shipment.

In order to gauge the economic impact of mandatory special trains, a number of the shippers involved in these proceedings have estimated the added costs that would be incurred.

George P. Rifakes of Commonwealth Edison Company has calculated the cost of shipping by rail all of the fuel to be discharged from 41 reactors during the 10-year period 1977 to 1986, both under the basic freight rates and with the added cost of mandatory special trains. See Exhs. 31 to 33 in Docket 36325. He estimated that in 1976 dollars the basic round-trip freight tariff costs of shipping spent fuel during this period would be $37,944,000 for the fourteen utilities involved. Adding the mandatory special train costs more than trebles this cost of shipping to $131,039,000. One-way shipment of spent fuel from these 14 companies for the same period of time would increase the basic freight costs from $20,176,000 to $66,723,000. By 1986 the annual round-trip added charges for special trains (in 1976 dollars) would be $14,105,000 and for one-way service an added $7,052,000. These figures represent only about one-fourth of all United States reactors planned to be completed by the mid-1980's.

The added costs of special trains even when considered from the perspective of individual utilities close to reprocessing plants are large. Duke Power Company has estimated that its added costs for shipment of spent nuclear fuel by special trains would be $1,527,300 for the period 1980 to 1990. See exh. 34 in Docket 36325. Virginia Electric and Power Company (VEPCO) has calculated that the added costs for shipment of spent nuclear

fuel in 1988 when all reactors currently planned are in operation will be $443,000 with freight rates at the 1976 level. Carolina Power and Light Company (CP&L), whose Robinson and Brunswick nuclear units are only 132 and 228 rail miles, respectively, from Barnwell has determined that its additional costs for special train shipments of spent nuclear fuel would be approximately $260,000 per year in 1976 dollars. See Exh. 36 in Docket 36325.

The Tennessee Valley Authority (TVA) has estimated that the requirement for use of special trains for spent nuclear fuel would add about $1,400,000 per year to TVA's transportation costs during the late 1980's. See Exhs. 29 and 30 in Docket 36325. If special trains are required for shipments of radioactive wastes from its nuclear power plants, TVA has estimated that such could result in additional costs to TVA of as much as $1,000,000 per year. When this amount is added to the special train costs for transporting spent nuclear fuel, the total annual additional cost to TVA amounts to $2,400,000.

Allied-General Nuclear Services (AGNS) has evaluated the costs for both spent nuclear fuel and radioactive waste shipments that will be required for its reprocessing plant at Barnwell to operate at its design capacity. See Exh. 24 in Docket 36325. AGNS has estimated that the increased cost of

special trains for spent fuel shipments alone will be from some $3,000,000 per year if more than one car per special train is shipped to some $6,100,000 per year if only one car is shipped per train. Special train charges for waste shipments could range from $4,900,000 to $26,800,000 per year depending upon the destinations and the use of single or multiple car special trains.

General Electric Company and a number of its electric utility customers are involved in transactions relating to the transportation of up to 4,200 metric tons (uranium weight) of irradiated nuclear fuel over the next ten years. If all of the material is shipped to storage using the General Electric IF-300 cask, the cost of regular freight service will be about $8,000,000. The use of special trains with one cask per movement would add nearly $21,000,000 to the cost. The stored fuel ultimately will have to be moved again for reprocessing, thus further increasing the transportation costs. The waste generated by 4,200 metric tons of fuel will be transported by rail for disposal. The cost of these waste movements is estimated at $5,000,000 for regular freight service with the cost of special trains estimated at $15,000,000. There is an additional cost to General Electric which is more difficult to estimate, namely that associated with loss of cask lease

revenue. Its IF-300 casks are offered to the utility industry for lease service in railroad transportation. Unreasonable restrictions on the use of this equipment, such as mandatory special train service, will cause those potential customers who can do so to shift their business to less efficient but less costly transport modes. At an approximate daily lease charge of $3,000 it is easy to see that a significant amount of lease revenue could be lost. The four existing IF-300 casks at full utilization would bring in about $4,000,000 per year. If the imposition of special trains resulted in a 50 percent reduction in utilization, over a ten-year period this would be a $20,000,000 loss in lease revenue. See Exh. 54 in Docket 36325.

The added costs to the Federal government also must be taken into consideration. The U.S. Energy Research and Development Administration (ERDA) has already stated that its additional costs from transportation of spent nuclear fuel will be significant. ERDA has calculated that its costs will increase as much as five times on shipments in the lower (75,000 to 100,000 pound) weight range. See Exh. 21 in Docket 36325.

All of the costs presented above are in 1976 dollars except as otherwise indicated. The U.S. Department of Labor, Bureau of Labor Statistics Price Indexes for Total Railroad Freight indicate that the cost of shipping goods by rail in the

United States has nearly doubled since 1969. Mr. Reuben Peterson, testifying before the ICC on July 30, 1976, stated that the use of special trains for 200 nuclear reactors in the 1980's would add $600 million annually in transportation charges at escalated dollar value. See Tr. 1250-55 in Docket 36325.

The added expense of special trains can be computed on a per shipment basis or a cost per mile basis. Section B.2-4 of Chapter VI of the NRC DES, which has been incorporated by reference into the ICC DES, estimates the cost of a spent fuel shipment involving seven fuel elements by special train to be $24,000 versus $9,000 by regular freight train. The existing special train tariffs indicate that the normal additional per mile charge is between $18.93 and $20.24 (requiring a 110-mile minimum).

The risk calculations that follow are based upon a 1,000-mile trip. Using the 1,000-mile trip as a standard, the extra charge per shipment would be about $20/mile x 1,000 miles, or $20,000. This cost figure thus provides a convenient basis for comparing cost and benefits.

Calculation of Risk

Based upon railroad statistics developed through the years and analyses prepared by the United States Government,

calculations of risk and its reduction by use of special trains has been estimated. The approach to this calculation has been to use conservative or upper-bound assumptions rather than what would be more realistic assumptions in order to eliminate any argument concerning the assumptions. The basis for the calculation is as follows:

(1) Spent fuel shipment mileage -- 10 shipments per reactor year at 1,000 miles each (10,000 miles per reactor year).

(2) Accident rate -- One railroad accident per 1,000,000 miles, or each 1,000 shipments.

(3) Accident rate per reactor year -- Multiplying 10,000 miles per reactor year times one railroad accident per 1,000,000 miles yields a figure of one railroad accident per 100 reactor years.

Following the method of the Environmental Protection Agency study,[29/] three categories of accident severity are used: minor, moderate and severe. Based upon the data used in that study, probabilities for each category of severity given an accident are as follows:[30/]

P (minor/accident) = 0.909
P (moderate/accident) = 0.09
P (sever/accident) = 0.001

Thus, (for example) one accident in a thousand, or one accident in a hundred thousand reactor years, is severe.

Next, four categories of release of radioactivity are established: none, small, medium, and large. These

---

29/Transportation Accident Risks in the Nuclear Power Industry, 1975-2000, U.S. Environmental Protection Agency, NSS 8191.1 (November 1974). (Exhibit 28 in Docket 36325.)

30/"P (minor/accident)" is read as follows: The probability, given that an accident has occurred, that the accident is minor.

categories are defined in terms of the amount of radioactivity which might be released, according to the following table:

Table 1

Release Categories

Amount of Radioactivity, in Curies,[31/] Defined to be Released in the Various Release Categories

Radioactive Material Released	Release Category		
	Small	Medium	Large
Kr-85	108	5,400	10,800
I-131	.0014	.070	.14
Other Fission Products	130	6,500	13,000

The more severe the accident, the more likely a large release. This is expressed in the following table of c conditional probability of release category given an accident of a certain severity:

Table 2

Conditional Probability of Release Category Given Accident Severity Category

Release Category	Accident Severity		
	Minor	Moderate	Severe
None	.988	.986	.982
Small	.0092	.01	.013
Medium	.0023	.0027	.0034
Large	.00097	.00011	.00015

[31/] A unit quantity of any radioactive nuclide in which 3.7×10^{10} disintegrations occur per second.

Combining Table 2 with the probabilities of accident, the conditional probabilities or release given an accident may be estimated as follows:

P (none/accident) = 0.988

(Example: .988 x .909 + .986 x .09 + .982 x .001 = .898 + .089 + .001 = .988)

P (small/accident) = 0.0093
P (medium/accident) = 0.0023
P (large/accident) = 9.8×10^{-5}

Or, in round numbers:

probability of no release given an accident	= 99%
probability of small release given an accident	= 1%
probability of medium release given an accident	= 0.2%
probability of large release given an accident	= 0.01%

Thus, one out of 100 accidents will result in a small release of radioactivity, one in 500 in a moderate release, and one in 10,000 in a large release.

If there were a release of radioactivity, the consequences would depend upon the number of people in the vicinity, the wind speed at the time, etc. The net effect

---

Continuation of footnote 31.

which 3.7×10^{10} disintegrations occur per second.

of these variables has been computed in WASH-1238 and has been presented in an appendix of WASH-1238. Table 3 herein, which is a summary of the probability of a given number of people receiving a given dose from an accident for each trip, is derived by using the results in that appendix of WASH-1238, and especially Table 7 and Figure 5 therein, and combining those results with the release definitions of Table 1 herein, and with the release probabilities stated above.

Table 3[32/]

Probability, in a 1,000-Mile Train Shipment of Spent Nuclear Fuel, That N or More Persons Will Receive D or More Dose to the Whole Body From Gross Fission Products Which are Released in an Accident During This Shipment and Which Deposit (I.e., Fallout) on the Ground[33/]

Number of People	Dose, Millirems						
N	1	10	10^2	10^3	10^4	10^5	10^6
1	$1x10^{-5}$	$1x10^{-5}$	$1x10^{-5}$	$1x10^{-5}$	$9x10^{-6}$	$4x10^{-6}$	$1x10^{-6}$
10	$1x10^{-5}$	$1x10^{-5}$	$1x10^{-5}$	$9x10^{-6}$	$4x10^{-6}$	$2x10^{-6}$	$5x10^{-7}$
10^2	$1x10^{-5}$	$1x10^{-5}$	$8x10^{-6}$	$5x10^{-6}$	$2x10^{-6}$	$1x10^{-6}$	$9x10^{-8}$
10^3	$1x10^{-5}$	$9x10^{-6}$	$6x10^{-6}$	$2x10^{-6}$	$7x10^{-7}$	$1x10^{-7}$	$4x10^{-9}$
10^4	$1x10^{-5}$	$7x10^{-6}$	$4x10^{-6}$	$1x10^{-6}$	$2x10^{-7}$	$1x10^{-9}$	
10^5	$9x10^{-6}$	$6x10^{-6}$	$2x10^{-6}$	$4x10^{-7}$	$1x10^{-7}$	$6x10^{-10}$	

32/ Based upon Table 7, in WASH-1238.

33/ Exposed persons are assumed to remain in the contaminated area for one year and it is assumed that there is no loss or cleanup of radioactivity from the ground. 50 percent of the dose is to the skin.

Table 3 is essentially a calculation of the risk surface[34/] in tabular form for regular train service. Thus, it says, for example, that in a 1,000-mile shipment, the probability that there will be an accident which will result in 100 (10^2) or more people receiving a dose of 1 rem (10^3 millirem) or more as a result of fission product fallout is 5×10^{-6}, i.e., one chance in 200,000 shipments of spent fuel.

The numbers in Table 3 may be put into context by comparison. For example, a typical medical x-ray is of the order of 10^2 to 10^3 millirems. The threshold for observable effects from whole body radiation is 50 rems, or 50,000 millirems. Therefore, the millirem doses in Table 3, which are doses resulting from an accident, become biologically significant only somewhere between the 10^5 and 10^6 column.

The curve for special train service must be computed so that the difference between the two curves, which is risk reduction, can be measured against the cost of the reduction. However, the risk surface for special trains cannot be calculated in a definitive way, since no statistical data have been presented on accident rates for special trains. There are only some

---

34/ See Appendix II. More accurately, Table 3 represents an upper bound to the risk surface. It assumes, in a "large" release, a release of radioactivity 100 times greater than that assumed in WASH-1238, Table 7. Table 3, moreover, assumes no evacuation or cleanup or natural dispersion for a period of one year. Moreover, since 80 percent of the dose in Table 3 is to the skin, and the threshold for biological effects is 50 rem, the doses in Table 3 become biologically significant only between the last and next-to-last columns (10^5 and 10^6 millirems).

opinions by railroad personnel to the effect that these rates are lower. Cask cars on special trains are more vulnerable to collision damage than on regular trains and it may be that the risk for special trains is actually higher than for regular trains.

Thus, a definitive risk curve for special train service cannot be calculated, and a convincing argument cannot be made that this curve is lower than the regular curve. Thus, it cannot be said that there is in fact a reduction in risk.

However, the maximum possible reduction in risk would be to eliminate the risk entirely. Even if the risk in special trains were absolutely zero, the maximum reduction in risk is the risk that exists in regular trains, i.e., Table 3. The maximum possible reduction in risk in such an unlikely situation then would be the difference between the probabilities presented in Table 3 and zero. It is infinitely more likely that the difference in risk between special and regular trains is much less than the difference between the probabilities presented in Table 3 and zero. Because elimination of even this gross upper bound risk reduction is not worth the price of special trains, the actual risk reduction is, a fortiori, not worth it.

Conclusion

We may now ask: Suppose the reduction in risk is all of that shown in Table 3; would that be worth $20,000 per shipment?

The number $1,000 per man-rem is currently being used by the Nuclear Regulatory Commission as a measure of the

detrimental value of radiation.[35] It should be noted that the use of this figure is conservative, because another distinguished study estimated the figure at $12-$120 per man-rem.[36] Based upon the use of $1,000 per man-rem, Table 3 would imply an expected detriment of less than $1,000, far below the $20,000 per shipment cost.

Thus, Table 3 illustrates that the expected detriment per shipment is extremely low. These figures illustrate the point that the railroads are proposing protection against risk which exceeds any possible loss that might result.

There is, of course, no assurance that special trains decrease risk -- their use may in fact increase it. Special trains should not be used, of course, unless it can be persuasively shown that their use decreases risk. But even if it is assumed that the use of special trains does decrease risk, they should not be used unless that benefit (decrease in risk) exceeds their cost. We have, however, demonstrated that costs exceed any possible benefit to be derived from the use of special trains. Thus, the conclusion is inescapable, in light of the above cost/risk/benefit analysis, that special trains are an unjustified and unreasonable alternative.

35/ 10 C.F.R. 50, Appendix I, Sec. II D (1976).

36/ "The Effects on Populations of Exposure to Low Levels of Ionizing Radiation", Report of the Advisory Committee on the Biological Effects of Ionizing Radiation, National Academy of Sciences (1972), p. 70.

Respectfully submitted,

LeBOEUF, LAMB, LEIBY & MacRAE
1757 N Street, N.W.
Washington, D.C. 20036

Leonard M. Trosten
L. Manning Muntzing
Omer F. Brown, II
Michael F. McBride
Attorneys for
Commonwealth Edison Company
Exxon Nuclear Company, Inc.
Houston Lighting and Power Company
Kansas City Power and Light Company
Kansas Gas and Electric Company
Niagara Mohawk Power Corporation
Northern States Power Company
Pacific Gas and Electric Company
Philadelphia Electric Company
Power Authority of the State of New York
Public Service Company of Indiana, Inc.
Rochester Gas and Electric Corporation
Southern California Edison Company
Union Electric Company
Vermont Yankee Nuclear Power Corporation

BELNAP, McCARTHY, SPENCER, SWEENEY & HARKAWAY
1750 Pennsylvania Avenue, N.W.
Washington, D.C. 20036

Charles J. McCarthy

Attorneys for
Carolina Power and Light Company
GPU Service Corporation
Pennsylvania Power and Light Company
Virginia Electric and Power Company

MACLEAY, LYNCH, BERNHARD & GREGG
1625 K Street, N.W.
Washington, D.C. 20006

Donald Macleay
James F. Bromley

Attorneys for
General Electric Company

DONELAN & CLEARY
914 Washington Building
Washington, D.C. 20005

John F. Donelan
John K. Maser, III

Attorneys for
Allied-General Nuclear Services
Duke Power Company

RUDOLF C. RAVASZ
C. WESLEY SMITH
Allied-General Nuclear Services
Post Office Box 847
Barnwell, South Carolina 29812

Attorney for
Allied-General Nuclear Services

WILLIAM LARRY PORTER
Associate General Counsel
Duke Power Company
Post Office Box 2178
Charlotte, North Carolina 28242

Attorney for
Duke Power Company

MACDONALD & McINERNY
1000 - 16th Street, N.W.
Washington, D.C. 20036

John Guandolo

Attorneys for
NL Industries, Inc.

CERTIFICATE OF SERVICE

We hereby certify that on this 30th day of August, 1976, we served copies of the foregoing Comments on the Draft Environmental Impact Statement upon all parties of record in Docket Nos. 36307, 36307 (Sub 1), 36307 (Sub 2), 36307 (Sub 3), 36312, 36313, 36330, 36335, 36336 and 36325, and upon other persons known to be interested, by mailing copies of the same to them, postage prepaid, in accordance with the General Rules of Practice of the Interstate Commerce Commission.

JAMES F. BROMLEY

JOHN F. DONELAN

OMER F. BROWN, II

JOHN K. MASER III

APPENDIX I

Outline of Department of Transportation (DOT) Regulations

The DOT regulations deal primarily with shipper and carrier responsibilities in preparation of the package for shipment; external temperature, radiation and contamination limits, labeling and placarding, and certification; and with transportation requirements, restrictions, and emergency notifications during shipment. The DOT, in keeping with the Memorandum of Understanding with NRC, accepts the adequacy of packaging for which NRC has issued a COC. Some of the more important DOT regulations are:

Temperature [49 CFR 173.393 (e)2]	For sole-use rail cars, the maximum allowable temperature of accessible surfaces is specified.
Radiation - [49 CFR 173.393 (j) and 173.29(e)]	For sole-use rail cars loaded, the maximum allowable radiation levels around the car are specified. Empty packaging is limited to 0.5 mrem/hr on contact.
Contamination - [49 CFR 173.393 (h), 173.29(e) and 174.566(d)]	No "significant" removable surface contamination on the exterior of the package. Significant is rigorously defined in the regulations. Also, limits on rail car contamination are specified.

Loading and Testing - [49 CFR 173.393 (m)]	Reiterates and reemphasizes NRC requirements on proper loading and testing prior to shipment.
Labeling and Placarding - [49 CFR 173.399 173.402(a), 173.416 and 174.541(b)]	The package must be labeled according to its contents and the vehicle must also be placarded to make persons aware of the contents of the shipment.
Certifications - [49 CFR 173.427, 173.430 and 174.510-511	The Bill of Lading given to the Carrier must include the information specified regarding the contents and packaging and certification that the contents have been properly classified, described, packaged, marked, labeled and are in proper condition for transportation according to DOT regulations.
Mixing and Handling Radioactive Materials with Other Hazardous Materials - [49 CFR 174.527, 532(j), 538, 586(h), 589(m)]	Controls are placed on the Carrier to avoid the presence of explosives or flammable materials in close proximity to radioactive materials both in a train and while standing

in a terminal. The primary intent of these controls is to minimize the possibility of explosion or fire caused by other materials in the train in close proximity to radioactive materials.

Routing and Movement - [49 CFR 174.582]

Carriers are required to assure that shipments go forward promptly.

Accidents - [49 CFR 171.15-16 and 174.588(c)]

Carriers are required to notify DOT and the Shipper immediately in event of serious accident or fire, breakage, spillage or suspected contamination involving radioactive materials and are advised to notify the AAR and ERDA for assistance, if needed. Both ERDA and Shippers are prepared to make available promptly any assistance that is requested.

Appendix II

Decision Theory and Its Application To the Special Trains Case

Outline of Decision Theory

A concise, yet quite general, presentation of the ideas of decision theory is contained in the diagram of Figure 1 which shows the anatomy, or structure, of a general decision problem. At the point of decision we have various "indications" or items of information. With this information we are faced with choosing between the various decision options A, B, C, . . . etc.

If we knew what the outcomes of the various options would be, we would have little trouble making a choice. What makes the problem interesting is that there are a number of possible outcomes, or ultimate results, from each decision option. So at this point the diagram represents the range of possible outcomes coming from each decision option and indicates the probability (likelihood) of each such outcome. Thus, if option A is chosen, the probability is p(A1) that the outcome will be A1, p(A2) that it will be A2, and so on.

Each outcome, if it occurs, does not have just a single effect; it usually has a number of effects -- effects on people, property, environment, costs, etc. In general then, one can make a list of all these effects or impacts. This list is what we call the impact "vector"

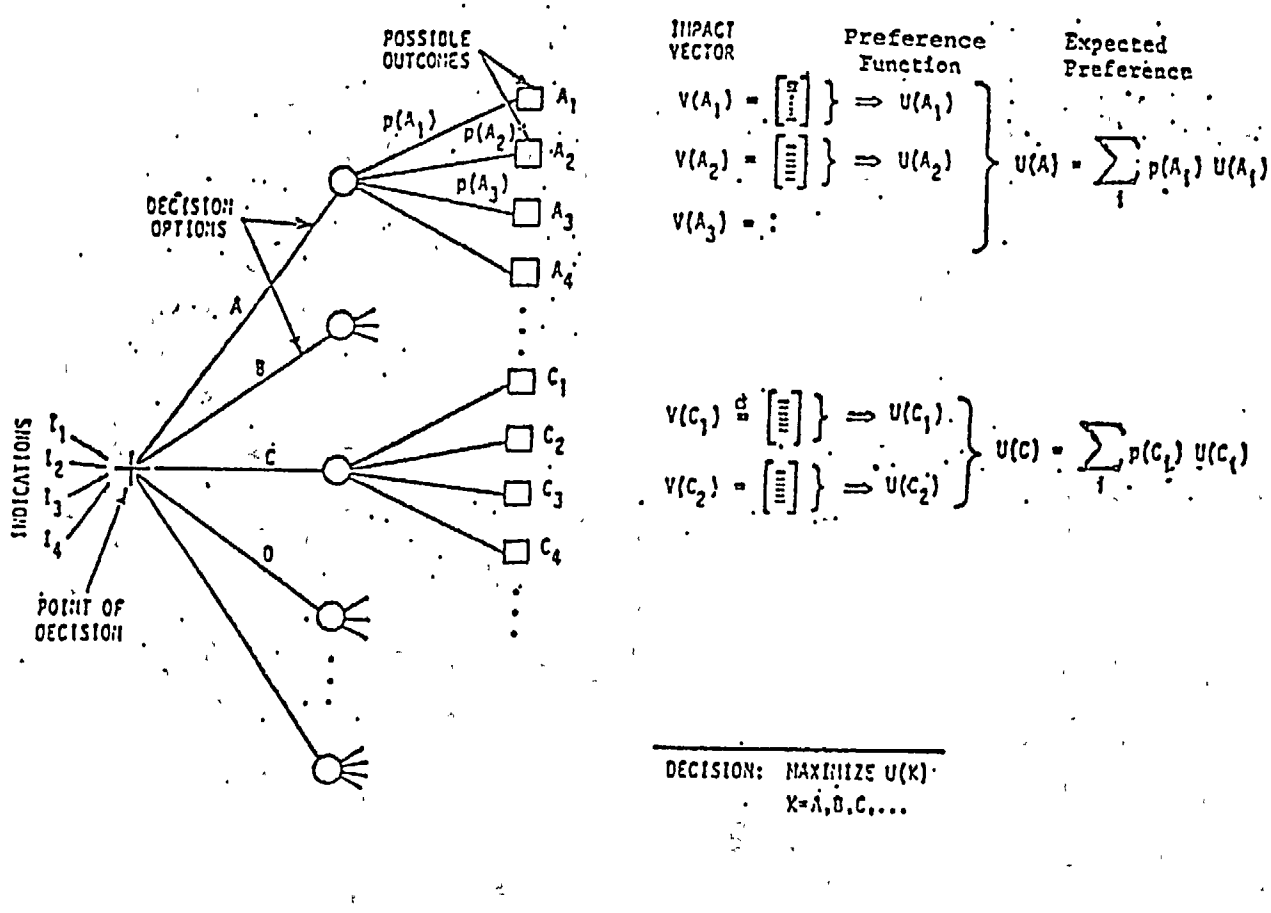


FIGURE 1. ANATOMY OF A DECISION

where the word vector connotes, as usual, that we are talking about a multiple valued, rather than a single valued, quantity.

In general, certain of the impacts, i.e., the individual items in the list, will be desirable, and some will be undesirable. Yet they come all together as a set in the impact vector. The set as a whole then may be desirable or undesirable and any given set may be more or less desirable than any other set. Thus, with respect to the collection of impact vectors we will have in our minds a notion of "ranking" or "preference". That is, we will prefer one set of impacts to another. We could express this preference by assigning a numerical value to each impact vector. This numerical value is often called the "utility function". So each impact vector has a "utility" associated with it which expresses our degree of preference for that set of impacts.

Each possible outcome of the decision thus also has a "utility" value assigned to it. And the "expected utility", then, for any decision option is the sum over all possible outcomes of that option, of the probability of the outcome times the utility of the outcome.

The "optimal" decision then is that option which has the largest expected utility. Note that within this general framework we regard no decision as just another decision option -- it has its own outcomes and impacts.

Application to the Special Train Question

In order to place the special train question within the general forumlation of the last subsection, let us imagine that we have a specific shipment of spent fuel to make. At the point of decision then, we have a choice of sending this shipment by special train or regular train.

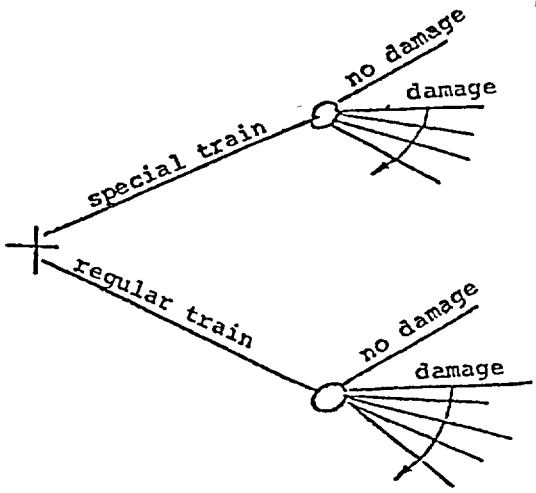


FIGURE 2. SPECIAL TRAIN DECISION TREE

The outcome or consequence of most interest to us is the degree of damage to people as a result of possible release of radioactivity to the environment. Either there will be a release during the shipment or there will not. If there is, it may be of varying quantities at various locations with various consequences, etc. Thus,

in concept there is an infinity, a whole continuum, of possible "bands" of outcome possibilities. Likewise in concept there exist probability density functions erected over the bands of outcomes. The question we wish to resolve is what are these probability functions and how do they differ on the special and regular train branches of the decision tree shown in Figure 2.

These probability functions may be visualized in graphical form as a risk curve, Figure 3.

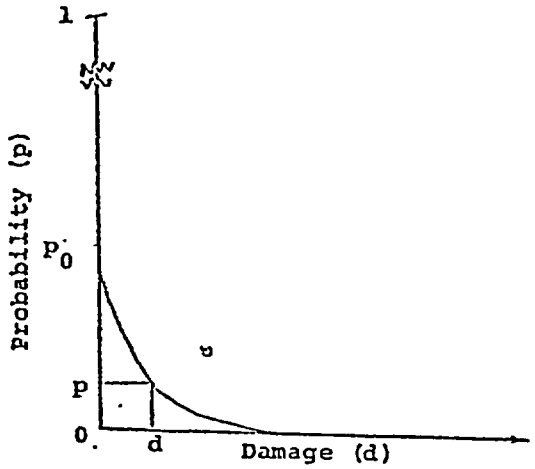


FIGURE 3. RISK CURVE

The ordinate, p, of this curve at any point d on the abscissa expresses the probability that as a result of this shipment we will have damage to the public of amount d, or greater. This curve thus tells the total risk story in far more complete fashion than one can by speaking

in terms of "mean" or "expected" values. Observe that the curve starts at a value P_o, much smaller than one. The difference $1 - P_o$ in fact is the probability that there will be no damage at all to the public in this shipment.

Data are not available from which to plot a risk curve for special trains. The Draft EIS assumes that the risk is less for special trains. The contrary may well be true. But, if a risk curve could be plotted for special trains and if it was lower than the risk curve for regular trains, the difference between the two curves would represent what would be gained by going to special trains.

The other impact of importance is the costs, ultimately to the public, of going to special trains. This must be included in the impact vector for if there were no extra costs, we would of course opt for the lower curve regardless of how low the curves are or how small the difference between the curves. On the other hand, if there is extra cost, and if the probability P_o and the possible damage values are sufficiently small, then it would not be worth going to special trains even if the special train curve were reduced to absolute zero.

The impact vector therefore consists of two components: cost and damage. The damage must be expressed probabilistically for the two options; the cost can be

expressed deterministically from the rates for special and regular trains. The decision then rests on the utility function applied to the impact vectors, which is to say whether the reduction in risk, if there is one, is worth the extra cost.

STATE OF NEW YORK
DEPARTMENT OF LAW
TWO WORLD TRADE CENTER
NEW YORK, N.Y. 10047
TELEPHONE: 212-488-3474

LOUIS J LEFKOWITZ
ATTORNEY GENERAL

PHILIP WEINBERG
ASSISTANT ATTORNEY GENERAL
IN CHARGE OF
ENVIRONMENTAL PROTECTION
BUREAU

97.

August 25, 1976

Director
Office of Standards Development
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Re: Comments on the Nuclear Regulatory Commission's Draft Environmental Impact Statement on the Transportation of Radioactive Materials (NUREG-0034)

Dear Sir:

The New York State Attorney General has submitted a series of comments to you on certain portions of the above-referenced document.

Further consideration of this document has illuminated several other deficiences in the presentation which have been numbered according to the prior Resnikoff-Skinner comments.

48. Your analyses have considered impacts of transportation accidents in terms of population dose only. Careful consideration must be made in the final document of the clean-up costs of all postulated accidents as well as a qualitative description of the inconveniences suffered by residents adjacent to and within accident contamination zones.

49. Your analyses should contain reviews of typical accidents which have already occurred and the costs and difficulties of clean-up at each. These reviews should include plutonium clean-up operations at Thule, Greenland and Palomares, Spain.

50. No discussion appears in the alternatives section concerning the impact of facility location on the severity of accidents and the probability of their occurance.

51. Many accident modes within each transportation pathway have been overlooked. Such likely occurences as fork lift puncture and container leakage are not treated in each pathway.

52. No discussion in the Draft Impact Statement can be found relating to errors in record-keeping, radiation monitor errors, container maintenance hazards, and other miscellaneous causes of inadvertant over exposure to the public during transportation.

We hope these comments will further assist you in preparation of a thorough Final Environmental Impact Statement on Transportation of Radioactive Materials.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

PNS:PC

PETER N. SKINNER P.E.
Environmental Engineer

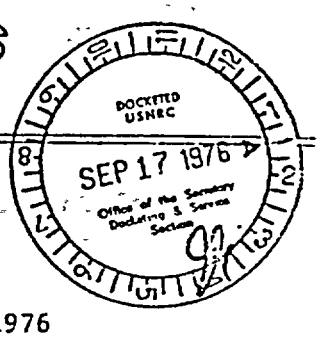
JANET WILLEN
Environmental Investigator

ASSOCIATION OF
AMERICAN RAILROADS
LAW DEPARTMENT
AMERICAN RAILROADS BUILDING · WASHINGTON, D.C. 20036 · 202/293-4096-97

HARRY J. BREITHAUPT, JR.
Vice President and General Counsel

DOCKET NUMBER
PROPOSED RULE PR-7173

(98)



September 14, 1976

Mr. Samuel J. Chilk, Secretary
Nuclear Regulatory Commission
Washington, D. C. 20555

Re: NUREG 0034 - Draft Environmental Statement on the Transportation of Radioactive Materials by Air and Other Modes

Dear Mr. Chilk:

I have received a copy of the letter dated August 26, 1976, addressed to you by Mr. Joseph DiStefano, Attorney for the Energy Research and Development Administration, in which he questions the credibility of certain conclusions contained in the five Verified Statements furnished to me by member railroads and enclosed with my letter to you of June 25, 1976. Since the AAR is not a party to ICC Docket No. 36325, Radioactive Materials, Special Train Service, Nationwide, or related proceedings, I have not had access to any of the data referred to in Mr. DiStefano's letter and cannot determine the credibility of that data.

My purpose in writing to you initially was to advise your Commission that experienced railroad officers in the ICC proceedings had expressed conclusions on special train service which were contrary to the conclusions stated in the Draft Environmental Statement. As I understand, the evidentiary record in the ICC proceedings is not closed as yet, but I feel confident that when all of the facts are made known, the railroad officers' conclusions will be fully supported and verified by such facts. The ICC proceedings will be very informative on special train service, so I would hope that the Nuclear Regulatory Commission would not

Acknowledged by card 9/17/76

J-98

make a statement concerning special train service in its final Environmental Statement until all of the facts are developed in those pending proceedings.

Very truly yours,

cc: Mr. Joseph DiStefano, Attorney
U. S. Energy Research and
Development Administration
Washington, D. C. 20545

UNITED STATES
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
WASHINGTON, D.C. 20545

AUG 26 1976

(99)

DOCKET NUMBER
PROPOSED RULE PR-71,73 (40FR23768)

Mr. Samuel J. Chilk
Secretary
Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Chilk:

NUREG 0034, DRAFT ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF RADIOACTIVE MATERIALS BY AIR AND OTHER MODES

We recently received a copy of a letter dated June 25, 1976, to you from Mr. Harry J. Breithaupt, Jr., General Counsel, Association of American Railroads. He enclosed copies of certain verified statements of the railroads in Docket No. 36325, Radioactive Materials, Special Train Service, Nationwide, now pending before the Interstate Commerce Commission. He apparently did not enclose the verified statements of the other parties, nor the transcript containing cross-examination of any of the witnesses. In order that you will be assured of having the complete ICC record for your files, we are transmitting herewith a copy of the entire evidentiary record to date in Docket No. 36325 as well as a copy of ERDA's brief in Docket No. 36307, another ICC proceeding involving the transportation of radioactive materials. We have omitted the following exhibits from the copy of the record in Docket No. 36325:

> Exhibits No. 15, WASH 1238; No. 16, NUREG 75/038; No. 20, film; No. 26, NUREG 0034; No. 55, photograph; No. 56, photograph; and No. 57, photograph.

We do not have additional copies of Exhibits 20, 55, 56, 57, which, however, can be made available to you upon request on a loan basis; and, of course, Exhibits 15, 16, and 26 are readily available to you.

Mr. Breithaupt criticizes NUREG 0034 in his letter for its alleged failure to take into account the "special service" that would be afforded by the special trains that the railroads would force the shippers of spent fuel and radioactive waste to use. Mr. Breithaupt claims that the special handling connected with special trains "virtually eliminates accidents," based on the statements of five railroads that in their experience there had never been an accident of any sort involving a special train operation.

First, our information is quite different. There is evidence that there have been special train accidents (e.g. Tr. 1203, 1229-31); and it is the opinion of a respected witness with 40 years of operating experience on the railroads that a special train is no safer than a regular train (Tr. 1226).

Second, the comparative safety of special trains is essentially beside the point, because the transportation of spent fuel and radioactive waste in regular trains entails such a very low risk. In this connection, we refer you to the testimony and cross-examination of Robert F. Barker of the NRC staff, and of B. John Garrick.

The very high cost of special train service is described in the testimony of Murray Chais for ERDA and that of several other witnesses for the industry. Accordingly, the statement in NUREG 0034 that "the use of dedicated trains does not appear to be cost-effective," is fully supported by the ICC record, and indeed understates the waste of resources that would flow from the mandatory use of special trains for the transportation of all spent fuel and radioactive waste.

Sincerely,

Joseph DiStefano
Attorney
Office of the General Counsel

Enclosures:
As stated

cc: Mr. Breithaupt, AAR
Attorneys of Record in
ICC Docket 36325

Due to its bulk the evidentiary record was not reproduced. It has been reviewed by Standards Development and will be on file in the Docketing and Service Branch.

APPENDIX K

COMMENTS ON THE DRAFT FINAL ENVIRONMENTAL STATEMENT

DATED FEBRUARY 1977

Comments on NUREG-0170

by

Karl Z. Morgan

February 25, 1977

1. When Dr. C. Siess announced and Dr. D. Hopkins confirmed at the Atlanta meeting that NUREG-0170 in its present form was essentially the final manuscript for the NRC Impact Statement on Shipping, some of the persons attending this meeting--and especially some of the consultants--had the feeling that maybe we had wasted our time reading this material and attending the meeting. Perhaps there is a compelling reason why this material must be rushed into print, but it is a shame that the published report cannot be modified in such a way as to benefit from the numerous constructive criticisms expressed at this Atlanta meeting. Although, in many respects NUREG-0170 is more carefully prepared than many other NRC documents I have reviewed, it is far from a polished publication; it fails to answer satisfactorily several questions raised at the meeting, and in some cases lacks clarity and makes it possible for the reader to arrive at wrong and unintended conclusions.

2. The final drafts of the papers under review did not reach the hands of the consultants and many of others who might have input to the meeting. Usually, I like to check equations and verify a few of the calculations by spot checks, but, because of the shortness of time, no one could do a good job of this. This is especially true for busy persons who cannot drop everything else a few days before the meetings.

3. My general impression of NUREG-0170 is that it is not an attempt to assess the effects on health and the risks of surreptitious diversion of fissile or radioactive materials during shipping, but rather an attempt to prove the effects on health and the risk of surreptitious diversion are completely negligible. Sometimes there is only a shade of difference in these two styles of writing, but the effect of one is concurrence and acceptance of the public and the result of the other is a challenge to the public to show the NRC is wrong. The job of the NRC would be easier if the public were made to believe NRC was simply stating the true facts and

explaining their meaning. Nuclear energy could sell itself better sometimes without the aid of a salesman.

4. I do not believe this report treats adequately the long term problems of wide spread contamination of a city by plutonium and transplutonium following a major shipping accident. In Rocky Flats, Colorado, we have many square miles contaminated with plutonium above the 2.2 dpm level and this contaminated desert land is resulting in serious immediate and long-term problems. Not many persons would care to live in a building or make their home in a city that is badly contaminated with plutonium.

5. I think a poor case is made for shipping plutonium and transplutonium material by air.

6. The cost comparisons for shipment via air, truck, train and barge are biased because of transhipments at each end. What would be the cost (in man-rem) were barge or train terminals located at all nuclear facilities? In a proper comparison, I believe the man-rem cost by rail would be about 1/10 that by truck and the cost by barge would be about 1/100 that by truck.

7. I would like to see the estimated saving in costs (in man-rem) were we to completely change our future nuclear power program and do the following:

a. Discontinue the LMFBR program for the present.

b. Establish large reactor parks over suitable bedded salt formations such that:
   1) High level waste would not have to be shipped
   2) Build converter ($^{232}Th + {}^{233}U \rightarrow {}^{233}U$) reactors at the parks
   3) Denature the ^{233}U with ^{238}U when it is shipped outside the park to reduce the risk of hijacking and diversion.
   4) Have proper isolation of these parks
   5) Several studies at Georgia Tech suggest Th-breeders are possible which would have a negative void coefficient in the coolant, and would have a doubling time much less than that of the LMFBR.
   6) Pu and trans-Pu elements would not be produced
   7) The problems of ^{232}U and ^{234}U production in the Th cycle are minor compared with the Pu problems.
   8) Of course, the parks would have fuel reprocessing and fabrication plants as well as power reactors (converters and breeders).

8. I think NUREG-0170 should have given more attention to the recommendation of the Special Panel to Study Transportation of Nuclear Materials and its report to the JCAE of Congress (December 17, 1974).

9. It was indicated by Mr. Hoppins in answer to my question that some of the shipping containers that were improperly designed and approved by the AEC (now NRC) are still in use under the grandfather clause. This presumably includes the C-10 industrial source shipping container which occasioned the serious accident into Atlanta in which I became involved a few years ago. It was indicated that NRC places reliance on administrative control rather than upon safe design in these cases. I think this is a very serious situation because unless the operator is careful about what he is doing, the source will be pushed outside the C-10 shipping container where no shielding protection is provided. I think NRC must share responsibility for any accidents that result during the term of the grandfather clause because it (or the AEC) is responsible for this ridiculous design in the first place.

Battelle
Pacific Northwest Laboratories
Battelle Boulevard
Richland, Washington 99352
Telephone (509) 946-2222
Telex 32 6345

March 1, 1977

Mr. G. R. Quittschreiber
Senior Staff Engineer
Advisory Committee on Reactor Safeguards
Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Quittschreiber,

At the conclusion of the Working Group Meeting on Transportation, Atlanta, Georgia, February 24, 1977, Chairman Siess invited the consultants to submit comments on the review of NuReg-0170. We understand that the Working Group is not proposing to advise NRC on this topic at this time.

Therefore, the following comments are intended solely to document my personal concerns.

I am disappointed to discover that it is proposed to publish NuReg-0170 in essentially the form discussed on February 24. Despite the evident care that has gone into this preparation, I believe that the end-product is far less useful than it could have been. I understand that it started in support of proposed rule-making concerning air transportation of radioactive materials (Federal Register June 2, 1975). Such a study would have considered alternatives to air transport <u>but only for such packages as a reasonable person would have contemplated sending by air as one option</u>. That vital distinction has not been observed so that one immediately becomes involved with the whole gamut of transportation scenarios.

The new lists of package types for standard shipments are impressive in two ways:

1. They are so different from the earlier NuReg-0034 versions in number and activity that one wonders whether a third look would bear any resemblance to either -0034 or -0170 tallies.

2. They contain packages whose "hazard properties" are polar extremes. For example, a typical radiopharmaceutical source

is a short-lived gamma emitter requiring some heavy material shielding for normal transport. If it is either misplaced or damaged in transit, it is not likely to be very hazardous. At worst, the effect is gone in a relatively short time. At the other extreme is the long-lived alpha emitter. In this case the hazard in normal transport is essentially zero. In an accident capable of releasing the product, one has the long-term risk of contamination.

In NuReg-0170 the so-called alternatives group all these classes together so that real differences between modes tend to cancel each other out.

The quoted differences in health effects for the various scenarios, are in my opinion below the uncertainty level of any of the calculations of risk and cost-effectiveness.

I, for one, believe that air shipments should be limited to cases where speed is of the essence*--in practice, to the radiopharmaceutical case, where the public does accept a compensating social benefit. If that analysis had been made separately it would at once have been clear that innovative alternatives have not been included. As examples, let it be assumed that estimated doses from air shipments are too high. Then, at the source of the transportation web, one must analyze the merits of radiopharmaceutical preparation at more and better chosen locations. Upon loading on planes, one must consider packaging with one thick shielding face under the passengers instead of conventional equal shielding on all sides.

At the natural terminals, usually large cities with clustered hospitals, one must examine the possibility of underground tube delivery, and so on.

For other modes of transportation, one should make the alternatives for <u>each generic type</u> of shipment--not for all taken together.

The above steps seem to be necessary to develop an environmental statement of adequate sensitivity. There are many minor points to be raised of which the following are examples.

a. The above scenario was predicated on the assumption that dose from air shipments was too high. Table IV-19 (p.IV-55) displays an annual individual dose to an airline passenger of 108 mrem, which translates the issue from assumption -

* These comments are a more simplified exercise than the detailed rule-making. For example, I could accept the reasonableness of helicoptering survey sources to otherwise inaccessible locations, where special circumstances other than speed prevail.

to fact. In view of the NRC's efforts to get reactor fencepost doses down to the range of 10 mrem/yr, casual acceptance of 108 mrem/yr for an unsuspecting passenger is incredible. Surely the ALARA principle calls for reduction by about one order of magnitude.

b. It is somewhat difficult to fault the authors in their attempt to use numerical health effects such as a Latent Cancer Fatality Index. The plain truth is that whatever figure is used, vociferous objectors will appear quoting studies of their choice with different results, not a single one of which is definitive in 1977, nor likely to become so in the 20th Century. Yet the -0170 approach must be faulted on two counts:

1. Genetic effects are excluded on the grounds of scarcity of information. Curiously, this is one area in which there is essential agreement on a dose and dose-rate effect. There is no real way to add genetic effects and cancer fatalities on a common scale, but some arbitrary allowance has to be shown.

2. There is much more scarcity of information on the somatic side than is reflected by an LCF Index of 121.6 per 10^6 person-rem. The implied precision for a number that may be 12 (or even zero) on the one side or perhaps 600 on the other side is entirely out of place. The best efforts of NRC to set dollar indices such as $1000 per person rem, or $8 million per LCF simply cannot be accepted.

c. Some of the basic dosimetry equations need better support. Even the point source formulation

$$\frac{Ke^{-\mu D}B(D)}{D^2}$$

where μ is some formal absorption coefficient and B(D) is a Berger build-up factor is arbitrary. The relevant absorption factor is rarely well known and the build-up factor is both empirical and terrain-variable. What is known is the total energy emitted from any well described source. Then, the integration of energy absorption over all space would demonstrate the appropriateness of the combinations of μ and B(d) used.

In the integration of dose at a point from a source moving uniformly in a straight line, we have mathematically the same issue as dose at a point from a uniform line source, the familiar Sievert equations published in Acta Radiologica

in 1928. Formal demonstration of this equivalence would have improved confidence in the result.

In the second stage of double integration as in Fig. D-2 of p. D-4, the same result should be obtained by integrating the dose from an infinite disc of radioactive material (also a familiar Sievert equation) as the receptor moves uniformly across a diameter.

Sincerely yours,

H. M. Parker
Consultant

Copies to: Dade Moeller
J. W. Healy
K. Z. Morgan

SAFE ENERGY

ENVIRONMENTALISTS INC.

FOUNDED 1972

TO: ADVISORY COMMITTEE ON REACTOR SAFEGUARDS

FROM: ENVIRONMENTALISTS, INC., a non-profit South Carolina Corporation

SUBJECT: NUREG -0170

DATE: FEBRUARY 24, 1977

Environmentalists, Inc., is a non-profit public education organization existing in South Carolina. This group has a strong interest in potential existing problems surrounding shipment of radioactive materials. In addition to studying nuclear fuel reprocessing for five (5) years, the organization is officially intervening in the licensing proceedings for both the Barnwell Nuclear Fuel Plant and the Barnwell Fuel Receiving and Storage Station. Obviously, the transportation of radioactive materials by any mode will have a significant environmental impact. Environmentalists, Inc., recognizes the importance of having a well-documented and realistic estimate of such impact. On behalf of Environmentalists, Inc., this statement is submitted to ACRS for its consideration.

We know of no report which adequately assesses the outcomes of transportation of radioactive materials. Estimates of the radiation doses to the public from the shipment of radioactive materials presented in the Draft Environmental Impact Statement on the Transportation of Radioactive Materials by Air and Other Modes, NUREG-0034, are based on incomplete and incorrect information. The following examples are among the numerous deficiencies:

1. The impact of transporting radioactive nuclear materials associated with nuclear weapons is excluded.

Continued . . .

1339 SINKLER ROAD • COLUMBIA, S. C. 29206 • 803-782-3000

2. Accidental releases are not among the factors included in the models used to calculate radiation dose predictions.

a) The long-term detrimental environmental impact from a major transportation accident, such as an unplanned release of radioactive materials, is not included in the models used to calculate radiation dose predictions. The pathways by which such radioactive releases might continue to increase the public's exposure to radiation are not considered.

b) The cumulative impact from frequent small leaks, the escaping of radioactive materials due to such human error as not fastening an opening securely, failures of gaskets and other equipment, highway, rail, air, and barge incidents that may not be reported are among the exposure increases which have been excluded.

3. The increase of radiation exposure to the public and to workers at those points where delays in shipment occur are not included as part of the model calculations, i.e. on highways, in rail, air, and barge transport, during switch operations in freight yards, and at transfer points.

4. The failure to calculate radiation exposures with consideration for the converging of transportation routes to one central point is conspicuous.

5. The study fails to include an estimate for the releases that might result during hijacking, theft, and other terrorist activities.

6. There is an absence of any evaluation of genetic damage resulting directly from transportation activities or indirect damage to the gene pool from such activities.

Continued . . .

7. The study fails to reveal whether or not the "No Threshold/Linear Hypothesis" is utilized in assessing the impact on public health. Any amount of man-made radiation is damaging and is an added harm over and above the harm done by natural radiation.

8. The study fails to prepare a number of models which would be relevant to special areas. Many vicinities will be receiving radiation exposure from a number of sources: nuclear power plants, waste handling facilities, weapons operations, etc.

9. The study fails to take into account the varying qualities of rail points in existence on the various routes proposed.

The defects in calculating and assessing the effects of radiation exposure due to the transport of radioactive materials make the existing report practically useless. Environmentalists, Inc., is most concerned about transportation activities associated with the various Barnwell facilities. The Barnwell area will be the terminal of many transportation routes. The population will be exposed to radiation not only from numerous shipments, but will be exposed to accidental and normal releases from the Savannah River Plant, BNFP, converging transportation routes, Chem Nuclear waste handling, nuclear submarine base, nuclear power plants --- including leaks to the drinking water. NUREG-0170 will be of small value in assessing the environmental impact of the Barnwell operations.

We question the use of taxpayers' money for a report which appears to have little if any use. The report does not follow the provisions of NEPA. The alternative section does not include discussion of the possibility of not transporting nuclear materials nor the alternative of halting the use of nuclear energy.

Continued . . .

The cost-benefit analysis fails to quantify many of the transportation costs and some are not even listed.

Environmentalists, Inc., regrets not having had the opportunity to make initial comments on NUREG-0034. However, since NUREG-0170 appears to have such little merit, we anticipate a redundant study for the purposes of licensing the Barnwell facilities.

G P I R G
Georgia Public Interest Research Group, Inc.
201 Washington Street SW
Atlanta, GA 30303
(404) 659-7082

G-PIRG COMMENTS CONCERNING NUREG-0170 FINAL ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF RADIOACTIVE MATERIAL BY AIR AND OTHER MODES

The Georgia Public Interest Research Group (G-PIRG) is a private, non-profit organization concerned with consumer and environmental issues in the state of Georgia. We would like to thank the Advisory Council for the opportunity to present these comments.

Before commenting, we would like to express our concern of the adequacy of notice for this meeting. There has been no notice that NUREG-0170, a lengthy and complex document, was schedule for release. The most recent notice in the Federal Register announced an ACRS meeting "to review public comments on NUREG-0034 'Draft Environmental Statement on Transportation of Radioactive Materials by Air and Other Modes'." There was no mention of comments on the Final Draft NUREG-0170. Finally, NRC's Regional Office did not receive verification of this meeting until fourteen days prior to date.

In light of these facts, and because of the inability of G-PIRG and other interested parties to adequately review the document under consideration, we strongly urge that the Advisory Council schedule an additional public meeting with 60-days notice to each agency or group represented here today.

G-Pirg's chief concern with the Final Draft Environmental Statement is with the adequacy of treatment accorded coordination between State and Federal Authories. There are twenty Federal and State agencies that could be called upon to act in the event of an incident. The instant document does not adequately deal with this problem.

The New York Department of Law asked similar questions in a letter to NRC dated May 17, 1976. The NRC failed to sufficiently address the issue. For example, there are no regulations or plans for communication equipment or frequent contact between local law enforcement agencies along truck routes (see VII-10). Nor does NRC's answer deal with distances, transportation, or communications between airports (see VII-11) or with regulations concerning "airport security personal" as stated in VII-11, or airplane security personal.

G-PIRG also feels that the FES should have focussed more attention on the issue of financial responsibility in the event of an incident. Will the costs be borne by the agencies involved or by the carrier? If by the former, how would the liabilities be apportioned?

G-PIRG also feels compelled to ask who is responsible for the planning and approving of routes and times of travel and for the notification of checkpoints. These activities are vital in the effort to reduce the risk of incidents. Again, these questions are not sufficiently

dealt with in the FES.

Finally, G-PIRG cites the NRC for not confronting the potential problem of non-compliance. It is naive to assume that the regulations will be followed merely because they exist. We are mindful of the Brown's Ferry incident. G-PIRG also submits that it is extremely unwise to accept "industry practices" as assurances of compliance.

In conclusion, we feel that the potential dangers of transport of radioactive materials are great enough to warrant an unhurried and careful consideration of all the issues and ramifications. These risks are particularly acute to Atlanta and to Georgia because of their location at the crossroads of America's transport links and because of their proximity to the Barnwell Nuclear Reprocessing Plant. In light of t is, G-PIRG urges more thorough attention to the issues addressed in this paper and to the convening of another public meeting in Atlanta concerning NUREG-0170 with proper advance notice to all interested parties.

- Sharon Collings,
  Project Coordinator

- Larry Katzman,
  G-PIRG Executive Director

The Georgia Conservancy

3110 MAPLE DR., SUITE 407 ATLANTA, GEORGIA 30305 TELEPHONE: 404/262-1967

THE GEORGIA CONSERVANCY
COMMENTS GIVEN FEBRUARY 24, 1977
BEFORE THE ADVISORY COUNCIL FOR
REACTOR SAFEGUARDS ON
NUREG - 0170

FINAL ENVIRONMENTAL STATEMENT ON THE
TRANSPORTATION OF RADIOACTIVE MATERIAL
BY AIR AND OTHER MODES

Docket N PR - 71,73 (40 FR 23768)
February, 1977

Before making specific comment on various issues contained in the Statement, we first wish to express our vigorous disapproval and criticism of the lack of notice to interested parties, and the inadequate time interval between publication and availability of the material on which comment was solicited and the date set for the public hearing. The impossibly short time period between availability and the date set for comment evidences on the part of the NRC either a lack of competence in establishing and meeting reasonable time schedules or a lack of sufficient consideration for the schedules of those for whom the hearing is held.

Whether due to incompetence or unconcern, the result is burdensome to public participation and lowers the quality and value of the hearing. We deeply resent such a cavalier approach by a Federal Agency created to serve the public interest.

It is self evident that a generic statement such as this is inadequate to meet the needs of specific areas of the Nation where a concentration of nuclear facilities or a convergence of transportation routes to such facilities create circumstances demanding independent and detailed treatment. This is particularly true of Georgia, where the presence of the Savannah River Plant, Chem-Nuclear low level waste storage facility, Barnwell Nuclear Fuel Reprocessing Plant, together with the proposed Posiedon Base at Kings Bay, nuclear reactors, weapons systems and weapon components within the State, medical radio-pharmaceutical, industry, etc. will funnel a disproportionate shore of hazardous nuclear materials through Georgia's rails, highways, waterways, and airways. A separate Environmental Impact Statement incorporating the aggregate and cumulative effect of such activities is a minimal requirement for the understanding and protection of those asked to accept and support their existence. We need a comprehensive study of precisely what is moving through and to our State now, and a projection for 1985 and beyond.

(1) The cost for land reclamation of a radiation accident site is stated to "exceed $200 million" in the Summary and Conclusions. However, table V-14 shows the cost of decontamination being as high as $8.21 billion which is 40 times as much cost. We therefore find it materially misleading to include only the lower figure in the summary statement.

(2) As seen by the above comment, the possible costs resulting from a radiation transport accident are enormous. It appears that insufficient attention has been given to the question of who will be responsible for absorbing these costs and their financial ability to pay. It is questionable that the shipper would be able to cover such costs and the State of Georgia should certainly not be required to bear the responsibility for reclamation and decontamination.

What provisions have been made for assurances that these costs are paid?

Will the Federal Government be prepared to cover such costs? Through what mechanism?

(3) It's apparent that the accident risks and health effects due to a given accident are directly tied to the frequency of shipments and routes of transport. The full impact of radioactive transport on the State of Georgia or communities in the State cannot be fully assessed without adequate information on these factors.

Is information on the projected frequency and routes of shipments available to the State of Georgia and concerned citizens?

It is imperative that the State be provided with advance notice of radioactive shipments and that the State be given the option of prescribing acceptable routes and times of transport.

It is our understanding that the State of Florida is already pursuing this option.

Is there provision for Georgia to exercise this right?

(4) The magnitude of health effects following a radioactive transport accident will obviously depend to a large degree on what immediate action is taken at the accident site to minimize these effects.

Has an established procedure been developed for handling such an event and have responsibilities for specific activities been fully defined?

For example, who will be responsible for radioactive monitoring, for evacuation of adjacent areas, for retaining contaminated people at the site, for decontamination of the accident site?

We question whether there are even adequate medical and personnel decontamination facilities in Georgia to handle victims of such incidents.

(5) We question whether all reasonable alternatives have been considered to reduce the environmental effects of radioactive transport. For example, the alternative of limiting the amount of radioactive material transported should be addressed. This would include limiting the number of nuclear power plants in the country to those now in operation or under construction. This would significantly reduce the risk of adverse environmental effects due to transport, and particularly in Georgia, it would help to minimize the amount of nuclear materials transported across the State to and from the Barnwell, South Carolina Reprocessing Plant.

(6) Spent fuel shipments are specifically exempted from physical protection requirements of 10CFR Part 73. No discussion of special precaution or less rigorous methods of protection proportionate to the risk are discussed. The rupture of a cask is a stated possibility, resulting in a total of 244 predicted deaths (page VII-2). A consequence of this magnitude (or worse, should the cask fall in a water supply for example) merits more serious consideration of escorts or other appropriate types of safety precautions.

The final conclusion of Section VII dealing with special nuclear materials, states that "alternative means of protection --- are neither necessary nor desirable for the protection of privately owned materials." Apart from the highly debatable merit of this conclusion, a more profound question which should be addressed is "What are materials such as these (which have the potential for cataclysmic harm to society in a variety of ways) doing in private ownership to begin with?"

It seems to us that there is a substantial question as to whether bomb grade material should be introduced into the general stream of commercial traffic.

(7) Table VI - 2 sets forth the economics of rail and truck shipments of spent fuel. Do the "costs" include the costs to the State for road damage and maintenance (particularly for overweight shipments), bridge strengthening where needed, increased police coverage and special equipment, if necessary?

Who bears these costs? Sec. 168 of the AEC Act of 1954, as amended, and Sec. 91 of the Atomic Energy Community Act, of 1955, as amended, provide a specific statutory mechanism for the evaluation and determination of the need for financial assistance to local entities which may be affected by ERDA activities.

Would these or similar costs imposed by any of the various modes of transport contemplated by this statement qualify for relief under these provisions?

(8) On Page XXV of the Detailed Summary as one of the long term positive results from the shipment of radioactive materials the assertion is made that the use of nuclear fuels in reactors allows production of electricity for society with lower costs than is possible by more conventional methods of generating electricity.

Statements like the above have for far too long accompanied cost benefit assessments. To state it now, without qualification or supporting data, in the light of increasing numbers of critical analyses which arrive at contrary conclusions, is simply inexcusable.

This is particularly true when it is characterized as a "long term" benefit, implying either (1) an adequate supply of uranium for the indefinite future, (2) the acceptability of plutonium recycle, (3) and/or the economic and environmental viability of a breeder reactor, none of which has or can be demonstrated at the present time.

Cecil R. Phillips
Executive Director
The Georgia Conservancy

The Georgia Conservancy

3110 MAPLE DR., SUITE 407 ATLANTA, GEORGIA 30305 TELEPHONE: 404/262 1967

ADDITIONAL COMMENTS ON THE FINAL ENVIRONMENTAL STATEMENT ON THE TRANSPORTATION OF RADIOACTIVE MATERIAL BY AIR AND OTHER MODES, NUREG-0170
Docket N. PR-71, 73 (40 FR 23768), February 1977

March 4, 1977

We are pleased to accept the invitation of the Chairman to offer further comment to become a part of the record of this Proceeding. While our additional remarks will be confined to two principal matters, we would like it to be clearly understood that our silence in regard to a variety of other issues is not to be construed as consent or acquiescence, but simply reflects the limitations of available resources to adequately address them in a restricted period of time.

I. We recognize that this meeting was not intended as a "public hearing" in the usual connotation of that term, with the opportunity for full participation. There was, however, a clear expectation that members of the public and other interested parties would attend and contribute to the substance of the meeting by comment.

As a part of the written comment furnished prior to the meeting we expressed our disappointment and indignation at the lack of adequate time between the date when the Final Environmental Statement first became available and the date set for the meeting. We now learn from NRC's Mr. Hopkins that the sole reason for such haste was to meet the exigencies of a lawsuit against the NRC by the State of New York, an admission of an outrageous unilateral decision which passed without a single comment or critical observation on the part of the Ad Hoc Committee.

A further abuse of the rulemaking process, to our understanding of the purpose of the meeting, and to the assembled consultants and members of the Committee, was that, as far as the NRC was concerned, the document was in final form. They intended it to be printed substantially as it now exists, apparently without regard to what may have transpired at the meeting.

II. Among the final matters dealt with by the Committee was the question of what consequences might reasonably be expected as a result of a successful "diversion of special nuclear materials", a question wholly omitted in the Statement itself.

Let us first comment the Committee Chairman for directing the NRC Staff to initiate a study of this question. And now we would like to talk about it for a while.

First we would suggest that euphemistic terms like "special nuclear materials" and "diversion" be deleted entirely from any communication which is intended to enlighten or edify. "Special nuclear material" means bomb grade material and "diversion" means theft. It does not change the nature of a substance or an act to call it something else. The literature of this industry and the agencies governing it is replete with similar efforts to obscure reality. Please stop it. Learn to tell the truth in a fashion that can be understood and dealt with.

In the NRC spokesman's formal presentation on the threat of "diversion," in the following sequence we understood him to say first that "it is impossible to quantify the threat" and later on to state that "any mode of transportation can be protected against any level of threat." Those two statements are totally inconsistent. More importantly, they reveal an attitude, a "way of thinking" as the Chairman expressed it, which in our opinion has characterized the Government's role in the nuclear industry from its inception, and accounts in large part for the growing mistrust and resistance on the part of the public to continued or increased reliance on nuclear power as the sine qua non of our economic existence.

Some years ago Dr. Edward Teller, an outspoken advocate of nuclear power, presented the question of reactor safety as an interesting mathematical problem - "What is the product of zero times infinity?" It is indeed interesting, because the survival of our nation as we know it may depend upon the answers to a number of such questions inherent in the use of nuclear materials as an everyday article of commerce.

The specific question addressed briefly in this proceeding were the probabilities and consequences of theft of bomb grade material. We suggest for your consideration that history supports the view that any human endeavor whose success depends upon achieving "zero defects" is doomed to failure. Recent examples in the realm of technology are the Apollo and SNAPS programs. A similar failure in the field of "anthropology" is exemplified by the actions of Mr. Nixon's staff.

We further suggest that any serious effort to achieve zero probability of failure, whether technological or anthropological, will, in itself, incur unprecedented costs to our society. Financially, power companies are already chafing under the escalating capital costs of nuclear facilities which knowledgeable critics proclaim to be still not safe enough. Societally, you gentlemen calmly discussed the introduction of guards armed with automatic weapons to traverse America's expressways - a profound "environmental impact" upon our society, we should say. We urge you to reflect upon it.

Nuclear power generation has already distorted our judicial system in a variety of ways. Most notably, the ancient doctrine of tort law creating liability to innocent third parties for harm done them by a negligent act has been laid aside to accomodate the growth of this particular industry, and for none other.

Less obviously, but perhaps even more importantly, scientific dissent is quelled, not encouraged, as it properly should be in the search for truth. William Rowe, a ranking official of the Environmental Protection Agency, recently responded to a question on this topic by stating that no effort was made to discourage dissent "except, of course, when it is contrary to departmental policy."

Examples abound. The price already paid or incurred to generate electricity in this way is far greater than that which appears in any cost-benefit analysis. The more we seek to attain zero defects the more the price will rise.

And we have no choice but to seek it, for the consequences of a major failure, whether it be a transportation accident, a successful theft, or any other mode, though not infinite would surely be intolerable. With costs in the billions, and fear of repetition rampant, regardless of who pays what to whom, what do you think would happen? Do you think it would end there? Would a new Rasmussen study placate the public?

And suppose it happens when 20% - 40% of the electrical power of the United States is generated by nuclear fission and you are the President? What do you do?

This EIS is inadequate in failing to consider the above questions. They are being discussed in other forums. As a presidential candidate addressing the Washington Press Club, Mr. Carter predicted that a major reactor accident would mean the end of the nuclear power industry. Dr. Lynn Weaver head of Georgia Tech's nuclear Engineering Department has expressed the same opinion. Countless others share this view. Clearly, it is a credible consequence of any major nuclear disaster, including theft or transportation accident, and should be included in any responsible overall assessment of acceptability.

It seems to us, as it has for a long time now, that, in dealing with the nuclear questions we will remain torn between intolerable risk and intolerable cost.

In summary, then, we ask that these specific matters be addressed:

1. Adequate notice and availability of subject matter to all interested parties in timely fashion.

2. A clarification of language using plain english rather than terminology which tends to obscure fact or meaning.

3. The ultimate consequence of a successful theft of bomb grade materials, or any major credible catastrophe which might occur anywhere in the commercial fuel cycle. Such an assessment should address not just the immediate economic or biological effects of such an occurance as this statement does, but the predictable events which are likely to ensue, including the possible shutdown of the industry and the attendant disruption in our economy and other major effects (on our foreign policy for example). Alternatively, if the plants are not closed, what effect on public and worker morale? And to production costs if more stringent safety features were demanded?

4. A more comprehensive review of the societal effects of efforts to shield from error, accident, or misuse ultra-hazardous materials in huge quantities as a day-to-day commercial enterprise. We have identified a few examples:

(a) Civilian guards armed with automatic weapons. What effects, subtle or overt, on travelers sharing the expressways and the general public? What specific instruction to the guards as to their response in a wide range of potential encounters, both real, or as they may be perceived by the guards in a sudden and unexpected confrontation? What quality of individual is contemplated to be recruited and entrusted to bear these weapons? What program of indemnification and financial responsibility on whose part for error in selection, training, supervision or performance?

(b) What surveillance systems are specified and in place to identify and monitor potential threats to transportation of nuclear materials? The statement was made that there are no known groups who have the motivation and capability to successfully divert bomb grade materials. Who made that determination? The FBI? The CIA? The NRC? Is the dollar cost of acquiring and maintaining such information charged to the public generally, or is it internalized and accounted for in the cost-benefit analysis? Apart from financial cost, what loss of freedoms is likely to occur to individual citizens? Will there be increased numbers of phone taps and similar encroachments on privacy deemed necessary to adequately protect these materials? Will the need to protect them result in the successful passage of legislation such as that proposed in the State of Virginia to grant to the Virginia Electric and Power Co. a variety of police powers?

(c) What additional effects can be expected in our judicial and political systems to protect and encourage nuclear power generation? We have identified the abandonment of tort liability, the repression of dissenting opinion, and the extension of police powers to private firms. Will the states be preempted by the Federal Government from a voice in nuclear plant siting and the regulation of nuclear materials transported within their borders? Is that good or bad? Who decides? These are not frivolous questions and they are not adequately considered (if addressed at all) in the Final Environmental Impact Statement. We think they should be.

James T. Mills
Chairman, Energy Sources Committee

Cecil R. Phillips
Executive Director
The Georgia Conservancy

STATE OF NEW YORK

J. LEFKOWITZ
RNEY GENERAL

DEPARTMENT OF LAW
TWO WORLD TRADE CENTER
NEW YORK, N.Y. 10047

TELEPHONE:
212-488-7562

PHILIP WEINBERG
ASSISTANT ATTORNEY GENERAL
IN CHARGE OF
ENVIRONMENTAL PROTECTION
BUREAU

April 29, 1977

Director
Office of Standards Development
United States Nuclear Regulatory
Commission
Washington, D.C. 20555

Re: The Nuclear Regulatory Commission's Environmental Statement on the Transportation of Radioactive Materials (Draft: NUREG-0034, Final: NUREG-0170)

Dear Sir:

Pursuant to the Notice of Availability of the above-referenced Draft Environmental Impact Statement ("DES") published at 41 Fed. Reg. 12937 and the solicitation of comments on that DES as contained in the Notice of Availability, the New York State Attorney General submitted a series of comments on the DES. It was noted in the Attorney General's filing of May 17, 1976 that the DES did not address the issues set forth in the materials previously submitted by the office to the NRC in the course of this administrative proceeding on transportation of nuclear materials as originally noticed in the Federal Register. 40 Fed. Reg. 23768 (June 2, 1975). More specifically the DES did not address the materials submitted by way of this office's letter, dated July 2, 1975, which letter and materials are apparently on file in the Commission's public docket room.

It has been brought to our attention that, as with the DES, the unreleased final environmental impact statement ("FES") ignores the above described

materials and, in part, subsequent filings. In addition, we have been informed that certain comments are dismissed as being based on "unconfirmed analysis." Such a response to the comments, calculations and estimates of this office is meaningless and displays a failure by staff to resolve factual disputes. All the comments and supporting materials filed by this office must be responded to in a thorough manner in order for the Commission to comply with the Guidelines of the Council on Environmental Quality under the National Environmental Policy Act, 42 U.S.C. § 4321 et seq. It is particularly appropriate for the Commission to attend to this matter now in view of its recent decision to have the FES redrafted.

For your convenience, the filings by this office which have been incorporated into its comments include

letter and enclosures dated July 2, 1975
letter and enclosures dated August 12, 1975
letter and enclosures dated February 23, 1976
letter and enclosures dated May 17, 1976
letter (from John F. Shea, III) and enclosures (comments By Dr. Marvin Resnikoff and Peter N. Skinner, P.E.) undated
letter and enclosures dated August 3, 1976
letter and attachment dated August 4, 1976
letter dated August 25, 1976

We hope this letter will further assist you in preparing a thorough FES on the transportation of radioactive materials.

Very truly yours,

LOUIS J. LEFKOWITZ
Attorney General
By

JFS:rab

JOHN F. SHEA, III
Assistant Attorney General