

UNITED STATES OF AMERICA  
NUCLEAR REGULATORY COMMISSION

ATOMIC SAFETY AND LICENSING BOARD

Before Administrative Judge  
Peter B. Bloch

In the Matter of	)	Docket Nos. 70-00270
THE CURATORS OF	)	30-02278-MLA
THE UNIVERSITY OF MISSOURI	)	RE: TRUMP-S Project
(Byproduct License	)	ASLBP No. 90-613-02-MLA
No. 24-00513-32;	)	
Special Nuclear Materials	)	
License No. SNM-247)	)	

**AFFIDAVIT OF DR. SUSAN M. LANGHORST  
REGARDING ADEQUACY OF SAFETY PROCEDURES, ADMINISTRATIVE  
CONTROLS AND LICENSEE'S PERSONNEL QUALIFICATIONS**

I, Susan M. Langhorst, being duly sworn, hereby state as follows:

1. I am Manager of Reactor Health Physics at the University of Missouri-Columbia Research Reactor Facility ("MURR"), a position I have held since April 16, 1987. My background and experience are described in the Affidavit of Dr. Susan M. Langhorst Regarding NUREG-1140 and Intervenors' Dispersion Concentrations (Licensee's Exhibit 2).

2. As the MURR Health Physics Manager, I was Licensee's major contact person in discussing the proposed TRUMP-S experiments and the progress of the project with NRC Region III personnel. I was responsible for writing and coordinating the internal review of the requests for amendment of License Nos. SNM-247 and 24-00513-32. These requests were forwarded by Licensee's Radiation Safety Officer ("RSO") to NRC Region III as attachments to his amendment request letter. (See Hearing File.) Hence, based on my education, experience, and job responsibilities, I am qualified to discuss the contents of the license amendments, especially in regard to the adequacy of safety procedures, the administrative controls, and the qualifications of personnel responsible for the TRUMP-S experiments in the Alpha Laboratory.

3. I have reviewed the Written Presentation of Arguments of Intervenors and Individual Intervenors ("Intervenors' Written Presentation") (October 15, 1990) including Exhibits 1-19

1 thereof, and other relevant materials, including Intervenor's  
2 Renewed Request for Stay Pending Hearing ("Renewed Stay Request")  
3 (October 15, 1989).

4 4. Herein I discuss the adequacy of the safety procedures  
5 established for the TRUMP-S experiments, the Licensee's  
6 administrative controls for radioactive materials, and the  
7 technical qualifications of Licensee's personnel who have  
8 radiological safety responsibilities. In particular, I describe  
9 the careful, extensive and continuing control Licensee maintains  
10 over the establishment of the Alpha Laboratory and the associated  
11 safety precautions, and over the development of TRUMP-S  
12 researchers, staff and students trained and experienced in the  
13 safe handling of actinide materials.

#### 14 Adequacy of Safety Procedures

15 5. Intervenor's claim that the applications do not contain  
16 the proposed procedures to protect health and minimize danger to  
17 life and property. Intervenor's Written Presentation at 21.  
18 Intervenor then reference § 70.22(a)(8) implying that they refer  
19 to the application for amendment to License No. SNM-247. Id.

20 6. Regulatory Guide 10.3 ("RG 10.3"), "Guide for the  
21 Preparation of Applications for Special Nuclear Material Licenses  
22 of Less Than Critical Mass Quantities" gives additional guidance  
23 to licensees in preparing application for an amendment to a  
24 special nuclear materials license. Section 4.6 of RG 10.3 is  
25 entitled "Proposed Procedures to Protect Health and Minimize  
26 Danger." This section states: "Procedures should be established  
27 to ensure compliance with provisions of 10CFR19 . . . and  
28 10CFR20." This does not mean that each of the procedures must be  
29 attached to the application as Intervenor imply. It means that  
30 the applicant must describe proposed procedures that will achieve  
31 the intent of § 70.22(a)(8). (See §§ 8 - 14, below).

32 7. The NRC recognizes that procedures need to be dynamic,  
33 allowing for revisions on a timely basis by the licensee when an  
34 improvement to procedures is determined. NRC uses this practice  
35 to eliminate the need for a license amendment every time a  
36 procedure needs to be changed. Therefore, the NRC issues a  
37 license or an amendment based on the description of procedures  
38 and not the procedures themselves.

39 8. Licensee, in its application for amendment to License  
40 No. SNM-247, responded to guidance in each of the applicable  
41 subheadings under RG 10.3, Section 4.6 either by description of  
42 proposed procedure or by reference to the January 16, 1989  
43 renewal of License No. SNM-247. Specifically, these were: (a)  
44 Section 4.6.1 "Specification of Radiation Safety  
45 Responsibilities and Duties" (see page 17 of application); (b)  
46 Section 4.6.2, "Personnel Monitoring" (see page 17 of



1 application); (c) Section 4.6.3, "Radiation Survey Program" (see  
2 page 18 of application); (d) Section 4.6.4, "Waste Disposal" (see  
3 pages 18, 19 of application); (e) Section 4.6.5, "Record  
4 Management" (see page 19 of application); (f) Section 4.6.6,  
5 "Material Control Provision" (see pages 19 & 20 of application);  
6 (g) Section 4.6.8, "General Safety Instructions" (see pages 20 &  
7 21 of application); (h) Section 4.6.9, "Emergency and  
8 Decontamination Procedures" (see page 21 of application); and (i)  
9 Section 4.6.10, "Procedures for Training Personnel" (see page 21  
10 of application). No information was required under Section  
11 4.6.7, "Sealed-Source Leak Checking Provisions," since the  
12 amendment was for material in an unsealed form.

13 9. Most of the responses to RG 10.3, Section 4.6, in the  
14 application referenced previously submitted information contained  
15 in the January 16, 1989 license renewal. This is consistent with  
16 § 70.21(a)(3) which states "Information contained in previous  
17 applications, statements or reports filed with the Commission may  
18 be incorporated by reference if the references are clear and  
19 specific."

20 10. The Intervenors are incorrect in stating that  
21 procedures must be submitted as part of the application.  
22 Intervenors' Written Presentation at 22. All that is required to  
23 be submitted are descriptions of the procedures that will meet  
24 the intent of § 70.22(a)(8). This was done as described above.

25 11. Intervenors question whether the procedures would ever  
26 have been written if Intervenors had not intervened, and say this  
27 is an open question. Intervenors' Written Presentation at 21-22.  
28 Again, they are incorrect. References to requirements and  
29 procedures specific to use of radioactive materials in the TRUMP-  
30 S experiments were made in the amendment application (see  
31 Amendment Request, License No. SNM-247):

32 "The specific radiological safety requirements for the safe  
33 handling of the uranium and plutonium in this project are  
34 being established by the MURR Health Physics Group." (p. 3,  
35 Individuals Responsible for the Radiation Safety Program and  
36 Their Training and Experience)

37 "The experimental procedure and precision of the  
38 measurements will be established before starting these  
39 measurements." (p. 13, General Process Procedures, in  
40 reference to Np, Pu, and Am measurements)

41 "Persons allowed access and use of radioactive materials in  
42 the Alpha Laboratory will be trained on the specific  
43 procedures developed for that facility." (p. 21, Item 10.  
44 Procedures for Training Personnel)

45 Drafting of the procedures began in March 1990 and drafts were

1 issued for comment beginning on April 11, 1990 (see ¶ 39, below).  
2 The drafting process was well advanced by the time Intervenor  
3 filed their intervention on May 10, 1990. The procedures were  
4 completed on schedule when needed for initiation of the  
5 experiments involving actinide materials.

6 12. Moreover, the necessary procedures must be written,  
7 approved, <sup>1/</sup> reviewed, and in place, prior to obtaining  
8 approval from the Isotope Use Subcommittee for authorization to  
9 use the material in the TRUMP-S experiments. (see ¶ 39, below)  
10 Compliance to this commitment to have specific procedures for the  
11 TRUMP-S experiments is checked by NRC inspection, so there is no  
12 open question about whether the procedures would ever be written.  
13 These proposed procedures were written and approved prior to use  
14 of the SNM licensed material and Licensee will be inspected for  
15 compliance by NRC inspection.

16 13. The Standard Operating Procedures for TRUMP-S  
17 experiments ("TAMs") include many of the procedures described in  
18 the SNM-247 application, particularly under General Procedures,  
19 Material Control Procedures, Health Physics Procedures, and  
20 Emergency Procedures. Other procedures that meet the requirement  
21 of § 70.22(a)(8) already existed at MUR. as part of the Emergency  
22 Plan Implementing Procedures or are embodied in the Handbook of  
23 Radiological Operations that is part of the SNM-247 license  
24 (condition no. 16).

25 14. The new TAMs and the changes to the FEP's and Reactor  
26 Operations SOP's meet or exceed the procedural requirements  
27 specified in § 70.22(a)(8).

28 15. Intervenor's criticism of TAM-62 (Intervenor's Written  
29 Presentation at 22) was addressed in the Affidavit of Walter A.  
30 Meyer, Jr., Regarding Emergency Planning (Oct. 30, 1990) at 18-  
31 19, ¶¶ 61-65. Intervenor took one sentence out of context from  
32 a procedure, which in turn is a part of a set of procedures used  
33 to perform experiments with TRUMP-S materials.

34 16. Intervenor's Exhibit 3 suggests that Licensee needs to  
35 have a detailed procedure for subdivision of the actinide metal  
36 inventories. The steps of physically performing this separation  
37 are described below. The safety of this particular evolution, as  
38 well as accountability for each piece of material, is ensured by  
39 the health physics procedures, glove box operational procedures

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40 <sup>1/</sup> Authorization to begin experiments with depleted uranium  
41 was approved to begin with draft procedures under a  
42 radiation work permit ("RWP"). (see Attachment 3, June 6,  
43 1990 minutes). However, experiments utilizing depleted  
44 uranium were not begun until the procedures were  
45 approved.



1 and the material control and accounting procedures included in  
2 TRUMP-S TAMs.

3 17. This evolution involves transferring the actinide  
4 material (in double sealed containers in an inert atmosphere)  
5 into the glove box. This is only done with glove box atmosphere  
6 at less than 10 ppm of oxygen, nitrogen, and water vapor, 2/  
7 and no heat source on in the glove box. The entire inventory of  
8 a particular actinide material is only handled once. The  
9 shipping (or storage) container (double sealed in an inert  
10 atmosphere) is brought from the MURR fuel vault to the Alpha  
11 Laboratory by the Special Nuclear Materials Custodian with the  
12 assistance of a second person as per TAM-21, "Transfer of  
13 Actinides." In the Alpha Laboratory, the shipping containers are  
14 opened and the sealed inner container is passed into the argon  
15 glove box under special precaution of Health Physics procedure  
16 TAM-35, "Transfer of Actinide Metal into the Glove Box."

17 18. Using methods appropriate to the nature of the  
18 container (double, nested, welded stainless steel for Np; and  
19 sealed glass for Pu) the material is opened and unpacked by a  
20 senior TRUMP-S researcher. As the material is subdivided, it is  
21 weighed repeatedly to maintain accurate material inventory as per  
22 TAM-22, "Actinide Sample Subdivision & Storage." Hand tools are  
23 chosen to do this subdivision as is appropriate for the physical  
24 form and properties of each material, i.e., tweezers to remove a  
25 few turnings of Np, or bolt cutters to nip off a small piece of  
26 Pu. A small amount of the material, approximately 0.3 grams, is  
27 removed for use in the experiments. During these operations, no  
28 heat source is turned on and the material can be readily placed  
29 in a covered metal container. Thus, the risk of a fire during  
30 this limited period is extremely small.

31 19. The stock material to be returned to the fuel vault for  
32 storage is sealed in a stainless steel vial (screw top, O-ring  
33 seal) which is then placed in an aluminum canister that is sealed  
34 (bolted lid, O-ring seal). This canister is passed through the  
35 air glove box, as per TAM-12, "Glove Box Transfers," and enclosed  
36 in airtight bags ("bagged out") as per TAM-14, "Bagging Material  
37 In and Out of a Glove Box." The material is placed in a  
38 transport can and returned to the Special Nuclear Materials  
39 Custodian for return to the vault (again, as per TAM-21,  
40 "Transfer of Actinides"). The separated piece of material is  
41 placed in a sealed container inside the argon glove box where it  
42 remains until it is used to make the actinide salt mixture needed  
43 for experiments.

44 20. Subsequent access to the remaining inventory is

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45 2/ See License No. SNM-247 Amendment Request, p. 10,  
46 Experimental Equipment.

1 accomplished by the same procedures. The only difference in  
2 obtaining access to the remaining inventory is that the container  
3 for the special nuclear materials is already "bagged" when it is  
4 placed in the air glove box. Therefore, the bag must be removed  
5 (inside the glove box) before the container can be opened.

6 21. Procedures presently require that a minimum of two  
7 persons be present during all procedures involving the transfer  
8 and handling of the actinide materials. Control room personnel  
9 are also notified whenever the inventory has been removed from  
10 the vault, as is required for vault entry under a Physical  
11 Security Plan procedure.

12 22. In summary, contrary to what Intervenors state,  
13 procedures as required by §70.22(a)(8) were described in the SNM-  
14 247 amendment application. Further, procedures exist to safely  
15 transfer material to the glove box, perform a subdivision of  
16 materials under the cognizance of a health physicist and material  
17 custodian, and then return the actinides to safe storage. This  
18 process involves several procedures with overlapping safety and  
19 accountability requirements.

#### 20 Qualifications of Personnel

21 23. Intervenors claim that the amendment applications fail  
22 to demonstrate technical qualifications and that the Licensee's  
23 personnel are not qualified to engage in the TRUMP-S experiments.  
24 Intervenors' allegations are absolutely without merit and  
25 Licensee is offended by Intervenors' statements.

26 24. Byproduct License No. 24-00513-32 is a Type A specific  
27 license of broad scope, as defined in § 33.11(a). 1/  
28 Requirements for approval of a Type A broad scope license are  
29 specified in § 33.13: "Requirements for the issuance of a Type A  
30 specific license of broad scope." Section 33.13(c) requires,  
31 among other things, that:

32 "The applicant has established administrative controls and  
33 provisions relating to organization and management,  
34 procedures, record keeping, material control, and accounting  
35 and management review that are necessary to assure safe  
36 operations, including:

37 (1) The establishment of a radiation safety committee  
38 composed of such persons as a radiological safety officer, a

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39 1/ See renewal application for License No. 24-00513-32,  
40 dated January 29, 1980. Renewal application was made  
41 using Form NRC-313I, as directed by Regulatory Guide 10.5  
42 ("RG 10.5"), "Applications for Type A Licenses of Broad  
43 Scope," Revision 1, December 1980.



1 representative of management, and persons trained and  
2 experienced in the safe use of radioactive materials;..."

3 As stated in RG 10.5:

4 "One of the main functions of the radiation safety committee  
5 is to administer the institution's radioactive material  
6 program. The committee should have the authority and  
7 responsibility for approval and disapproval of all proposals  
8 for radionuclide use prior to purchase of the materials."

9 This committee is thus designed to act as the Licensee's internal  
10 governing body which is responsible for the review, approval, and  
11 control of work performed under the license. Licensees are  
12 specifically directed by RG 10.5 on how the licensee should  
13 complete Item 6. "Individual Who Will Supervise Use" to state  
14 this commitment:

15 "For this item the applicant should write: 'Radioactive  
16 materials are to be used by or under the direct supervision  
17 of individuals designated by the radiation safety  
18 committee.'"

19 This committee's review must encompass the same types of reviews  
20 as are made by the NRC in approving license applications, 4/  
21 i.e., purpose is authorized by the license, equipment and  
22 facilities are adequate to protect health and minimize danger to  
23 life or property, and the applicant is qualified by training and  
24 experience to use the material for the purpose requested in such  
25 manner as to protect health and minimize danger to life or  
26 property. Quite appropriately, the NRC requires that a licensee  
27 granted such broad scope responsibilities must have "engaged in a  
28 reasonable number of activities involving the use of byproduct  
29 material" (see § 33.13(b)). The Licensee has engaged in multiple  
30 activities involving use of byproduct materials and had held a  
31 Type A specific license of broad scope since November 17, 1961  
32 5/

33 25. Licensee also holds NRC License No. SNM-247 for source  
34 and special nuclear material (as per 10 CFR 40 and 70).  
35 Licensee's radiation safety committee has committed 6/ to take

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36 4/ See § 30.33 and § 40.34 : "General requirements for  
37 issuance of specific licenses", and § 70.23:  
38 "Requirements for the approval of applications".

39 5/ U.S. AEC License 24-513-32, issued November 17, 1961.

40 6/ See the application for renewal of SNM-247 License, dated  
41 January 26, 1989, Attachment B: "Handbook of Radiological  
42 Operations," (the "Handbook") Part 1.0: "Management of

1 the additional responsibilities for the review, approval, and  
2 control of work performed under License No. SNM-247. Licensee  
3 has submitted the Handbook with renewals of License No. SNM-247  
4 to describe this same type administrative control for source and  
5 special nuclear material since October 22, 1981. 7/ The NRC has  
6 recently reviewed and approved Licensee's administrative control  
7 of License No. SNM-247. 8/

8 26. Licensee's radiation safety committee is the Central  
9 Radiation Safety Committee ("CRSC"). The principal functions and  
10 duties of the CRSC are described in the Handbook in Section 1.2.  
11 Included in this description are the duties of the Subcommittees  
12 of the Central Committee (Handbook, §1.2.1), the Local and Human-  
13 Use Committees (Handbook, §1.2.2), the membership (Handbook,  
14 §1.2.3), the schedule of meetings (Handbook, §1.2.4), and the  
15 procedure for conduct of business (Handbook, §1.2.5). The CRSC  
16 has established local committees at each of the four University's  
17 campuses, at the two medical centers and at the MURR. The CRSC  
18 delegates to its local committees the responsibility for the  
19 review of applications for use of radiation sources on each  
20 campus of the University of Missouri. The Isotope Use  
21 Subcommittee ("IUS") of the Reactor Advisory Committee serves as  
22 the local committee for the CRSC in reviewing MURR applications  
23 to use radiation sources not covered by License No. R-103.

24 27. Resumes of the current IUS chairman (Dr. G.J. Ehrhardt)  
25 and the other current members of the IUS (Mr. S.L. Gunn, Dr. S.M.  
26 Langhorst, Mr. W.A. Meyer, Jr., Mr. J.G. Shotts, Dr. A.Y. Sun, and  
27 Dr. K.R. Zinn) were provided with each of the license amendment

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28 Radiation Safety", Note 1:

29 The program described in this Section is directed  
30 to the University's responsibility for radiation  
31 safety for programs conducted under NRC byproduct,  
32 source, and special nuclear material licenses, for  
33 programs conducted under the Missouri Radiation  
34 Protection Regulations, and for programs using  
35 hazardous non-ionizing sources. A separate program  
36 described elsewhere is directed to the University's  
37 responsibility for radiation safety for programs  
38 conducted under NRC licenses R-79 and R-103.

39 7/ See License No. SNM-247 Amendment No. 9, Condition 18.

40 8/ See License No. SNM-247 Amendment No. 10, dated March 22,  
41 1989, which incorporates renewal application in Condition  
42 16. of the license.



1 requests. 9/ These resumes were included in each amendment  
2 request to provide additional information on the qualifications  
3 of the current membership of the local committee which is  
4 responsible for the radiation safety program of the research work  
5 to be conducted with the actinide materials in the MURR Alpha  
6 Laboratory. All members of the IUS are authorized users of one or  
7 more isotopes at the University and/or members of one of the  
8 University's Health Physics organizations. Each member of the  
9 IUS is trained and experienced in the safe use of radioactive  
10 material. All of the members, except Dr. Sun, have had  
11 responsibilities for handling curie amounts of radioactive  
12 material, including alpha, beta, gamma, or neutron radiation  
13 sources. In addition, Dr. Ehrhardt has had responsibilities as a  
14 graduate student in handling unsealed alpha emitters at  
15 Washington University in St. Louis, MO. 10/ and Mr. Shotts has  
16 had experience in decontaminating and decommissioning several of  
17 the University's laboratories used for radium research. 11/  
18 Several (Dr. Ehrhardt, Mr. Gunn, Dr. Langhorst, Mr. Meyer, and  
19 Dr. Zinn) are trained in the safe handling of these materials in  
20 glove boxes, in hot cells, and in other specially designed  
21 facilities.

22 28. The resumes of the two senior members of the MURR  
23 Health Physics Group (Dr. Langhorst and Mr. Ernst) were supplied  
24 again for NRC review to emphasize the experience and  
25 qualifications of those individuals responsible for implementing,  
26 training, and maintaining the day-to-day operation of the  
27 radiation protection program at MURR. Both Dr. Langhorst and Mr.  
28 Ernst are Certified Health Physicists, have worked at the MURR  
29 for a total of 16 years, and have completed graduate degrees and  
30 special training specific to health physics and radiation  
31 protection. 12/ Dr. Langhorst and her Health Physics Group

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32 9/ Appendix B appears in the License Amendment Request for  
33 SNM-247, dated February 21, 1990, and the License  
34 Amendment Request for 24-00513-32, dated March 12, 1990.  
35 See Attachment 1 for cover page of Appendix B which lists  
36 the individuals whose resumes were enclosed and  
37 identifies their responsibility.

38 10/ Work done from 1970 to 1976 with enriched uranium (93.2%  
39 U-235) under License No. SNM-1891 and with Ra-228 and Ac-  
40 227 under Missouri State Registration.

41 11/ Work performed the summer of 1982 under Missouri State  
42 Registration.

43 12/ Mr. Ernst has had the same radiological emergency  
44 response training as Dr. Langhorst to be a member of  
45 MoNET. (See Affidavit of Dr. Susan M. Langhorst Regarding  
46 NUREG-1140 and Intervenors' Dispersion Concentrations at

1 are responsible for the radiological training program at MURR,  
2 which is recommended in RG 10.5 as:

3 "Conducting training programs and otherwise instructing  
4 personnel in the proper procedures for the use of  
5 radioactive material prior to use, at periodic intervals  
6 (refresher training), and as required by changes in  
7 procedures, equipment, regulations, etc." (see p. 10.5-6, b.  
8 "Radiation Safety Officer", item (7)).

9 29. The applications for license amendments did not  
10 identify or include the resumes of authorized users of the  
11 licensed materials, except for Dr. R.A. Hultsch (as discussed  
12 below). Instead, as recommended by the NRC, the applications  
13 included the resumes of the members of the IUS who would approve  
14 such authorized users (see §§ 26 - 27, above) and the training  
15 that would be received by prospective users prior to  
16 authorization (see §§ 31 - 32, below).

17 30. The resume of the initial authorized user (Dr. R.A.  
18 Hultsch) was included in the applications. Dr. Hultsch was  
19 approved (February 14, 1990) by the IUS solely to receive and  
20 possess the actinide materials and to act as custodian  
21 responsible for material accountability. See Attachment 2,  
22 "Application for Possession and Use of Radiation Sources by Dr.  
23 Roland A. Hultsch, PhD." The IUS did not authorize use of these  
24 materials in the TRUMP-S experiments at the time of Dr. Hultsch's  
25 approval for receipt and possession. (see § 39, below) As is  
26 shown by his application, Dr. Hultsch had been responsible for  
27 fuel management and had been custodian for all source and special  
28 nuclear material licensed under R-103 for six years.

29 31. Training to establish the authorized users for the  
30 actinide experiments to be conducted in the Alpha Laboratory was  
31 described in the amendment requests. The progression of the  
32 planned work involving the actinide materials was described in  
33 the amendment requests under the General Process Procedures  
34 section. Description of this progression was included to show  
35 that experiments of this type involving rare earth materials had  
36 already been conducted by Rockwell, and that the initial  
37 experiments would be repeated in the Alpha Laboratory to verify  
38 operation of the equipment and to establish and refine the  
39 associated procedures. As stated in the SNM-247 License  
40 Amendment Request 13/:

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41 § 6)

42 13/ The identical section is found in the 24-00513-32 License  
43 Amendment request with the exception that "neptunium" was  
44 inadvertently substituted for "uranium" in the first  
45 paragraph.



1           "When the emf cell has been installed, its components  
2 will be checked and a series of runs with a rare-earth metal  
3 repeated to verify operation of the instruments and  
4 procedures. Initial actinide measurements will be made on  
5 depleted uranium. The emf measurements will be made at  
6 eight to twelve compositions on three isotherms. Depleted  
7 uranium has the lowest specific activity and some data are  
8 already available to compare with the new measurements. The  
9 uranium experiments may be repeated to improve the  
10 experimental statistics of the cell measurements.

11           The measurements will proceed through the actinide  
12 series: Np, Pu, and Am. As the specific activity of the  
13 active metal increases, the number of measurements will be  
14 minimized to about eight compositions on three isotherms.  
15 The experimental procedure and precision of the measurements  
16 will be established before starting these measurements. It  
17 is anticipated that measurements can be made using as little  
18 as 100 mg of the radioactive metal."

19           32. Due to the sophisticated nature of the experiments and  
20 the associated precautions required when handling unsealed long-  
21 lived alpha-emitting isotopes, the Licensee demonstrated its  
22 commitment to training the initial authorized users on the  
23 equipment and process by indicating that initial training would  
24 be done by an experimenter who had helped to develop the  
25 experiment and had actually performed the experimental  
26 measurements on rare-earth materials. Specifically, the  
27 amendment requests stated 14/ the following concerning the  
28 procedures for training personnel:

29           "The training responsibilities were described in the  
30 January 16, 1989 license renewal and remain the same.  
31 Persons allowed access and use of radioactive materials in  
32 the Alpha Laboratory will be trained on the specific  
33 procedures developed for that facility. Initial training on  
34 the experimental equipment and process will be provided by  
35 Mr. Jeff Roy. He has assisted in the design of this  
36 experiment and he has performed the rare-earth experiments.  
37 The resume for this individual is included to provide  
38 additional information on his qualifications."

39           Mr. Roy's experience is in the use of this equipment and in the  
40 process, not in the handling of radioactive materials. His  
41 contribution as a trainer has been to instruct the Licensee's  
42 initial authorized users in the experimental protocol and use of  
43 the equipment. Such sophisticated chemical experiments are  
44 highly dependent on experimental technique. Licensee wanted this  
45 training in technique to be done without the use of radioactive

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46           14/ From amendment request for License SNM-247.

1 materials. Mr. Roy has been in the role of trainee with respect  
2 to the requirements and proper handling of radioactive materials  
3 and has been under the direct supervision of one of Licensee's  
4 authorized users when he has assisted in experiments involving  
5 actinide materials.

6 33. In summary, the IUS is responsible for controlling the  
7 use of radioactive materials in the TRUMP-S experiments; Dr.  
8 Langhorst and the MURR Health Physics Group are responsible to  
9 provide training to prospective authorized users in the  
10 requirements for safe handling of radioactive materials,  
11 particularly alpha-emitters and their use in TRUMP-S experiments;  
12 and Mr. Roy was responsible to train the initial TRUMP-S  
13 authorized users in the techniques and setup of the TRUMP-S  
14 experiments. The initial TRUMP-S experimenters were to first  
15 learn and perfect their experimental techniques on non-  
16 radioactive materials (rare earth materials). Radiological  
17 control training specific to the TRUMP-S experiments was next  
18 conducted with the initial experimenters using depleted uranium  
19 under Dr. Langhorst's or Mr. Ernst's direct supervision. Once  
20 proficiency in technique and radiological control were  
21 demonstrated, the TRUMP-S experimenters could apply for their own  
22 authorization to conduct the TRUMP-S experiments. The  
23 progression of experiments would follow the progression of  
24 specific activity associated with the actinide metals for this  
25 project, i.e., depleted uranium, neptunium, plutonium, and  
26 americium. The experiments, equipment, techniques, procedures,  
27 training and experience could thus be established, reviewed, and  
28 modified as needed to progress to the next element.

#### 29 IUS Review of Authorized Users

30 34. In order to obtain approval to work with radioactive  
31 materials at the University of Missouri, a faculty or staff  
32 member must apply for status as an authorized user. See  
33 Handbook, §5.1. This application is made utilizing University  
34 forms RadSafe 9 and RadSafe 10 (See Attachment 2) which describe:  
35 the radioactive materials and quantities to be used; where  
36 radioactive material will be used; proposed use and plan of  
37 investigation; plan for personnel monitoring, radiation  
38 protection, and disposal of radioactive wastes; equipment and  
39 facilities for radiation safety of workers and the public; and  
40 training and experience of the applicant with regard to  
41 radioactive materials. At MURR, these application forms are  
42 completed by the applicant in conjunction with the Reactor Health  
43 Physics Manager to insure that licensing, facilities, equipment,  
44 additional personnel, procedures (operational and emergency), and  
45 applicant training and experience are sufficient to perform  
46 safely the described work with radioactive materials.

47 35. Following the Health Physics Evaluation, the  
48 application is reviewed by the IUS. This review can result in



1 the approval of the authorized user, the approval of the  
2 authorized user with additional recommendations or conditions, a  
3 request for further information or documentation, or denial of  
4 the authorized user. Approved RadSafe 9 and 10 documents are  
5 forwarded to the University Radiation Safety Officer for his  
6 review and for centralized documentation. The approved  
7 authorization is also presented for review to the CRSC and, for  
8 authorizations at MURR, to the Reactor Advisory Committee.  
9 Authorizations are limited to personnel supported through the  
10 University.

11 IUS Control of the Radiological  
12 Protection Program for the TRUMP-S Experiments

13 36. The TRUMP-S experiments to be conducted at MURR are  
14 carefully reviewed by the members of the IUS. The committee  
15 recognized and appreciated the potential hazards and related  
16 precautions needed to handle unsealed transuranic materials, the  
17 sensitivity of working with these types of radioactive materials,  
18 and the benefit and need to obtain the basic scientific data on  
19 these materials. Excerpts of the pertinent sections of the  
20 minutes of the IUS reflecting the thorough and intense  
21 discussions concerning the TRUMP-S experiments are provided in  
22 Attachment 3.

23 37. The involvement of the IUS in reviewing the TRUMP-S  
24 experiments began at its January 10, 1990 meeting, prior to  
25 submitting the proposal for funding to Rockwell. The project was  
26 described to the committee; its purpose, the academic interest,  
27 and the scope of work. The IUS emphasized the importance of  
28 having personnel who were experienced in handling alpha emitters,  
29 and that it would have the responsibility of reviewing and  
30 approving personnel who would be working with the actinide  
31 materials. The role of Rockwell as a training resource with  
32 personnel having experience in working with alpha emitters was  
33 included in this discussion, with the possibility of sending  
34 University personnel to Rockwell to gain additional experience  
35 and knowledge of the specialized equipment for the TRUMP-S  
36 experiments, 15/ or requesting that Rockwell send one of their

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37 15/ On January 24, 1990, MURR personnel (Chester Edwards,  
38 Brad McCracken, and John Ernst) traveled to Los Angeles  
39 to visit the Santa Susana Field Laboratory. The purpose  
40 of the trip was to evaluate laboratory equipment that  
41 would be provided to support the TRUMP-S experiments.  
42 This equipment included the argon glove box, the Nitrain  
43 and Dritrain units, the ICP and glove box, computer, HEPA  
44 filters and housing, and radiation monitoring equipment.  
45 They spent a day and a half touring labs and talking with  
46 Rockwell personnel concerning the design of an alpha  
47 handling laboratory, equipment needed to support such a

1 health physics personnel to MURR. The Intervenors have stated  
2 their concern on personnel experience as follows:

3 "The inexperience of the personnel has obvious, frightening  
4 implications in terms of the safety concerns of the  
5 Intervenors." (Intervenors' Written Presentation at 24)

6 Yet they fail to acknowledge the role of the IUS and the steps it  
7 has taken, even though the Intervenors have included the excerpt  
8 of these January IUS minutes of their presentation. Intervenors'  
9 Exhibit 19, pp. 343-344.

10 38. In reading the entire section of these minutes  
11 concerning the IUS's initial discussion of TRUMP-S, the strong  
12 commitment of the committee is evident, particularly in regard to  
13 emphasizing the training and experience required to become an  
14 authorized user for the first phase of the work to insure safe  
15 performance of these experiments. In addition, the IUS was  
16 particularly adamant that adequate support be provided for health  
17 physics coverage of the project. It was recognized by the  
18 committee that the scope of the radiation protection program  
19 required for this project would add significantly to the overall  
20 scope of the radiation protection program at MURR. The IUS  
21 emphasized its strong support of the MURR Health Physics Group in  
22 establishing the necessary equipment and specific radiological  
23 control for this project. The committee viewed this support to  
24 be in terms of salary support of MURR Health Physics personnel,  
25 equipment and additional training. The committee did not lack  
26 confidence in the qualifications and experience of the MURR  
27 Health Physics Group to be able to perform this task, but rather  
28 voiced its concern that the necessary resources be provided to  
29 maintain the proposed schedule. They were also emphatic on the  
30 committee's control of authorizations for this project and on the  
31 point that they would pay particular attention to the proposed  
32 authorized users' training and experience in handling these  
33 materials.

34 39. The progression of the IUS's thorough continuing  
35 review, questioning, and control of the radiological protection  
36 program aspects of this project is evident in the subsequent  
37 meeting minutes (see Attachment 3 for excerpts of these minutes),  
38 a summary of which follows:

39 1) February 14, 1990 IUS meeting --

40 The committee was provided a draft of the SNM-247  
41 amendment request previous to the meeting and discussed its  
42 contents page by page. Included in the committee's

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43 laboratory, and the special equipment required for  
44 conducting the TRUMP-S experiments.



1 discussion was the University's RSO (Mr. Pitchford), the  
2 Assistant RSO (Mr. Young), the TRUMP-S project manager (Mr.  
3 McKibben), and the facilities manager (Mr. Edwards). Safety  
4 features were reviewed. The possibility of "an ex-  
5 experienced health physics technician" being sent from  
6 Rockwell 16/ was discussed again to provide an additional  
7 person to contribute to the radiological control needed at  
8 the beginning of the project. The commitment to training  
9 authorized users and establishing procedures is evident in  
10 the following statement:

11 "The proposed authorized users for the TRUMP-S project  
12 are not ready to apply for authorization. The  
13 facilities must be tested, the procedures established  
14 and training documented. These procedures and training  
15 will be reviewed by the IUS in their next few  
16 meetings."

17 The IUS reviewed and, in light of the plans for establishing  
18 facilities capable of safely performing these experiments,  
19 approved Dr. R.A. Hultsch as the TRUMP-S authorized user to  
20 act as material custodian. With approval of this initial  
21 authorization to receive and possess these actinide  
22 materials, the University could initiate its request for  
23 license amendments.  
24

25 2) March 21, 1990 IUS meeting --

26 The IUS approved authorization for Dr. S.M. Langnorst  
27 (Manager of MURR Health Physics Group) to be the authorized  
28 user responsible for use of the depleted uranium 17/ in  
29 the TRUMP-S experiments. In this role, Dr. Langhorst was  
30 given the double responsibility as the local radiation  
31 safety officer and as the authorized user to train and  
32 establish the radiological control experience of the  
33 researchers identified as being initial authorized users for  
34 TRUMP-S experiments. Dr. Krueger was identified as being  
35 one of the initial authorized users for the TRUMP-S  
36 experiments. Update of the progress in construction of the  
37 Alpha Laboratory and licensing work also reported.

38 3) April 11, 1990 IUS meeting --

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39 16/ Rockwell was not able to provide an HP, but provided  
40 support for hiring an HP consultant and made available  
41 their HP personnel via telephone as an informational  
42 resource for MURR HP personnel.

43 17/ It was noted that the work with depleted uranium could  
44 also be licensed under a general license, 10 CFR 40.22:  
45 "Small quantities of source material".

1 The first set of draft operational procedures for the  
2 TRUMP-S project were distributed and the committee members  
3 were requested to provide their comments on them. Progress  
4 of the testing of the Alpha Laboratory facilities and the  
5 licensing update were reported. Again, training and its  
6 documentation were emphasized (Item 5a., 3rd para):

7 "The question of documenting training for these  
8 procedures was raised; in reply it was noted that the  
9 rare-earth work will serve to test the procedures and  
10 train the experimenters. At this time only uranium has  
11 been authorized for these experiments by the IUS."

12 Dr. Krueger was identified to be the primary glove box  
13 operator for the TRUMP-S experiments and his initial  
14 training on mastering the experimental techniques began  
15 during this time. 1E/

16 4) May 16, 1990 IUS meeting --

17 The IUS was brought up to date on the progress of the  
18 facilities and procedures, the initiation of the current NRC  
19 proceeding, the receipt of some of the actinide samples, and  
20 the hiring of an alpha consultant.

21 5) June 6, 1990 IUS meeting --

22 Updates were provided on the procedures, facilities,  
23 rare-earth experiments to date, the NRC proceeding, and the  
24 alpha consultant. John Ernst was approved as an authorized  
25 user for depleted uranium. Mr. Ernst was authorized for the  
26 same purpose as Dr. Langhorst, i.e., to continue to provide  
27 the required radiological training of the TRUMP-S  
28 researchers (in particular, Drs. Krueger and Storvick).  
29 During this time the TRUMP-S researchers were, under Dr.  
30 Langhorst's and Mr. Ernst's direction, utilizing and further  
31 developing the TAMS procedures in working with the rare  
32 earth experiments. Also at this time, Dr. Langhorst's  
33 responsibilities were being required more and more in  
34 support of the NRC proceeding to continue the TRUMP-S work.  
35 Again the IUS voiced its strong control and support of the  
36 TRUMP-S research (Item 5c., 3rd para.):

37 "With respect to the questions raised on safety of this

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38 1E/ On April 30, 1990, Dr. Leon Krueger traveled to Los  
39 Angeles to visit the Santa Susana Field Laboratory. He  
40 received three days of training by Mr. Roy (see ¶ 32,  
41 above) on conducting the TRUMP-S experiments using rare  
42 earth materials in an argon glove box identical to the  
43 one in the Alpha Laboratory.



1 project, it was asserted that the risks are minimal; it  
2 is very hard to get these materials airborne and keep  
3 them airborne. It was the sense of the IUS that the  
4 Subcommittee has been adequately informed; also, the  
5 IUS has so far approved only the use of U in this  
6 research project, not Np, Pu, or Am. It was also noted  
7 that the IUS has been sensitive to this issue and has  
8 expressed the commitment to 'do this project right.'

9 6) July 17, 1990 IUS meeting --

10 Based on his glove box experience, Dr. Langhorst and  
11 Mr. Ernst approved Dr. Kruegger to work with depleted  
12 uranium under their authorizations in order to further  
13 develop his experience in radiological controls. Dr. L.  
14 Krueger's application to be allowed to work under Dr.  
15 Langhorst's and Mr. Ernst's authorization to handle depleted  
16 uranium was presented to the IUS for review of his training,  
17 especially with respect to working in the argon glove box.  
18 The committee was provided a copy of the approved TRUMP-S  
19 Procedures. Updates again were given on the progress of  
20 experiments, on the current NRC proceeding, and on  
21 communication efforts. Again, the IUS strongly stated its  
22 control of this project (Item 5a., 2nd para.):

23 "It was remarked that it is the responsibility of the  
24 IUS to see that learning occurs with the U and Np  
25 isotopes; if the TRUMP-S workers can not handle Np,  
26 they shouldn't use Am or Pu! The IUS was reminded that  
27 they have approved receipt of these materials only, and  
28 only the use of U at this time. Check-off sheets have  
29 been prepared for each material; the isotope will not  
30 be used before everything is ready as assessed via  
31 these check-off sheets. Some work with (non-DOE)  
32 uranium tetra-chloride may begin later this week to  
33 test some of the procedures and get some data.  
34 Currently the procedures are being tested with rare-  
35 earths."

36 In addition, the committee discussed the alpha consultant's  
37 recommendations of an additional HEPA filter and plans for  
38 possible installation. The point by point review of a June  
39 19, 1990 memorandum describing the consultant's observations  
40 was scheduled for the next meeting. The IUS was informed of  
41 the NRC's inspection of the Alpha Laboratory.

42 7) August 15, 1990 IUS meeting --

43 Dr. Krueger's application for authorization to use  
44 depleted uranium and neptunium in the TRUMP-S project was  
45 presented. Based on his proven safe handling of depleted

1 uranium in the TRUMP-S experiments and Dr. Langhorst's and  
2 Mr. Ernst's recommendations, Dr. Krueger's authorization for  
3 the depleted uranium was unanimously approved. As part of  
4 its review of Dr. Krueger's neptunium authorization request,  
5 the committee requested update on the progress of the  
6 experiments and specifically they reviewed, point by point,  
7 the recommendations of the alpha consultant and the actions  
8 taken on each. Much discussion centered on the additional  
9 HEPA filter recommendation. The committee discussed the  
10 possible scenarios leading to a backflow condition. The  
11 committee considered as incredible the multiple failures  
12 necessary to cause backflow into the Alpha Laboratory  
13 without initiating an alarm to alert the workers in the  
14 Alpha Laboratory of a flow problem. Dr. Langhorst also  
15 noted that, since the additional filter is not shown on the  
16 schematic included in the original application for license  
17 amendment, another amendment might be required to install an  
18 additional filter. The committee reviewed the letter of  
19 DOE's commitment to accept return of the actinide materials  
20 and were updated on the progress of the depleted uranium  
21 experiments. The IUS unanimously approved Dr. Krueger's  
22 authorization for TRUMP-S experiments with neptunium. Dr.  
23 Langhorst also recommended based on Dr. Storvick's training  
24 to date, that he be authorized for use of depleted uranium  
25 and neptunium. Dr. T. Storvick was also unanimously  
26 approved as TRUMP-S authorized user of depleted uranium and  
27 neptunium.

28 8) September 12, 1990 IUS meeting --

29 The IUS was provided a detailed report on the progress  
30 of the TRUMP-S experiments using depleted uranium and  
31 neptunium, and the associated experience with regard to the  
32 radiological control of the experiments by Dr. Krueger, Mr.  
33 Ernst, and Dr. Langhorst. Receipt of the plutonium sample  
34 was reported and Dr. Krueger's application for authorization  
35 to use plutonium was discussed. The experience of Dr.  
36 Krueger in working with depleted uranium and neptunium was  
37 reported, and his attention to experimental detail and  
38 radiological controls noted. The training and experience of  
39 the others involved in handling the materials were also  
40 discussed. Dr. Krueger had been able to develop and  
41 demonstrate his expertise performing the TRUMP-S experiments  
42 first with the rare earth materials, then with depleted  
43 uranium, and then with neptunium. Both Dr. Langhorst and  
44 Mr. Ernst recommended Dr. Krueger be approved for plutonium  
45 based on his demonstrated knowledge and dedication to  
46 maintaining excellent radiological control. The IUS  
47 unanimously approved Dr. Krueger's authorization to use  
48 plutonium in the TRUMP-S experiments. A similar application  
49 for authorization from Dr. Storvick was discussed. The  
50 committee did not feel that Dr. Storvick had been able to



1 gain adequate experience in "hands on" work in the argon  
2 glove box with neptunium. The IUS has established as its  
3 policy to request from users authorized for material greater  
4 than 100 mCi statements of additional training (this is in  
5 addition to the training information given on the  
6 application forms) that is required by the authorized user  
7 to recommend other individuals trained by that authorized  
8 user to either work under his authorization (i.e., TRUMP-S  
9 researcher-in-training or a graduate student) or to become  
10 authorized users themselves (i.e., experienced TRUMP-S  
11 researcher). Because of the complexities of the TRUMP-S  
12 experiments and the activity levels involved with handling  
13 the plutonium and americium samples, the committee directed  
14 Dr. Krueger as follows (Item 2b., last sentence):

15 "Leon was directed to identify critical manipulations  
16 in the Ar glove box, specifically for the purposes of  
17 maintaining radiation safety; these manipulation will  
18 need to be mastered by persons wishing to obtain  
19 authorization to work with Pu or Am."

20 The IUS felt strongly that an authorized user of plutonium  
21 or americium for the TRUMP-S project should be, as Dr.  
22 Krueger has become, a qualified glove box operator. Dr.  
23 Storvick's request for authorization was not approved, but  
24 tabled for consideration at a later date. Updates to the  
25 TRUMP-S procedures and the continuing NRC proceeding were  
26 reported to the committee.

27 40. The IUS met again on October 31, 1990 19/ and a  
28 draft of Dr. Krueger's training outline for the TRUMP-S work was  
29 reviewed (see Attachment 4). The committee was pleased with the  
30 training outline and added a few of their comments to the draft.

31 41. As of November 12, 1990, the IUS has approved only Dr.  
32 Krueger as an authorized user of plutonium, and all TRUMP-S  
33 experiments involving plutonium have been carried out by him. No  
34 application for an authorized user for americium has yet been  
35 filed with the IUS, and such experiments are not scheduled to be  
36 performed until Phase II of the project.

37 42. With respect to the involvement of graduate students,  
38 Intervenor's make the disparaging statement that the handling of  
39 actinide materials:

40 "... by graduate students, even under some modicum of  
41 faculty supervision, causes substantial concern about  
42 mishandling leading to an accident, particularly fire."  
43 Intervenor's Exhibit 15, Declaration of Dr. Theodore B.

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44 19/ Minutes of this meeting are not yet available.

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Taylor at 4.

Of prime importance to the University is the TRUMP-S project's outstanding potential to provide graduate research opportunities having national significance and involving a unique, one of a kind research facility. University students involved in the handling of radioactive materials in the TRUMP-S and related experiments are supervised and guided in their research by experienced authorized users. The students' training, particularly specific to TRUMP-S procedures, and experience in working with radioactive materials are documented and must be reviewed and approved by the authorized user, the Reactor Health Physics Manager, and the IUS. A major role of a University is to educate and train students. Licensee considers the opportunity to give students the "hands-on" training and experience in handling radioactive materials, and the appreciation of safety requirements and management control for these materials to be essential to the role of a university.

43. The deliberations of the IUS are yet another indication of the University's dedication to assure the safe operations of the TRUMP-S project. The insistence and careful review by this committee, particularly in the training and development of the experienced staff deemed necessary to safely conduct work involving the handling of these alpha emitting isotopes in unsealed forms, is abundantly evident throughout the continuing review of this project. Dr. Krueger is MURR's full-time employee, engaged full-time in the TRUMP-S project, who has demonstrated experience in handling depleted uranium, neptunium, and plutonium in unsealed form using the Alpha Laboratory facilities. (Intervenors' Written Presentation at 24)

#### Conclusions

44. Licensee has established, as it committed to do, the safety procedures to conduct the TRUMP-S experiments in a safe manner.

45. Licensee's administrative controls for radioactive materials are strong and well in control of the TRUMP-S experiments.

46. Licensee has the technically qualified personnel who have demonstrated a sound and dedicated radiological control program.

47. In particular, Licensee is deliberate and diligent in its continuing development of TRUMP-S researchers, staff and students trained and experienced in the safe handling of actinide materials.



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Subscribed and sworn  
before me in

BOONE County,  
Missouri this 13<sup>th</sup> day of  
November 1990

*Susan M. Langhorst*

Susan M. Langhorst  
Manager,  
Reactor Health Physics

*Sharon Wasselmann*

Sharon Wasselmann, Secretary Public, State of Missouri  
My commission expires February 21, 1991  
Boone County, Missouri

My Commission Expires

2-21-91

APPENDIX B

RESUMES ENCLOSED

Name/Responsibility

Gary J. Ehrhardt/IUS, Chairman

John P. Ernst/MURR Health Physics

Stephen L. Gunn/IUS member

Rolland A. Hultsch/Custodian

Susan M. Langhorst/MURR Health Physics, IUS member

Walter A. Meyer/IUS member

Jeff J. Roy/Trainer

Jamieson G. Shotts/IUS member

Albert Y. Sun/IUS member

Kurt R. Zinn/IUS member



**UNIVERSITY OF MISSOURI**  
**APPLICATION FOR POSSESSION AND USE OF RADIATION SOURCES**

1. Name of individual user:

Roland A. Hultsch, PhD

2. Date:

2/13/90

3. Department to use material:

MURR

4. Room, building, and telephone:

MURR 882-4211

5. Source(s) to be used:

Uranium (Depleted)  
 Plutonium (94.42 wt %  
 Pu-239, 5.58 wt % Pu-240)  
 Np-237  
 Am-241

6. Form and possession limit required:

any, 100g  
 any, 6g  
 any, 5g  
 any, 5g

7. Proposed use and plan of investigation:

Custodian of actinide metals to be used in TRUMP-S research project. Material will be stored in the MURR Fuel Vault and portions of this stock material transferred to authorized users involved in this research project. Remainder of the stock will be resealed and returned to the vault for storage. As custodian, Dr. Hultsch will maintain material transfer documentation and will perform monthly material balance calculation and quarterly inventory of this material.

8. Plan for personnel monitoring and radiation protection:

MURR Personnel Dosimetry Program and Radiation Protection Program

9. Plan for disposing of radioactive wastes:

LSA waste incorporated into MURR Radwaste Program.

TRU waste stored until DOE can accept the material for disposal--no TRU waste will be generated until a written commitment of DOE's eventual acceptance of TRU waste is received.

Health Physics Evaluation

Campus or Medical Center Review

Date received

2/14/90

Date received

2/14/90

Date evaluated

2/14/90

Date approved

2/14/90

Risk-level classification

S.M. Langford

Committee chairman

D.J. Ehrhardt

Applicant named in item 1

Chairman of department

Roland A. Hultsch

[Signature]

[Signature]

## UNIVERSITY OF MISSOURI TRAINING AND EXPERIENCE OF INDIVIDUAL USER

10. Type of training:	Where trained	Duration of training	On the job (Check box)		Formal course (Check box)	
A. Principles and practices of radiation protection	UMC/MURR	8 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
B. Radioactivity measurement techniques and instruments	UMC/MURR	8 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
C. Mathematics basic to measurement of radioactivity	UMC/MURR	8 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No
D. Biological effects of radiation	UMC/MURR	8 years	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	<input type="checkbox"/> No

### 11. Experience with radiation sources: (Actual use or equivalent experience)

Source	Quantity	Where gained	Duration	Type of use
High Enriched Fuel Elements	max 45 kg	MURR	6 years	Fuel management for MURR and Custodian for R-103 source and SNM.
Spent Fuel Elements	MCi quantities	MURR	6 years	
Depleted U Pu	max 50 kg 14 g			

### DESCRIPTION OF EQUIPMENT AND FACILITIES FOR RADIATION SAFETY

#### 12. Radiation Detection Instruments: (Use supplemental sheets if necessary)

Type of instrument (include make and model number of each)	Number available	Radiation detected	Sensitivity range (mR/hr)	Window thickness (mg/cm <sup>2</sup> )	Use Monitoring, surveying, measuring
Equipment as described in TRUMP-S research project.					

#### 13. Method, frequency, and standards used in calibrating instruments listed above:

Same as Item 12.

#### 14. Special facilities:

Same as Item 12.



**Excerpts on TRUMP-S from the  
Minutes of the January 10, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 1:33 p.m. Members present were Gary Ehrhardt, Sue Langhorst, Albert Sun, Walt Meyer, Kurt Zinn, Steve Gunn, and Jamie Shotts. Also present were guests Kathy Robertson (NE graduate student in Health Physics) and Charlie McKibben.

The minutes of the October 18, 1989 meeting were approved unanimously.

(Due to the length of the meeting and agenda, agenda items will be referred to by number and sub-letter).

Item 5a: Charlie McKibben gave an overview of the TRUMP-S project. MURR is submitting a proposal to Rockwell International to locate this research project at MURR. The project involves measurement of certain thermodynamic parameters relating to removal of actinides from lanthanide fission product wastes of spent nuclear fuel. The purpose is to support development of a process using pyropartitioning separations which would be a highly efficient separation process, permitting destruction of the long-lived transuranics in actinide "burner" reactors and leaving essentially only fission product wastes for burial. Because the fission product waste decays to stable products far more rapidly than transuranics, the required isolation time for wastes would be about 500 years instead of 100,000 or more. This would be a significant development for the nuclear power industry and for countries where waste disposal options are limited (such as Japan, which is funding this project). Because of license limitations at the Rockwell Facility in Los Angeles and timetable commitments to Japanese grantors, Rockwell is interested in transferring the part of this project requiring work with small quantities of depleted uranium, neptunium, americium, and plutonium to a university which has or can obtain the license to do the work.

Considerable interest and collaboration with UMC Chemical Engineering (with Dr. Truman Storvik as lead PI) and UMC Nuclear Engineering has developed. Basically an intact electrochemical project with an annual budget of close to \$0.5 M per year would be transferred with equipment to specially built facilities in the basement of the MURR. This project may be renewable for four years or more and will have heavy UMC academic involvement from the Chemical and Nuclear Engineering departments. Equipment would be retained by UM after the project and patents (as proposed) would be shared; DOE would handle the transuranic and mixed (radioactive and hazardous) wastes. NRC Amendments to the Broad Scope and SNM Licenses would be needed for the U, Np, Am, and Pu isotopes; in this regard, Sue's recent efforts on the license renewal for the Co-60 facility should help in our application to the NRC.

A discussion ensued on the importance of having personnel available experienced with handling alpha emitters; in this regard much assistance should be available from Rockwell. Hopefully new hiring in MURR Health Physics will reflect this need as well. It was noted that personnel doing the work on this project under the proposed license amendment must be authorized by the IUS as well. Details on the inert atmosphere in the glovebox(es) were given in answer to a question about fire hazards with these actinide substances. In the quantities to be used there is minimal fire hazard; the inert atmosphere is needed for accuracy of measurement.

Excerpts on TRUMP-S from the  
Minutes of the January 10, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee  
Page two

Sending personnel to Rockwell to observe and learn, as well as having Rockwell personnel visit MURR were proposed. It was also noted that the project will begin with possible cold lanthanide runs and U chemistry as benchmarks to work out any problems in the system and prove our capabilities. The need for exhaustive controls on this project was emphasized, including an airlock and external air monitoring.

In reply to a question it was noted that a HEPA filter only removes particles. It also was noted that an argon leak in the facility (argon is the inerting gas) might result in argon being sucked up the MURR p-tube system and subsequent Ar-41 release up the stack; the air intake for the p-tubes may have to be re-routed. Since the alpha room is designed for approximately ten air changes per hour, any problem with oxygen deprivation during an argon leak should be alleviated. Some samples may eventually be removed from the alpha room for other analyses, including NAA; this use will be assessed by conventional RUR's. It was noted that Rockwell also does quarterly bioassays of urine from their personnel; MURR could develop a bioassay program beyond what is done now.

In a discussion of the transuranics to be worked with, it was noted that the alpha energies could be separated on a good alpha spectroscopy system, permitting nuclide identification similar to that performed with gamma spectroscopy. Uranium, neptunium, and plutonium are included in Stage I of the project, while americium is added for Stage II. These isotopes will be studied separately in the current request; MURR will have to go back to NRC in future stages if these elements will be mixed in samples. It was noted that Rockwell is willing to start spending money before NRC approval is obtained.

A discussion ensued concerning safety questions and whether all operational aspects of the project were covered. The committee agreed that isotopes such as plutonium were the subject of great concern to the public and that alpha releases and contamination must be avoided at all costs, for even a trivial incident could make national news. It was strongly emphasized that there must be plenty of room in the budget for health physics coverage. In reply to this it was noted that the budget proposed will support Stage I of this project very well. One committee member reiterated that this project must be done right, even if MURR money had to be added to it, and that an experienced person was essential for the first phase. Charlie McKibben concluded the discussion by emphasizing that the purpose of this project is to explore the basic science needed to make waste from nuclear power plants have far less environmental impact than it would otherwise have.

No action was requested from the committee on this project at this time. The IUS then enjoyed a five-minute recess.



**Excerpts on TRUMP-S from the  
Minutes of the February 14, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 1:36 p.m. Members present were Gary Ehrhardt, Steve Gunn, Sue Langhorst, Walt Meyer, Jamie Shotts, Albert Sun and Kurt Zinn. Also present were guests Chester Edwards, Charlie McKibben, Lew Pitchford and Tom Young.

The minutes of the January 10, 1990 meeting were approved with the following changes noted:

Item 3f should read "Dan Trokey's authorization to produce Cu-64 from zinc targets according to the approved procedure was approved after the IUS reviewed the RadSafe-9 and training form."

There were two "Item 5d"'s listed; the second should be "Item 5f."

The first and major item of business was to review drafts of the memo and license amendment request being prepared for the TRUMP-S project. The license amendments are being submitted to allow receipt of depleted uranium and plutonium under the SNM-247, and Np-237 and Am-241 under the Broad Scope License. The committee and visitors went through the documents page by page, raising and addressing concerns as needed. A summary of some of the discussion follows:

- Activities should be given for the transuranic isotopes as well as gram masses.
- Smoke alarms for the rest of MURR (besides the alpha lab) would be desirable, but are not affordable right now.
- The p-tube air intake in the basement should not need to be re-routed, as the chance of it taking in argon gas from a leak in the Alpha Lab is remote.
- Refer to the TRUMP-S research facility as the "Alpha Laboratory" throughout the document, not the "Alpha Room."
- The question of whether the Alpha Laboratory key should be a master was raised. It was pointed out that the other labs in the facility are keyed this way.
- A question to be considered--should there be an emergency key outside the room in case someone inside passes out, say, from oxygen deprivation due to an argon leak? With two people in the lab there is some protection from one getting into trouble, but an emergency key in a break-the-glass type of storage container wouldn't be a bad idea. The frequent air changes in the room make oxygen deprivation unlikely.
- An intercom between the basement and the lab would be desirable for communications without having to come through the airlock.

**Excerpts on TRUMP-S from the**  
Minutes of the February 14, 1990 Meeting of  
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- LSA waste will be stored in the basement; it is expected to be minimal from the TRUMP-S project and stored in the Alpha Lab, at least for Phase I. LSA waste will be disposed of by normal channels and paid for by Rockwell, while TRU waste will eventually be accepted by DOE for disposal.
- Clarification was requested on the exhaust system; it was noted that all air (except for the room) passes through several HEPA filters. The question of fire in one HEPA spreading to another was answered by the fact that there are physical separations to prevent fire spreading in that manner that the HEPAs to be used are fire-resistant. Use of screen spark arrestors in the outlet of the glove boxes was discussed. Liquid seals in the HEPAs were explained.
- On a related matter, one member raised doubts as to whether the output of the ICP (inductively coupled plasma) analyzer would be caught in HEPA filters, since it is at the atomic level. Kurt Zinn was requested by the subcommittee to pursue this question with LeRoy Grantham of Rockwell.
- The archived samples will probably be stored in a locked cabinet in the Alpha Laboratory or in a storage drawer in the basement.
- The committee was shown pictures of the crucible, glove boxes, ICP unit, etc., to be used in the project.
- With regard to training documentation of the Rockwell personnel, resumes will be sent to MURR. An alpha-experienced health physics technician may also be sent to help get things started.
- The proposed authorized users for the TRUMP-S project are not ready to apply for authorization. The facilities must be tested, the procedures established and training documented. These procedures and training will be reviewed by the IUS in their next few meetings.
- Contamination survey of the Alpha Lab will be performed by HPs or the workers themselves whenever the lab is used.
- Baseline bioassays for alpha emitter body burdens in workers in the Alpha Lab would be desirable before work commenced to get base-line measurements.
- Waste estimates for Phase I are 1-2 barrels of LSA, and 1 barrel of TRU wastes. Continuation of the project should result in 1 additional barrel of TRU/year.

The IUS approved the requested authorization for Roland A. Hultsch for U, Pu, Np, and Am for the TRUMP-S project.



**Excerpts on TRUMP-S from the  
Minutes of the March 21, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 2:08 p.m. Members present were Steve Gunn, Jamie Shotts, Kurt Zinn, Sue Langhorst, Gary Ehrhardt, and Walt Meyer. Also present were guests Gary Guinn and Karla Riggle.

1. The minutes of the February 14, 1990 meeting were unanimously approved.
- 5a. Progress on the TRUMP-S project was reviewed. Sue Langhorst's request for authorization (dated 3/20/90) for up to 80 grams of any form of depleted uranium for this project was approved. The Department of Energy's NEPA review of the TRUMP-S project at MURR is expected this week; also, dose calculations which DOE used in their review have been received.

It was noted that Kurt Zinn's question as to whether the output of an ICP (Inductively Coupled Plasma) analyzer would be caught by a HEPA filter was answered affirmatively by Mr. Leroy Grantham (Rockwell) and documented by letter to Chester Edwards dated 2/21/90. The material aggregates quickly and even tends to plate out on piping before reaching the HEPA filter.

The SNM license for plutonium and depleted uranium is in the mail (the NRC review and approval are finished), while MURR has submitted the Broad License Amendment for americium and neptunium last week. It was mentioned that Rockwell has pursued and obtained their license at the Los Angeles site.

- 5b. It was observed that Rolly Hultsch can receive depleted uranium under the present general license (10CFR40.22). Turk Storvick, Paul Sharp, and Leon Krueger will also eventually request to be authorized users, while Rolly will be the materials custodian.

**Excerpts on TRUMP-S from the  
Minutes of the April 11, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 1:34 p.m. Members present were Gary Ehrhardt, Steve Gunn, Sue Langhorst, Walt Meyer, Jamie Shotts, Albert Sun and Kurt Zinn.

1. The minutes of the March 21, 1990 meeting were unanimously approved.
- 5a. The Operational Procedures for the TRUMP-S Project were distributed in draft form with a request for comments from the committee. Rockwell's comments, it was noted, will be incorporated in the next draft. Sue reported that they were hoping to seal the boxes and do pressure testing and exhaust balancing in the next two weeks. Following that, the rare-earth procedures will begin as a test, followed by work with uranium. It was noted that noise reduction outside the alpha lab due to noise from the fans is needed, although the room itself is sufficiently quiet. A better appreciation of what needs to be done differently will be gained after the uranium work, which involves low activity, has begun.

A Readiness Review is to be held on April 12, 1990, in which representatives from the IUS, MURR, and the University will meet with representatives of Rockwell and DOE to get an overview of how the project is progressing.

The question of documenting training for these procedures was raised; in reply it was noted that the rare-earth work will serve to test the procedures and train the experimenters. At this time only uranium has been authorized for these experiments by the IUS. An IUS member requested some information on the background of Leroy Grantham, who has 20 years of experience in this area.

- 5c. The license amendment for 25 Ci of Am-241 and 10 mCi of Np-237 has been signed and mailed, but not yet received, Sue reported; Bill Adam has already sent her a copy by facsimile machine. These license amendments will more than cover the first two phases of the TRUMP-S Project.



**Excerpts on TRUMP-S from the**  
Minutes of the May 16, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee

The meeting was called to order at 1:42 p.m. Members present were Gary Ehrhardt, Steve Gunn, Sue Langhorst, Walt Meyer, Jamie Shotts, and Kurt Zinn. Albert Sun called earlier to indicate that he could not attend.

1. The minutes of the April 11, 1990 meeting were unanimously approved.
  
- 5d. Sue reported that intervenors have filed a petition to the Washington Office of the NRC asking for an NRC hearing on the license amendments for TRUMP-S and a stay on the work; MURR has until May 25 to file a response. The depleted uranium, neptunium, and americium are on hand, while the plutonium is not yet scheduled for shipment. It is expected that the NRC will appoint a one-person board to decide if a hearing before a judge or an NRC public meeting is justified, or whether to deny the intervention.

Sue reported that another iteration on TRUMP-S procedures will be distributed soon. She also reported that Gerry Steppen, a retired HP from Rocky Flats, has been retained as an alpha-emitter handling consultant. He is experienced in plutonium, americium, californium, and cerium handling and has good references.

Rare-earth testing is expected after Memorial Day. There has been some difficulty in obtaining the required flow rates of air through two breached glove ports (a defined credible accident); this problem is currently being solved. The problem of noise outside the alpha laboratory is still being worked. In addition, the ventilation at MURR has been switched to high flow conditions.

**Excerpts on TRUMP-S from the**  
Minutes of the June 6, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee

The meeting was called to order at 1:44 p.m. Members present were Gary Ehrhardt, Steve Gunn, Sue Langhorst, Jamie Shotts and Albert Sun. Walt Meyer joined the meeting at approximately 2:00 p.m.

1. The minutes of the May 16, 1990 meeting were unanimously approved.
2. An authorization for John Ernst to possess depleted uranium for use on the TRUMP-S Project was approved. The TRUMP-S procedures are still being written and several weeks of rare-earth work remain. The IUS agreed that depleted uranium work could begin under an RWP using draft procedures if needed.
- 5c. The University's response to the TRUMP-S intervenors' petition was sent to the NRC on May 25. Peter Bloch, the NRC administrative judge with the Atomic Safety and Licensing Board, has asked the petitioners for more information by June 9. Newman & Holtzinger, a Washington, D.C. law firm, has been hired to help the University with their case. It was also noted that a public meeting was held May 30 to explain the TRUMP-S Project.

Modifications on the Ar glove box have been finished and procedures are being put into final form for the first set of experiments involving a rare-earth, non-radioactive cell. Relevant portions of the process are being videotaped for record and training purposes.

With respect to the questions raised on safety of this project, it was asserted that the risks are minimal; it is very hard to get these materials airborne and keep them airborne. It was the sense of the IUS that the Subcommittee has been adequately informed; also, the IUS has so far approved only the use of U in this research project, not Np, Pu, or Am. It was also noted that the IUS has been sensitive to this issue and has expressed the commitment to "do this project right."

It was also mentioned that Gerry Steppen, a consultant HP with experience in working with  $\alpha$ -emitters, would be at MURR next Tuesday.



**Excerpts on TRUMP-S from the  
Minutes of the July 17, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 1:39 p.m. Members present were Walt Meyer, Kurt Zinn, Jamie Shotts, Sue Langhorst, Gary Ehrhardt, and Steve Gunn.

1. The minutes of the June 6, 1990 meeting were unanimously approved.
- 2b. A RadSafe 34 form for Leon Krueger for depleted uranium was reviewed by the IUS. Leon will be working under Sue Langhorst's and John Ernst's authorizations and will be considered for an authorization in his own right in the near future.
- 5a. The IUS was informed that the TRUMP-S Procedures and Revisions are available in the IUS Chairman's office and also in the HP office. Sue views them as adequate to start the depleted uranium work and subject to revision as experience is gained. The first revision number is blank on each procedure, rather than starting a revision "0". The Subcommittee suggested that the books need a revision entry sign-off sheet, as well as a place to mark what the revision is. It was remarked that the sheet each person must sign for Brenda showing they made the revision could also ask them to indicate that they have read and understood the change, thus accomplishing the two goals of review and procedure update at one time.

It was remarked that it is the responsibility of the IUS to see that learning occurs with the U and Np isotopes; if the TRUMP-S workers can not handle Np, they shouldn't use Am or Pu! The IUS was reminded that they have approved receipt of these materials only, and only the use of U at this time. Check-off sheets have been prepared for each material; the isotope will not be used before everything is ready as assessed via these check-off sheets. Some work with (non-DOE) uranium tetra-chloride may begin later this week to test some of the procedures and get some data. Currently the procedures are being tested with rare-earths.

- 5e. With respect to the TRUMP-S project, the petitioners were given additional time for input of their concerns by the NRC's ASLB judge in early June. The intervention was then allowed, with the three groups to act as one intervenor. Six of the seven concerns were admitted (although this does not automatically mean the concerns are valid); the proliferation concern was not admitted as being non-germane.

The NRC judge suggested the intervenors and licensees meet to negotiate a resolution to the problem, and this meeting occurred June 6, 1990. At this meeting the intervenors were given copies of some TRUMP-S procedures, license amendment requests, MURR Emergency Plan and Procedures and other documents pertaining to the TRUMP-S research project. The judge and the lawyers have set the schedule in which the petitioners were to make their direct case to the judge by July 11, 1990. Ten days later the licensee would make their case, after which each party gets 5 days to rebut the other's arguments. A (non-final) judgment could then occur by August 13, 1990. However, the intervenors then asked for an extension to July 21. The judge is making available the hearing file to the intervenors.

Excerpts on TRUMP-S from the  
Minutes of the July 17, 1990 Meeting of  
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A member of the IUS raised the question as to how to better communicate to the MURR staff, University, and general community the nature of the TRUMP-S project. In reply Sue reported the University is beginning bi-weekly "MURR in the Community" news briefings to keep the public informed about MURR, beginning with discussion of TRUMP-S. Steve Morris and Turk Storvick are also talking to community groups extensively. A "brown bag lunch" seminar for faculty to discuss the project and get their questions answered will also be held.

Comments for the alpha consultant Gerry Steppen will be reviewed at the next IUS meeting. Another set of HEPA filters are planned for installation between the U and Np work; some changes in the position of the exhaust blower is also being planned.

- 5d. During the NRC inspection of July 9-10, 1990, one inspector, Jim Lynch, looked at the TRUMP-S laboratory and asked many questions. He was pleased to have inspected the lab before actinide metals work had begun. His questions were answered, and he appeared satisfied. Their inspection report should be available in about 3 weeks.



**Excerpts on TRUMP-S from the  
Minutes of the August 15, 1990 Meeting of  
the Isotope use Subcommittee of the Reactor Advisory Committee**

The meeting was called to order at 1:44 p.m. Members present were Jamie Shotts, Gary Ehrhardt, Kurt Zinn, Sue Langhorst, and Steve Gunn. Chester Edwards was present as a guest for a portion of the meeting.

1. The minutes of the July 17, 1990 meeting were unanimously approved. Steve Gunn suggested that, where possible, names be included in the minutes; the committee was agreeable to this request.

2a. RadSafe-9 and RadSafe-10 forms were presented to authorize Dr. Leon Krueger as a user of 80 g of depleted uranium in the TRUMP-S Project; the authorization was unanimously approved. A second authorization for Dr. Krueger for use of 5 g (3.6 mCi) of Np-237 in the TRUMP-S Project was presented. As part of the review of this authorization request, the IUS was next updated on the progress of the TRUMP-S experiments.

5b. The IUS reviewed John Ernst's June 19, 1990 memo, "Summary of Consultant Visit", on recommendations made by the health physics consultant. Much discussion centered on the first recommendation that a scenario was possible in which backflow into the Alpha Lab could occur through two HEPA filters, only one of which is in-place DOP (dioctylphthalate) tested. Sue indicated that an additional in-place DOP tested filter is being considered for installation into the ventilation system. NRC Region III personnel have indicated that changes to the ventilation system as described in our license amendment requests would require another license amendment before implementing the change. Sue said that use of the actinide materials has been approved by the NRC with the current ventilation system. The installation of additional HEPA filters is still being considered and scheduling of the installation contingent on obtaining an additional license amendment.

Kurt asked if exhaust through the final filters was blocked, what would pressurize the system to drive a backflow. Jamie pointed out that possibly a regulator break on an Ar tank could occur and, if this happened simultaneously with a blockage of the main exhaust filters, then possibly a backflow could occur. Kurt remarked that DOE regulations might not be applicable to this ventilation system, as DOE might have some other source of pressure in their glove boxes.

Chester Edwards was requested to join the meeting to answer some of the IUS's questions. Chester indicated the Ar glove box has a pressure relief system which is exhausted through a certified HEPA filter and then through the glove box exhaust. In answer to Kurt's question, Chester agreed with Jamie's comments on backflow but also said that the Alpha Lab pressure alarm would sound if the final filters were blocked, thus giving immediate indication to the workers of an exhaust problem. Upon review of the multiple failures that would have to occur in order to get this backflow condition into the Alpha Lab and give no warning to the workers, the IUS unanimously agreed that experiments using Np-237 could be safely done with the current ventilation system.

**Excerpts on TRUMP-S from the  
Minutes of the August 15, 1990 Meeting of  
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Sue next reported on the actions to date on the other comments listed in the summary memo:

#### GLOVE BOXES

1. The need for additional bracing of the air glove box plexiglass windows is still being assessed along with the possible alternatives.
2. The hose clamps have been installed.
3. The metal clamps have been installed.
4. Containers with lids have been obtained.
5. The recommendation to include boxes of sand in the glove boxes was not accepted because of the need to keep the interior of the boxes clean and clutter-free. Additional empty waste cans with lids will be used to smother a fire.
6. The hazard of fire with respect to water on small amounts of active metals is minimal. These handling procedures continue to be assessed.
7. The need for leaded gloves is also being assessed for Am handling. While these gloves are effective in absorbing the 60 keV gamma from Am-241, they also make manipulations clumsy and require longer exposure times. Different uses of shielding and distance are being evaluated to minimize hand doses.
8. A review of the use of glove port covers at various DOE facilities is not consistent. Sue noted that the Ar glove box is equipped with a pressure relief system designed to prevent excessive negative pressure.

#### INSTRUMENTATION AND MONITORING

1. For receipt of all radioactive materials at MURR, the inner shipping container is considered to be potentially contaminated.
2. The consultant also suggested the use of a catch tray beneath the bag out port as an alternative method for contamination control, and this was incorporated into the bag out procedure.
3. Modifications of the glove port cover fasteners is being reviewed in connection with the continued use of glove port covers (see item 8 above).
4. Consideration of the Eberline friskers for needed instrument replacement is being made.
5. Jamie stated that Health Physics Services has a small detector which could serve as a wound counter.
6. Individual air monitoring filter heads are being installed and incorporated into the assessment of airborne contamination in the Alpha Lab.
7. Multiple sampling points are being installed. Further consultation with other health physicists led Sue to decide that use of a smoke source would not provide additional information beyond the prudent placement of samplers and could affect the performance of the exhaust HEPA filters.

GENERAL COMMENTS

1. Sue reported that Joe DeMers and Mark Stumbaugh have experience from their work in the Navy with this type of HEPA filter change out.
2. All vacuum pumps used with glove boxes containing unsealed radioactive sources are considered internally contaminated until proven otherwise.
3. The feasibility of using filters on all equipment fans located in the Alpha Lab is being investigated. Sue added that equipment removed from the Alpha Lab is considered to be potentially contaminated until proven otherwise.

Chester noted that recommendations based on experience with Pu production facility might not be applicable to laboratory-scale research.

Steve asked if masks were available in the event of an accident. Sue replied that additional respirators had been obtained for support of the TRUMP-S Project. The IUS discussed alternate emergency breathing devices that could also be considered.

Kurt asked whether DOE approval to accept TRU waste from the TRUMP-S Project had been received. Sue presented the July 20, 1990 and July 30, 1990 DOE letters which stated DOE's commitment to accept return of the radioactive materials used during the tests and to accept any TRU or mixed wastes.

With respect to the experience gained from depleted uranium experiments, it appears that quantities of less than 10 mg are sufficient for each experimental run which reduces the amount of actinide material that will need to be available in the glove box. Surveys are being performed and no contamination has been found. The glove boxes will be cleaned between changes in actinide materials. The IUS indicated they were satisfied with the safety aspects of the project.

The IUS unanimously approved Dr. Krueger's authorization for 5 g of Np-237 to be used in the TRUMP-S Project.

- 2b. Similar authorization requests for use of depleted uranium and Np-237 in the TRUMP-S Project for Dr. Truman Storvick were reviewed. The IUS unanimously approved Dr. Storvick's authorization for 80 g of depleted uranium to be used in the TRUMP-S Project. The IUS unanimously approved Dr. Storvick's authorization for 5 g of Np-237 to be used in the TRUMP-S Project.



**Excerpts on TRUMP-S from the**  
Minutes of the September 12, 1990 Meeting of  
the Isotope Use Subcommittee of the Reactor Advisory Committee

The meeting was called to order at 1:40 p.m. Members present were Sue Langhorst, Kurt Zinn, Jamie Shotts, Albert Sun, Walt Meyer, Gary Ehrhardt, and Steve Gunn. Also present were guests Leon Krueger and John Ernst.

1. The minutes of the August 15, 1990 meeting were unanimously approved.

2a. The request for authorization for Pu-239/240 for Leon Krueger in the TRUMP-S project was considered by the committee in lengthy discussion. Leon described the U and Np work, which has gone very well and which has produced data that look very good. Leon indicated the Np was cleanly packaged, with no oxygen in the container, and samples needed for the experiments were easily obtained because the material was in the form of metal turnings. Sue indicated the researchers had gotten data when plating out the Np, and then again as the Np was stripped off the electrode. Two separate measurements were therefore made with one Np sample, which helps in minimizing the handling amount of material needed. Contamination from the Li electrode is suspected to be introduced into the molten salt solution and the experimenters have not yet been successful in getting good data from trying to plate out the same sample a second time. Small samples are proving very usable and two runs can be obtained from ~10 mg of actinide material. In response to a question by Kurt as to what's being done with the residues, John replied that less than 1 g Np was being stored in the Ar glove box and U samples in the storage drawer, along with the glove from the Np process. It was noted that the glove is LSA waste. Double-encapsulated stainless steel storage containers for the Np samples have been built to hold the material under Ar atmosphere with provisions for periodic testing with a built-in pressure gauge. Both chambers will be under Ar with "O" ring seals. Similar ones, also made of stainless steel, will be designed and built for Pu.

In response to a question by Gary as to whether any problems with alpha contamination has been encountered, John replied that in 7 bag-out procedures no contamination has been observed outside the boxes. Sue asked about cleanup of the box; John replied that it was cleaned before the Np work, with the highest observed contamination being less than 220 dpm/300 cm<sup>2</sup>. John reported dry decontamination in the glove boxes has been challenging due to static charge. Wet rags cannot be used because the stored salts must not contact water. Walt added that it is desirable to not have to continually remove H<sub>2</sub>O and O<sub>2</sub> from the atmosphere in the Ar glove box. Kurt asked about glove changes, to which John replied that the oxygen content in the Ar box did not exceed 500 ppm for the first glove with a hole and the Ar atmosphere was easily cleaned up of excess oxygen. The experience with a pinhole leak in one of the gloves was more subtle, with the oxygen content raising from 0.1 ppm to 1 ppm. This demonstrated how the experimental need to continually monitor O<sub>2</sub> in the Ar box also acts as an extremely sensitive indicator to minimize spread of contamination through a hole in a glove. During the subsequent glove change, the oxygen only went to 130 ppm. John added that no contamination was observed from glove change-outs; Jamie asked about the filters, to which John replied

that swipe tests of the filter faces in the glove boxes showed no evidence of contamination.

Kurt asked about the ICP work with Np, to which Leon replied that the system was working, although Np is hard to analyze on an ICP instrument. In response to a question by Kurt as to how much Np was volatilized by the ICP, Sue and Leon estimated about 5 micrograms, yielding picocuries of activity. She remarked that the Alpha-6 air monitor has not detected any activity other than background from radon daughter products. Sue indicated that Pu work is planned to begin in about one week. She added that the response to the interveners' request for a stay had been submitted and that the stay had been denied, with the judge complimenting the University's presentation. Responding to a query from Steve about when the first phase would be completed, Leon said the activity coefficient work in Cd solution has been deferred and may not be done before the end of the month. If only the chloride activities are measured, Phase I will be completed by the end of September with Pu. John said that work on the ventilation system is planned after the Pu work to correct the noise problem in the Alpha Lab.

Sue and John went on to describe how all nine air monitoring filter heads are in place to additionally monitor for airborne contamination. The Alpha-6 pressure sensors, Ar level, and fire alarms are all indicated locally near or in the Alpha Lab and in the control room. In response to a question by Jamie it was noted that the operators' actions are well defined in the event of an alarm, with action and call lists in place in the procedures. Some of the dose rates observed with Np-237 have been 40 mR/hr near contact of the 4 gm sample, with whole body doses of about 1 mR/hr to Leon. Measurable hand dose is anticipated, since 1 gm of Np reads about 10-15 mR/hr. Walt said they would check for a neutron component from the Pu sample. Sue said a small amount of U was left in the air glove box as ICP standards, the total being about 20-30 mg. Leon added that they want to leave about 100 ml of a 10 ppm Np solution in the air glove box, also for ICP standardization purposes.

Sue announced that the Pu sample for this work has been received. Responding to Gary, she said the experiments should be possible with ~10 mg amounts of Pu per experiment, and the total amount in the Ar box needed to be about 250 mg. Leon remarked that it was interesting to compare the color of the KCl-LiCl Np eutectic (apple green) with previously reported colors (apple green, purple, and white). The chemical data indicates our sample is clearly neptunium chloride; as U chloride is purple, Leon speculated that those in the literature reporting this purple color for Np chloride may have been fooled by U contamination.

A discussion ensued in which the IUS was assured Leon would be present whenever Pu was used. Leon has been doing the experiments himself or has been directly supervising others (Matt McNally and Jeff Roy) in the handling of materials during the experiments. It was agreed by all that the work is going well, but that vigilance must be maintained. Sue remarked that HPs have trained Leon, Jeff, and Matt well in techniques to avoid contamination; Leon Krueger in particular is very precise. She said Paul Sharp and Turk Storvick are less practiced than Leon in working in the glove boxes. It has not been required that each person work with each.



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isotope, but practice of working in the glove box is required for experimenters to become experienced users. Steve asked if there are training forms, as in RIA; Sue responded that these will be required at least by the 100 mCi level. Steve stated that before someone does a procedure without direct supervision by Leon, their training should be documented.

The authorization for Leon Krueger for Pu-239/240 was unanimously approved.

- 2b. A discussion ensued about the proposed authorization of Turk Storvick for Pu-239/240 for TRUMP-S work. The crux of the matter involved what "hands-on" training a person who has read and understood the procedures must have to personally perform or supervise another. Whether a checklist was needed, as in RIA was discussed, and it was suggested that what must be learned to perform the experiments needed to be better documented. Sue pointed out that training was required for a person to receive access to the Alpha Lab. She added that before a procedure was done in the glove box by someone other than Leon and without Leon's direct supervision, an experimenter should have done the procedure in a practice situation or with Leon's direct supervision and be approved to do the work by Leon. Walt suggested that Leon provide the glove box training criteria which have to be met for him to approve anyone to work in the Ar glove box without his direct supervision. Leon was directed to identify critical manipulations in the Ar glove box, specifically for the purposes of maintaining radiation safety; these manipulations will need to be mastered by persons wishing to obtain authorization to work with Pu or Am.

The decision was made to table approval of Turk's authorization request until Turk has completed the glove box training criteria.

Kurt Zinn was excused from the meeting at this time.

- 3a., b. RadSafe 34 forms for Matt McNally and Jeff Roy were not completed in time for consideration by the IUS at this meeting. Their work with the TRUMP-S materials will continue to be directly supervised by Leon Krueger.
- 4a. Revisions to date of the TRUMP-S procedures were reviewed by the IUS.
- 5a. Steve Morris' affidavit and the judge's reply concerning TRUMP-S were provided to update the IUS on this matter.

**DRAFT**

**OUTLINE OF TRAINING REQUIREMENTS FOR  
HANDLING TRUMP-S ACTINIDES**

1. Understand that the glove boxes are the primary means of containment of TRUMP-S actinide materials:
  - a. Demonstrate knowledge of the radiological and chemical properties of the materials to be handled. (Actinides, cadmium, silver, lithium, etc.)
  - b. Know that health physics personnel must be present for any transfer of any materials in or out of the glove boxes.
  - c. Understand containment/confinement hierarchy:
    - (1) Glove Boxes
    - (2) Alpha Laboratory
    - (3) MURR Facility
    - (4) Required pressure differentials between 1, 2, and 3 above.
2. Explain the operation and purpose of the radiation monitoring systems:
  - a. Scintillation frisker - personnel
  - b. Alpha 3 monitor - laboratory air
  - c. Alpha 6 monitor - laboratory ventilation effluent
3. Demonstrate understanding of safety and emergency procedures:
  - a. Laboratory check in and check out procedures.
  - b. Glove replacement procedures.
  - c. Fire emergency procedures. (ie, location, type, and proper use of fire extinguishers)
  - d. Argon supply replenishment procedures.
  - e. Alarms and response.
4. Complete a hands-on orientation of the laboratory by the authorized user or his designated representative:
  - a. Demonstrate acceptable manual dexterity working in the glove box.
  - b. Show familiarity with the operation and function of the equipment in the laboratory.