



**DEPARTMENT OF THE ARMY**  
US ARMY CHEMICAL BIOLOGICAL, RADIOLOGICAL  
AND NUCLEAR SCHOOL  
14030 MSCOE LOOP, SUITE 1041  
FORT LEONARD WOOD, MISSOURI 65473-8926

U.S. Nuclear Regulatory Commission  
Region III, Materials Licensing Branch  
Suite 210 (ATTN: Mr. Frank P.D. Tran, Health Physicist)  
2443 Warrenville Road  
Lisle, IL 69532-4353

Dear Mr. Tran,

This letter is in reference to U.S. Nuclear Regulatory Commission License Number 24-32221-01, Docket Number 030-35257, Mail Control Number 617077 and your letter requesting additional information dated April 28, 2020. The enclosures to this letter provide the additional information you requested to complete your review.

Points of contact for this letter are Mr. Michael S. Gray, Health Physics Manager, (573) 563-6224, or email [michael.s.gray.civ@mail.mil](mailto:michael.s.gray.civ@mail.mil) and Captain Mahmut A. Atabay, Radiation Safety Officer and Chief Radiological Defense Division, (573) 563-6202, or email [mahmut.a.atabay.mil@mail.mil](mailto:mahmut.a.atabay.mil@mail.mil).

Sincerely,

Encls  
1. Requested Additional Info  
2. Disposal Documents

DARYL O. HOOD  
Colonel, CM  
Commandant

## Requested Additional Information

1. Commission Concern. A confirmation that licensed material will not be used in or on humans, in animals, or in tracer and field studies in which licensed material is released into the environment.

U.S. Army Chemical, Biological, Nuclear and Radiological School (USACBRNS) Response to Commission. We confirm that licensed material will not be used in or on humans, in animals, or in tracer and field studies in which licensed material is released into the environment.

2. Commission Concern. You provided that a radiation safety committee (RSC) quorum will need at least four voting members listed in Section 2 of Item 7 of your letter. We think it would be Section 3 of Item 7; please correct as necessary. You also stated that an individual can hold more than one voting member, for example a person can be the Radiation Safety Officer and Health Physics Manager. Please help us to understand if the RSC quorum will be at least four individuals in the RSC or four positions.

USACBRNS Response to Commission. The Radiation Safety Committee (RSC) quorum will be at least four individuals in the RSC regardless of the number of positions they hold.

3. Commission Concern. With regards to the deletion of Pu-239 and U-233 listed in Items 6.F. and 6.G. of the current license, please provide a copy of complete Form 540 with a signature of Rad Solutions LLC's representative who confirmed the receiving of your licensed material for Item 9 of the form.

USACBRNS Response to Commission. Enclosure 2 contains the requested documents.

4. Commission Concern. Your license is authorized for research and development; therefore, we utilize the guidance in NUREG-1556, Volume 7, Revision 1 in the review of the application. Based on Item 8.7.2, "Authorized User", of the guidance the proposed user who use or direct supervise the use of licensed material should have (i) a college degree at the bachelor's level or equivalent training and experience in physical, chemical, biological sciences, or engineering, and (ii) training and experience commensurate with the scope of proposed activities, including hands-on training with radioactive materials. Please describe how the licensee will ensure that a proposed user will meet item (i), has completed the hands-on training and is competent for the proposed licensed material and uses.

USACBRNS Response to Commission.

a. A college degree at the bachelor's level or equivalent training and experience in physical, chemical, biological sciences, or engineering. Proposed users who use or direct supervise the use of license materials for research and development will be limited to the following USACBRNS personnel: the Health Physics Manager of the Health Physics Office and the Supervisory Physicist and Nuclear Medical Science Officer of the Edwin R. Bradley Radiological Laboratories. The first two positions are general schedule civil servants with jobs series of 1306 (Health Physicist) and 1310 (Physicist). The personnel hired for these positions are required to have a college degree and/or experience that meet this requirement. Nuclear Medical Science Officers are U.S. Army Officers that also must have college bachelor degrees that meet this requirement. These positions will be the Radiation Safety Officer or Alternate Radiation Safety Officer for the USACBRNS license.

Requested Additional Information

b. Training and experience commensurate with the scope of proposed activities, including hands-on training with radioactive materials.

(1) The Health Physics Manager and Nuclear Medical Science Officer's resumes were included in enclosure 3 of the letter dated February 20, 2020. We are in the process of hiring the supervisory health physicist position.

(2) Individuals responsible for local radiation safety programs will complete a minimum of 40 hours of formal training in the areas listed in table 1 below. The 40-hour Operation Radiation Safety Course, Course #4J-F2/494-F9 given by the US Army Chemical School meets this requirement. The USACBRNS RSO is the approving authority for all formal training courses.

Table 1
Formal Training Requirements
(1) Principles and practices of radiation safety (2) Radioactivity measurement standardization and monitoring (3) Biological effects of radiation (4) Mathematics and calculations basic to the use and measurement of radioactivity (5) Requirements of pertinent regulations (6) Management of a radiation safety program

(3) All authorized users shall complete training that includes at a minimum the topics listed in table 2. The amount of training and experience will depend upon the type, form, quantity, proposed use of the license material. The duration of the source specific training will be determined by the USACBRNS RSC. The frequency of the training will be:

(a) Initial (e.g. before assuming duties)

(b) Annually (refresher training) and

(c) Whenever there is a significant change in duties, regulations, or the terms of the license.

Table 2
Authorized User Training Requirements
(1) Principles and practices of radiation safety (2) Characteristics of ionizing radiation (3) Units of radiation dose and quantities (4) Radiation detection instrumentation (5) Biological hazards of exposure to radiation (appropriate to the types and forms of radioactive material used) (6) Hands on-use of radioactive materials (7) Requirements of pertinent regulations

5. Commission Concern. Provide the topics which will be covered during the annual radiation safety refresher training (see Appendix F to NUREG-1556, Volume 7, Revision 1 for references).

## Requested Additional Information

USACBRNS Response to Commission. Annual refresher training topics will include those listed in Appendix F to NUREG-1556, Volume 7, Revision 1 except for incineration and animal experiments, which are not applicable. The USACBRNS RSO will also add any additional topics deemed necessary.

6. Commission Concern. Please note that licensee may not transfer the responsibilities of the RSO to other individuals. Many tasks and duties associated with managing the program may be assigned or delegated to other qualified individuals. The responsibility for these tasks and duties, however, lies with the RSO. The NRC does recognize that a qualified individual will have to fill in for the RSO when the RSO will be away for short periods of time for professional conferences, vacation, or illness. Please confirm that the alternate RSO will only act as RSO for a short period time when the RSO is temporarily absent.

USACBRNS Response to Commission. We confirm that the alternate RSO will only act as RSO for a short period time when the RSO is temporarily absent.

7. Commission Concern. Section 5 of Item 10 of your letter mentioned an old version of American National Standards Institute (ANSI) N323a-1997. Per NUREG-1556, Volume 7, Revision 1, the accepted version is ANSI N323AB-2013. Please confirm that the licensee will calibrate its radiation survey instrument in accordance with ANSI N323AB-2013 or provide justifications for using the old standard ANSI N323a-1997. In addition, if the licensee plans to conduct calibration for its radiation survey instrument in-house, please provide a description of the training program for individuals who will perform the radiation survey instrument's calibration.

USACBRNS Response to Commission.

a. We will calibrate our instruments in accordance with ANSI N323AB-2013.

b. Description of training program for individuals who will perform the radiation survey instrument calibration.

(1) Individuals responsible for local radiation safety programs will complete a minimum of 40 hours of formal training in the areas listed in table 3 below. The 40-hour Operation Radiation Safety Course, Course #4J-F2/494-F9 given by the US Army Chemical School meets this requirement. The USACBRNS RSO is the approving authority for all formal training courses.

Table 3
Formal Training Requirements
(1) Principles and practices of radiation safety (2) Radioactivity measurement standardization and monitoring (3) Biological effects of radiation (4) Mathematics and calculations basic to the use and measurement of radioactivity (5) Requirements of pertinent regulations (6) Management of a radiation safety program

(2) In addition to formal radiation safety training, individuals will be required to have source specific training on each major device. The duration of the source specific training will be determined by the USACBRNS RSC.

## Requested Additional Information

(3) The duration of training for personnel with no experience on a device or similar devices will be based on the activity of the radioactive material/device. If the activity of the beta/gamma radioactive material/device is 25 curies or less, the individual will receive 4 hours of source specific hands-on training on each device. If the activity of the beta/gamma radioactive material/device is greater than 25 curies, the individual will receive 8 hours of source specific hands-on training on each device. Hands-on training for alpha sources will be 8 hours.

(4) Personnel with prior experience on a device or similar beta/gamma or alpha radioactive material/devices will receive 2 hours of source specific hands-on training on each device. As a minimum, the source specific hands-on training will cover leak testing, surveys, interlocks (if applicable), safe use of the source/device, specific license conditions and emergency procedures. The training will be performed by a qualified RSO, approved by the USACBRNS RSO.

8. Commission Concern. In the application, the licensee requests that the RSC will approve or disapprove of changes to its facilities and equipment, user qualification, safe use of radionuclides and emergency procedures, radiation survey, and leak testing. The NRC may permit licensees make changes to its radiation safety program; however, the licensees must ensure the changes are in compliance with the regulations and license. Please describe the steps the licensee will take when making changes to their radiation safety program or provide the following.

“The licensee may make program changes and changes to procedures specifically identified in the letter received April 21, 2020 (ML20113E919) without prior Commission approval as long as:

- a) The proposed revision is documented, reviewed, and approved by the licensee's Radiation Safety Committee in accordance with established procedures prior to implementation;
- b) The revised program is in accordance with regulatory requirements, will not change the license conditions, and will not decrease the effectiveness of the Radiation Safety Program;
- c) The affected licensee's staff is trained in the revised procedures prior to implementation;
- d) The licensee's audit program evaluates the effectiveness of the change and its implementation; and
- e) The licensee will retain a record of each radiation safety program change for 5 years. The record will include a copy of the old and new procedures, the effective date of the change; and the record of approval by the Radiation Safety Committee.”

USACBRNS Response to Commission. We concur any changes to our radiation safety program must be in compliance with the regulations and our license. We will ensure this by following the process listed below.

The USACBRNS (licensee) may make program changes to procedures specifically identified in the letter received April 21, 2020 (ML20113E919) without prior Commission approval as long as:

- a. The proposed revision is documented, reviewed, and approved by the USACBRNS RSC in accordance with established procedures prior to implementation.
- b. The revised program is in accordance with regulatory requirements, will not change the license conditions, and will not decrease the effectiveness of the Radiation Safety Program.

Requested Additional Information

- c. The affected USACBRNS staff is trained in the revised procedures prior to implementation.
- d. The USACBRNS audit program for this license managed and conducted by our Health Physics Office evaluates the effectiveness of the change and its implementation and
- e. The USACBRNS will retain a record of each radiation safety program change for 5 years. The record will include a copy of the old and new procedures, the effective date of the change, and the record of approval by the RSC.

9. Commission Concern. In Sections 7, 8 and 9 of Item 10 of your letter, the licensee states that it will adopt AR 385-10, DAPAM 385-24, and Army Technical Manuals and Bulletins for the safe use of radionuclides and emergencies, and AR 385-10, DAPAM 385-24, DAPAM 385-25, Army Technical Manuals and Bulletins for radiation surveys and for sealed sources leak testing, and where applicable, Appendixes K, L and M, respectively, of NUREG-1556, Volume 11, Revision 1, "Consolidated Guidance About Materials Licenses: Program-Specific Guidance About Licenses of Broad Scope". Please note that, AR 385-10, DAPAM 385-24, DAPAM 385-25, Army Technical Manuals and Bulletins have not been endorsed by the NRC. Therefore, based on the licensing guidance you could commit to follow Appendixes K, L and M of NUREG-1556, Volume 11, Revision 1 for the safe use of radionuclides and emergencies, radiation surveys and sealed source leak tests, respectively, and revise them for your needs in accordance with your established procedures. Alternatively, you could provide a copy of the current version of the AR 385-10, DAPAM 385-24, DAPAM 385-25, Army Technical Manuals and Bulletins which you will adopt for our review.

USACBRNS Response to Commission. We commit to follow Appendixes K, L and M of NUREG-1556, Volume 11, Revision 1 for the safe use of radionuclides and emergencies, radiation surveys and sealed source leak tests, respectively, and revise them for our needs in accordance with our established procedures.

10. Commission Concern. Please confirm that besides disposing your licensed materials with half-life less than 120 days by decay-in-storage, you will transfer your licensed material and their wastes to authorized licensees who are licensed by the NRC or Agreement States only.

USACBRNS Response to Commission. We confirm that besides disposing our licensed materials with half-life less than 120 days by decay-in-storage, we will transfer our licensed material and their wastes to authorized licensees who are licensed by the NRC or Agreement States only.

Disposal Documents



Page 1

Friday, December 14, 2018

Gaye Nelson  
Rad Solutions, LLC./Hilmar, CA  
19858 Echo Street  
Hilmar, CA 95324

Dear Ms. Nelson:

The attached signed shipping manifest copies are your notice of receipt of the radioactive waste materials shipment specified on the manifest number below.

Manifest Number

5962-18-D-3

Date Received

12/14/2018

Thank you for your business.

Sincerely,

Shipping and Receiving

cc: Manifest File  
Shipping and Receiving file

Enclosure 2



**Manifest Discrepancies**

None



UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST SHIPPING PAPER										EnergySolutions Services, Inc.	
1. SHIPPER - NAME AND FACILITY										2. RECEIVING FACILITY	
3. SHIPPER'S LICENSE FOR DELIVERY NO.										4. LICENSE FOR RECEIPT NO.	
5. SHIPPER'S LICENSE FOR DELIVERY NO.										6. LICENSE FOR RECEIPT NO.	
7. SOUTH CAROLINA TRANSPORT PERMIT NO.										8. SOUTH CAROLINA TRANSPORT PERMIT NO.	
9. US ECOLOGY GENERATION NO.										10. US ECOLOGY GENERATION NO.	
11. US ECOLOGY PERMIT NO.										12. US ECOLOGY PERMIT NO.	
13. DATE OF PREPARATION OF MANIFEST (MONTH, DAY, YEAR)										14. DATE OF RECEIPT (MONTH, DAY, YEAR)	
15. DATE OF PREPARATION OF MANIFEST (MONTH, DAY, YEAR)										16. DATE OF RECEIPT (MONTH, DAY, YEAR)	
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97. DATE OF PREPARATION OF MANIFEST (MONTH, DAY, YEAR)										98. DATE OF RECEIPT (MONTH, DAY, YEAR)	
99. DATE OF PREPARATION OF MANIFEST (MONTH, DAY, YEAR)										100. DATE OF RECEIPT (MONTH, DAY, YEAR)	

# Disposal Documents

FORM 540A										EnergySolutions Services, Inc.	
UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST SHIPPING PAPER (CONTINUATION)										MANIFEST NUMBER (Use this number on all continuation pages) 18-D-3	
										PAGE 2 OF 2 PAGES	
11. U.S. DEPARTMENT OF TRANSPORTATION DESCRIPTION (Including proper shipping name, hazard class, UN ID number, and any additional information)	12. DOT LABEL "RADIOACTIVE"	13. TRANSPORT INDEX	14. PHYSICAL AND CHEMICAL FORM	15. INDIVIDUAL RADIONUCLIDES	16. TOTAL PACKAGE ACTIVITY mCi	17. IASSCO CLASS	18. TOTAL WEIGHT OR VOLUME (Use appropriate units)	19. IDENTIFICATION NUMBER OF PACKAGE			
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	1.624E+02	(4.397E+00)	NA	92 LBS; 7.5 FT3	RS169-D03		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	2.1340E+02	(5.7678E+00)	NA	92 LBS; 7.5 FT3	RS169-D04		
UN 2910, Radioactive material, excepted package-limited quantity of material, 7	NA	NA	Solid Oxide	C-14	3.0216E+03	(8.1666E+01)	NA	470 LBS; 7.5 FT3	RS169-D05		
DOT Non Regulated Material	NA	NA	Solid Oxides	C-14 H-3	7.4000E-01	(2.0000E-02)	NA	48 LBS; 4.01 FT3	RS173-D01		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	9.3166E+01	(2.6177E+00)	NA	110 LBS; 7.5 FT3	RS200-D01		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	6.8696E+01	(1.8661E+00)	NA	92 LBS; 7.5 FT3	RS200-D02		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	7.1181E+00	(1.9238E-01)	NA	96 LBS; 7.5 FT3	RS200-D03		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	2.0123E+01	(6.4396E-01)	NA	114 LBS; 7.5 FT3	RS200-D04		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	7.0217E+01	(1.8978E+00)	NA	407 LBS; 7.5 FT3	RS200-D05		
DOT Non Regulated Material	NA	NA	Solid Oxide	C-14	1.2421E-01	(3.3570E-03)	NA	448 LBS; 7.5 FT3	RS200-D06		
UN 2915, Radioactive material, Type A package, 7	Yellow II	0.7	Solid Oxides	Ag-110m Co-60 Cs-134 Cs-137 In-114m Mn-54 Nb-95 Zr-95	Co-60 Eu-152 Fe-59	8.3393E+01 (2.2539E+00)	NA	261.2 LBS; 7.5 FT3	RS219-D01		

FORM 540A (10-98)

FORM 641

Emergency Solutions Services, Inc.

# UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

## CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and Disposal of Radioactive Waste

1. MANIFEST TOTALS

2. MANIFEST NUMBER 18-D-3

3. PAGE 1 OF 3 PAGE(S)

4. SHIPPER NAME  
Rad Solutions LLC

SHIPMENT ID NUMBER 18-D-3

DISPOSAL CONTAINER DESCRIPTION										WASTE DESCRIPTION FOR EACH WASTE TYPE IN CONTAINER										TOTAL	
5. CONTAINER IDENTIFICATION NUMBER (10 digit NRC Number)	6. CONTAINER DESCRIPTION (See Note 1) PROCESS REQUESTED (See Note 2A)	7. VOLUME (m <sup>3</sup> )	8. WASTE CONTAINER WEIGHT (lb)	9. SURFACIC LEVEL (mm)	10. SURFACIC CONTAMINATION (mSv/hr) (See Note 2)	11. WASTE DESCRIPTION (See Note 2)	12. APPROXIMATE WASTE VOLUME IN CONTAINER (m <sup>3</sup> )	13. APPLICATION OR STABILIZATION MEDIA (See Note 3)	14. CHEMICAL DESCRIPTION	15. RADIOLOGICAL DESCRIPTION	16. WASTE CAUTION (See Note 4)	17. WASTE CLASSIFICATION (See Note 5)	18. WASTE CLASSIFICATION (See Note 5)	19. WASTE CLASSIFICATION (See Note 5)	20. WASTE CLASSIFICATION (See Note 5)	21. WASTE CLASSIFICATION (See Note 5)	22. WASTE CLASSIFICATION (See Note 5)				
FWA40P01 LEONARD	4	0.212	28,000	1,000E-03	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	7.800	64,000	1,000E-01	<1.870E-06	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	0.212	34,019	3,000E-03	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	7.800	78,000	3,000E-03	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	0.114	28,886	3,000E-03	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	4.019	87,000	3,000E-01	<1.870E-06	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	0.212	41,277	6,000E-04	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	7.800	81,000	6,000E-02	<1.870E-06	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	0.212	33,666	3,000E-04	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	7.800	74,000	3,000E-02	<1.870E-06	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	0.212	66,792	3,000E-04	<2.789E-11	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				
FWA40P01 LEONARD	4	7.800	123,000	3,000E-02	<1.870E-06	Outcomp	160	Outcomp	NP	Co-60	NP	Co-60	NP	Co-60	NP	Co-60	NP				

**Notes 1-4:** Container Description Codes. For containers needing disposal in approved structure over- and under- ground, the container must be labeled with the numerical code must be followed by "G-".

**Notes 5-8:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 9-12:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 13-16:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 17-20:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 21-24:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 25-28:** Waste Description Codes. (Choose up to three which predominates by volume.)

**Notes 29-32:** Waste Description Codes. (Choose up to three which predominates by volume.)



[illegible]

[illegible]

## Disposal Documents

[illegible]



[illegible]

FORM 640A (03-06)



11

# Disposal Documents

LD # 023199D

FORM 541A																	
UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST																	
CONTAINER AND WASTE DESCRIPTION (CONTINUATION)																	
EnergySolutions, LLC																	
2. MANIFEST NUMBER USA2017-011																	
3. PAGE 2 OF 2 PAGE(S)																	
DISPOSAL CONTAINER DESCRIPTION																	
5. CONTAINER IDENTIFICATION NUMBER(S)	6. CONTAINER DESCRIPTION (See Note 1.5)	7. VOLUME (m <sup>3</sup> )	8. WASTE AND CONTAINER WEIGHT (kg)	9. SURFACE RADIATION (mrem/hr)	10. SURFACE CONTAMINATION (dpm/100cm <sup>2</sup> )	11. WASTE DESCRIPTION (See Note 2.5)	12. APPROXIMATE VOLUME IN CONTAINER (m <sup>3</sup> )	13. RADIOLOGICAL STRATIFICATION METHOD (See Note 3)	14. CHEMICAL DESCRIPTION	15. CHEMICAL WEIGHT	16. CHEMICAL CHELATING AGENT (If > 0.1%)	17. RADIOLOGICAL DESCRIPTION	18. WASTE CLASSIFICATION				
FLUAFORT LEONARD		0.212	27.216	2.000E-02	<2.789E-13	39.424	0.212	100	Solid	NP		0.00000E+00	3.700E-02				
													AU				
FLUAFORT LEONARD		0.212	27.216	2.000E-02	<2.789E-13	40.41	0.212	100	Solid	NP		0.00000E+00	3.700E-02				
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