State-Licensed Disposal Area (SDA)

Citizen Task Force Meeting

July 16, 2003

SDA RADIONUCLIDE INVENTORY

- TYPES OF WASTE
- WASTE PROFILES
- SDA DISPOSAL RECORDS
- SDA DATABASES
- WASTE PROFILES AND "ADD-INS" – THE SEQUEL
- ESTIMATING RADIONUCLIDE ACTIVITIES
- ESTIMATING WASTE CLASSIFICATION

TYPES OF WASTE IN THE SDA

Physical Forms Include:

- Trash (paper, plastic, glass, metal)
- Demolition/Cleanup Wastes
- Aqueous Liquids (solidified or absorbed)
- Organic Liquids (absorbed)
- Ion Exchange Resins
- Sludge and Filter Media (flocculants, diatomaceous earth, cellulose)
- Biological Waste (human, plant, and animal)
- Sealed Sources
- Irradiated Metals (reactor internals, accelerator targets.

TYPES OF WASTE IN THE SDA

- Highly diverse in terms of radionuclides present and their activities.
- Most users of radioactive material generate several physical and/or chemical forms of waste.
- The identities and relative amounts of radionuclides tend to vary with the type of user.
- In many cases, the identities and relative amounts of radionuclides are relatively constant in a given type of waste for a given type of generator, although total radionuclide concentration may vary.

WASTE PROFILES

- Specific to a given type of user and type of waste.
- Identifies the radionuclides present in that waste.
- Specifies the relative amount of each radionuclide.
- Specifies the total average concentration of radionuclides in the waste.
- User types (groups) are:

Fuel Cycle	Isotope Production
Industrial	Power Reactor
Institutional	Special Purpose Reactor

SDA DISPOSAL RECORDS

TYPES OF RECORDS THAT MAY BE AVAILABLE:

- **Radioactive Waste Receipt Record (RWRR)**

  Prepared by NFS – Shipment Summary, Used for Billing

- **Radioactive Waste Shipment Record (RWSR)**

  Prepared by Generator or Broker – Details by Container

- **Bill of Lading**

  Prepared by Carrier – Origin of Shipment, Package Count.

- **NFS Notes**

  Package Tally, Condition, etc.

SDA DISPOSAL RECORDS

WASTE BROKERS:

- Provide waste disposal services, mostly to small generators.
- Primary service is collection of waste and delivery to disposal site ("Milk Runs").
- May also provide containers, package waste, and prepare RWSR.
- Generator remains responsible for certifying waste is acceptable for transport and disposal.
- Quality and completeness of shipping papers varies greatly.

NUCLEAR FUEL SERVICES, INC.

SUBSIDIARY OF W. R. GRACE & CO.
WEST VALLEY, NEW YORK

RADIOACTIVE WASTE SHIPMENT RECORD

NFS

SHIPPING NUMBER

CONTRACT NUMBER

ACCOUNT OF: Nuclear Diagnostic Laboratories, Inc. DATE SHIPPED: 4-25 EST. ARRIVAL: 4-26

ADDRESS: Post Office Box XXX 791 (1000 Lower So. Street) Peekskill, New York 10566 SHIPPED VIA: NBL

BILL OF LADING NO. 41574

LICENSED BY: ARC 31-12000-1 NYS NO. 1226-1422 NUMBER OF VEHICLES: one

PLEASE TYPE – MAIL OR SEND WITH SHIPMENT ALL COPIES BUT DUPLICATE TO NFS.

CONTAINER NUMBER	TYPE (1)	VOLUME (CU. FT.)	WEIGHT (LBS.)	RADIATION MR/HR @	RADIATION MR/HR @ 1 METER	MAJOR ISOTOPE(S)	MILLICURIES IN CONTENTS	SNM (GRAMS)	SOURCE MTL. (LBS.)	CHEMICAL FORM	PHYSICAL FORM	NAME AND ADDRESS OF WASTE PRODUCER
3501	D	7.35		20	2	I^{125}	65				S/J	Bellevue Hosp Cen. N.Y.C
3895				.5	.01	I^{131}	5					St C Times Hosp. N.Y.C.
3770A				9	1	I^{131}	1					Coney Island Hosp Brklyn, N.Y.
5711				15	10	I	.5					
4557				.01	.01	Tc^{99m}	2					
6483 F				165	9	I^{131}	20					St Lukes Hosp Newburgh N.Y.
6483 G				165	.5		1					
6483 H				150	1		10					
6483 I				165	.5		1					
6483 J				10	1		1					
6483 K				20	2		1					
6483 L				10	1		1					
TOTALS												

EXTERNAL VEHICLE RADIATION: _____ MR at 1 meter.

LOOSE CONTAMINATION: VEHICLE <500 dpm CONTAINERS <500 dpm

(1) Type of Containers B – Wood Box C – Concrete Cask D – Steel Drum

I hereby certify that the above listed radioactive wastes are properly described, are packaged and marked in accordance with ICC Regulations and NFS General Terms and Conditions, and do not contain explosives or pyrophoric material in concentrations which might cause significant hazard.

4-26-74
Date

Authorized Signature

Title

J

ALLIED CROSSROADS NUCLEAR CORPORATION

201 VICTORY ROAD · DORCHESTER 22, MASSACHUSETTS

A.E.C. License 20-[illegible]-2

Telephone [illegible], Area Code 617

Veteran Admin Hospital
Irv Ave & University Place

Veterans Administration Hospital

Irving Ave. & University Place

[illegible] New York

AUTHORIZED PERSON: Dr. [illegible]

(10)

CONTAINER IDENTIFICATION	SIZE OF CONTAINER	PRINCIPAL CONTAMINANTS	DESCRIPTION OF CONTENTS	AMOUNT OF CONTENTS	AT SURFACE OF CONTAINER	AT [illegible] FROM CONTAINER	[illegible]
[illegible]	[illegible]	C14	Animal Carcasses	[illegible]	< 1 mR	0	30[illegible]
[illegible]	55 gal	"	"	[illegible]	< 1 mR	0	27[illegible]

14.70

ALL CONTAINERS IN THIS SHIPMENT WERE WIPE TESTED AND FOUND TO [illegible] ALL [illegible] ENTRIES [illegible] AND FOUND TO BE CORRECT.

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY DESCRIBED, AND ARE PACKED AND MARKED, AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE REGULATIONS PRESCRIBED BY THE I.C.C.

SIGNATURE: David F. Hamm[illegible]

ORIGINAL

AN

ALLIED-CROSSROADS NUCLEAR CORPORATION

201 VICTORY ROAD • DORCHESTER 22, MASSACHUSETTS

A.E.C. LICENSE [illegible] TELEPHONE [illegible], AREA CODE 617

(14)

MIT

IDENTIFICATION NUMBER	[illegible] CONTAINER [illegible]	PRINCIPAL CONTAMINANTS	DESCRIPTION OF CONTENTS	AMOUNT OF CONTENTS	AT SURFACE OF CONTAINER	AT 1 METER FROM CONTAINER	[illegible]
3-[illegible]A	[illegible] .475	C-14	lab waste	.500	[illegible]	< .05	
3-[illegible]	"	P-32, C-14, H-3	"	.002, .003 .015	<.05	< .05	
3-[illegible]	"	C-14	"	.01	<.05	< .05	
3-501	"	C-14, H-3	"	.009, .0[illegible]	<.05	< .05	
3-[illegible]	"	C-14	"	.01	<.05	< .0[illegible]	
3-[illegible]70	"	PO-210, Hg203	"	.100, .01[illegible]	.2	< .05	
3-[illegible]75	"	Zn-65, P-32	"	.100, .001	.7	< .05	
3-[illegible]	"	Cs-137, Rb-86	"	.001	< .05	< .05	
3-[illegible]	"	H-3	"	.250	< .05	< .05	
3-[illegible]	"	Th-228, W-185 Co57, Tb124 Po210	"	.005, .0[illegible] .1[illegible], .1, .01	28	.5	
3-[illegible]	"	Tb-161 H-3, Gd-159	"	[illegible]	[illegible]	.5	
3-[illegible]	"	H-3	"	.005	< .[illegible]	[illegible]	
3-[illegible]	"	Co-60 Au-198, Fe-59	"	.0001 .001, .0001	.25	[illegible]	
3-[illegible]	"	Th-228	"	.002	[illegible]	[illegible]	
3-[illegible]	"	C-14	"	.100	< .05	< .05	
3-[illegible]	"	H-3	"	.01	< .05	< .05	
3-[illegible]	"	C-14	"	.05	< .05	< .05	
3-[illegible]	"	C-14	"	.015	.1	< .05	
3-[illegible]	"	Ca-45	"	.005	< .05	< .05	
3-[illegible]	"	C-14	"	.100	< .05	< .05	

ALL CONTAINERS IN THIS SHI[illegible] [illegible] HAVE [illegible] WERE [illegible] AND [illegible] TO BE [illegible]

29

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY DESCRIBED, AND ARE PACKED AND MARKED AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE REGULATIONS PRESCRIBED BY THE I.C.C. SIGNATURE F.X. [illegible]

ORIGINAL

FM 377

ALLIED CROSSROADS NUCLEAR CORPORATION

201 VICTORY ROAD · DORCHESTER 22, MASSACHUSETTS

A.E.C. LICENSE 20-[illegible]-2

TELEPHONE [illegible], AREA CODE 617

D

Looks Cabot Corp, on 63-K-3004
but differ signature

(4)

CUSTOMER'S IDENTIFICATION NUMBER	SIZE OF CONTAINER (CU. FOOT OR GALLON)	PRINCIPAL CONTAMINANTS	DESCRIPTION OF CONTENTS	MILLICURIE AMOUNT OF CONTENTS	RADIATION LEVELS AT SURFACE OF CONTAINER	RADIATION LEVELS AT 1 METER FROM CONTAINER	THIS CO[LUMN] TO BE [LEFT] BLAN[K]
1	30 gal	C^{14}	Dry	0.2	0	0	129
2	30 "	"	"	"	0	0	146
3	"	"	"	"	0	0	138
							41[illegible]

[illegible] 12.03

THIS IS TO CERTIFY THAT THE ABOVE NAMED ARTICLES ARE PROPERLY DESCRIBED, AND ARE PACKED AND MARKED AND IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE REGULATIONS PRESCRIBED BY THE I.C.C.

SIGNATURE [illegible]

ORIGINAL

6?

13.01	-1
8.02	-2
8.02	3
12.03	-4
4.01	5
4.01	6
16.04	7
.66	8
14.70	9
14.70	10
7.35	11
36.75	12
111.30	13
29.52	
30.46	
30.46	
30.46	
29.52	
29.52	
29.52	
29.52	
24.37	
23.37	23
147.00	24
147.00	25
73.50	26
[illegible] *	

111.30
4 @ 7.35 = 29.4
81.9 ÷ 14 = 5.85

Jed
12-5-63

no duplicate

704.82
11.30
593.52
corrected total
JH
1-29-64

NFS
used 0.66
[illegible]

29.52 / 20 = 1.476

15 drums

SN 454

NUCLEAR FUEL SERVICES, INC.

SUBSIDIARY OF W. R. GRACE & CO.

WEST VALLEY, NEW YORK

Shipping Number L3001

Radioactive Waste Receiving Record

Account of: Allied Crossroads Nuclear Corp Date Received 12/5/63

Address 201 Victory Road
Dorchester 22, Mass. 02122

Volume Received 893.52 cu. ft.

Received by J. E. Lovell
AUTHORIZED SIGNATURE

1. Shipping Invoice (is) (is not) correct

Remarks:

Charge: $719.28

Received 275 Containers

Total Vol. 893.52 Ft^3

2. Maximum Radiation Levels

Containers		Vehicles	
contact	1700 MR	contact	45 MR
1-meter	150 MR	1-meter	15 MR
Checked by	J. E. Lovell	Checked by	J. E. Lovell

3. Special Handling (was) (was not) required

Remarks:

Charge: -

4. Decontamination (was) (was not) required

Remarks:

Charge: -

Total Charges: $719.28

5. Disposition of Waste

Temporary Storage (date) _____ signed _____

Burial (date) 12/5/63 signed J. E. Lovell

Location of Burial

Trench No. I-Sta. 75-100: 10-20' Deep

	63-L-3001		2	2	2	20	20	20	20	20	20	16	20	55		
	Source	Sheet	1	2	3	15	16	17	18	19	20	21	22	23	Count	Total
1	ACNC-001	7.35													2	31.73
		4.01	1	2											3	
		5	1												1	6
		mCi	2	2											6	6
2	ACNC-002	7.35													0	8.0
		4.01			2										2	
		0.67													0	2
		mCi			24.9										24.9	24.9
3	Cabot Corp.	7.35													0	12.03
		4.01													3	
	Assumed	0.67													0	3
		mCi													0.6	0.6
4	ACNC-003	7.35													0	4.01
	Assigned	4.01													1	
	AD Little	0.67													0	1
		mCi													1	1
5	ACNC-004	7.35													0	4.01
	ID as	4.01													1	
	EG&G fill names	0.67													0	1
		mCi													1	1
6	ACNC-005	7.35													0	16.04
		4.01													4	
		0.67													0	4
		mCi													0.024	0.024
7	Boston City Hospital	7.35													0	0.67
		4.01													0	
		0.67													1	1
		mCi													1	1
8	VA - Syracuse	7.35													2	14.7
		4.01													0	
		0.67													0	2
		mCi													2	2
9	ACNC-006	7.35													1	7.3
	ID as	4.01													0	
	Raytheon	0.67													0	1
		mCi													4	4
10	ACNC-007	7.35													5	36.75
		4.01													0	
		0.67													0	5
		mCi													5	5
11	ACNC-008	7.35													4	111.3
		5.85													14	
		0.67													0	18
		mCi													18	18
12	MIT	7.35													0	263.348
		1.476							20	20	20		20		100	
		1.523				20	20	20				16			76	176
		mCi				22.68	1.979	0.456	11.48	219.1	15.79	0.016	16.97		341.0968	341.0968
13	ACNC-009	7.35												3	3	23.39
		4.01													0	
		0.67												2	2	5
		mCi												14004	14004.24	14004.242
14	Rowe	7.35												50	50	367.5
		4.01													0	
		0.67													0	50
		mCi												335.7	335.7	335.7
	Totals	7.35	0	0	0	0	0	0	0	0	0	0	0	53	67	900.85
		5.85	0	0	0	0	0	0	0	0	0	0	0	0	14	
		5	1	0	0	0	0	0	0	0	0	0	0	0	1	
		4.01	1	2	2	0	0	0	0	0	0	0	0	0	14	
		1.523	0	0	0	20	20	20	0	0	0	16	0	0	76	
		1.476	0	0	0	0	0	0	20	20	20	0	20	0	100	
		0.67	0	0	0	0	0	0	0	0	0	0	0	2	3	275
		mCi	2	2	24.9	22.678	1.979	0.4561	11.476	219.1409	15.7895	0.016	16.974	14339.942		14,744.56
			2	2	2	20	20	20	20	20	20	16	20	55	275	

SDA DISPOSAL DATABASES

Started with:

- Database of Information Transcribed from Disposal Records with Waste Profile Assignments.
- Database of Add-In Data with Subset of Transcribed Data.
- One Record = One NFS Billing Account's Waste. 4,317 Records.

Ended with:

- Single Database of Transcribed Data, Waste Profile Assignments, and Add-In Data.
- One Record =< One Generator's Waste. 9,571 Records.

  (Generator data may be split by profile, SNM, concentration.)

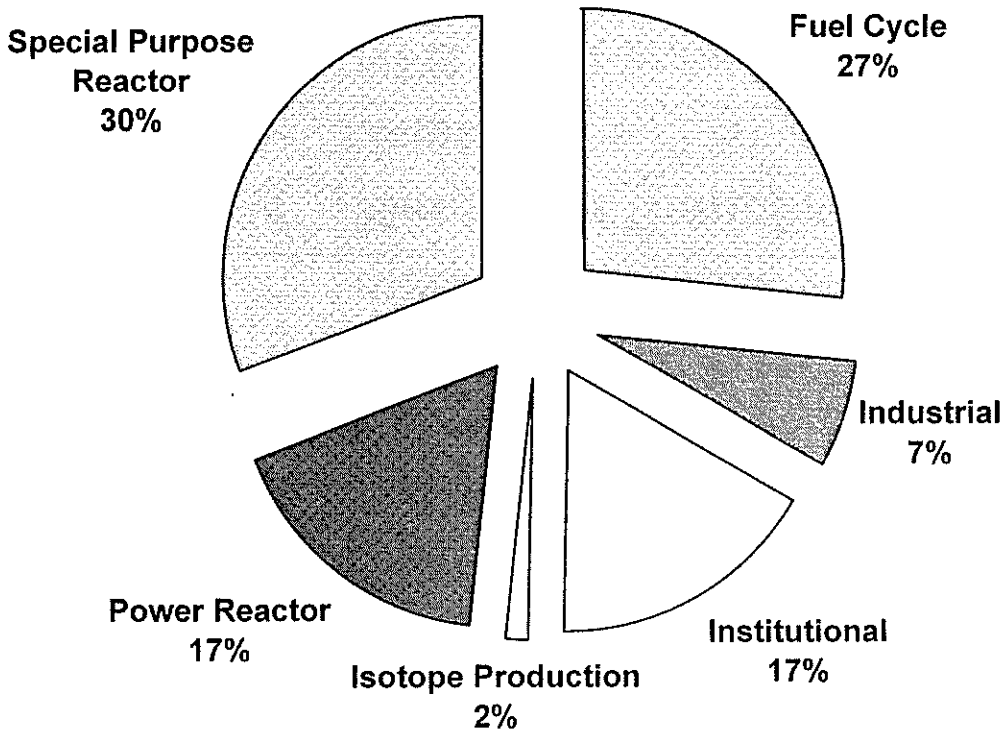
SDA WASTE PROFILES

- Same six Primary Groups.
- Number of Profiles Increased from 16 to 33.
- All Old Profiles Replaced or Revised.
- Profiles Involving Source Material and Special Nuclear Material Based on SDA Disposal Records.
- Other Profiles Based Primarily on Detailed Generator Surveys and Laboratory Analyses of Wastes.

  Chronological "in sync" with SDA Waste.

  Basis for Waste Characteristics Used in Developing 10 CFR Part 61.

SDA Waste Volumes by Primary Group
(2,360,000 ft^3)



FUEL CYCLE PROFILES

Secondary Profile	Generators	
	No.	Type
Depleted Uranium	11	AEC contractors. Facilities involved in production of uranium fuel.
Enriched Uranium	12	
Normal Uranium	9	
MOX	7	Facilities involved in production of mixed oxide fuel.
Ore	1	Middlesex Sampling Station cleanup waste.
Reprocessing	1	NFS Plant waste (≤ 200 mR/hr).
SNAP	1	Mound Laboratory Pu-238 contaminated trash.

INDUSTRIAL PROFILES

Secondary Profile	Generators	
	No.	Type
Beryllium	11	Industrial, Academic, Military facilities.
Biomedical	107	Pharmaceutical, cosmetic companies. Clincal labs.
Lead	1	Westinghouse Astronuclear Lab
LSA Trash	267	Very diverse. Do not fit other profiles.
Mercury	1	Cornell Aeronautical Lab
Radium	54	Radium is only or primary isotope.
Sealed Sources	25	Discarded/decayed sources.
Thorium	27	Lighting, jet engine chemical companies.
Uranium	15	Labs, chemical companies.

INSTITUTIONAL PROFILES

Secondary Profile	Generators	
	No.	Type
Bioresearch	237	Universities, Institutes, Medical facilities conducting life-sciences research.
Medical	304	Hospitals and Clinics performing treatment or diagnostics.
Non-Bioresearch	58	Universities and Institutions conducting physical sciences research.
Radium	8	Primarily Ra-226 implants.

ISOTOPE PRODUCTION PROFILES

Secondary Profile	Generators	
	No.	Type
Large Tritium	8	Producers/Users of large amounts of H-3 and some C-14 and S-35.
Small Tritium	37	Producers/Users of large amounts H-3.
Reactor Targets	1	Tc-99m for medical use. Union Carbide, Sterling Forest. High activity waste with SNM.
Reactor Trash	2	Tc-99m for medical use. Union Carbide, Sterling Forest. Lower activity trash.
Sealed Sources	7	Sealed source manufacturers. High specific activity.

POWER REACTOR PROFILES

Wastes from nuclear reactors with the primary purpose of generating electric power.

Secondary Profile	Generators	
	No.	Type
BWR	10	Boiling Water Reactors. All for commercial plants
Internals	5	Irradiated reactor components. All from commercial Light Water Reactors.
PWR	13	Pressurized Water Reactors. Commercial and Military.

SPECIAL PURPOSE REACTOR PROFILES

Secondary Profile	Generators	
	No.	Type
D&D	2	SPR decommissioning waste.
Experimental	9	Prototypes. Power, air/space propulsion.
Internals	7	SPR irradiated components.
Naval	16	Naval propulsion reactor development and maintenance.
Small Research	10	Low-power industrial, institutional, and military reactors for materials and life-sciences research.

WASTE PROFILES AND "ADD-IN" RADIONUCLIDES

- "Add-In" radionuclides supplement or replace activity based on waste profile with radionuclide activities found on shipping papers that are either not present or with activities much higher than would be obtained based on the waste profile.

- Previously, add-ins based on contents of "Memo" field of old database.

- Now based on re-examination of every microfilmed disposal record.

- Some profiles define zero concentrations (non-radioactive waste or activity always based on add-ins).

SDA RADIONUCLIDE INVENTORY

- If the only information needed is radionuclide activities, calculations are very simple. For each waste profile:

  Activity = Volume of Waste Assigned to Profile

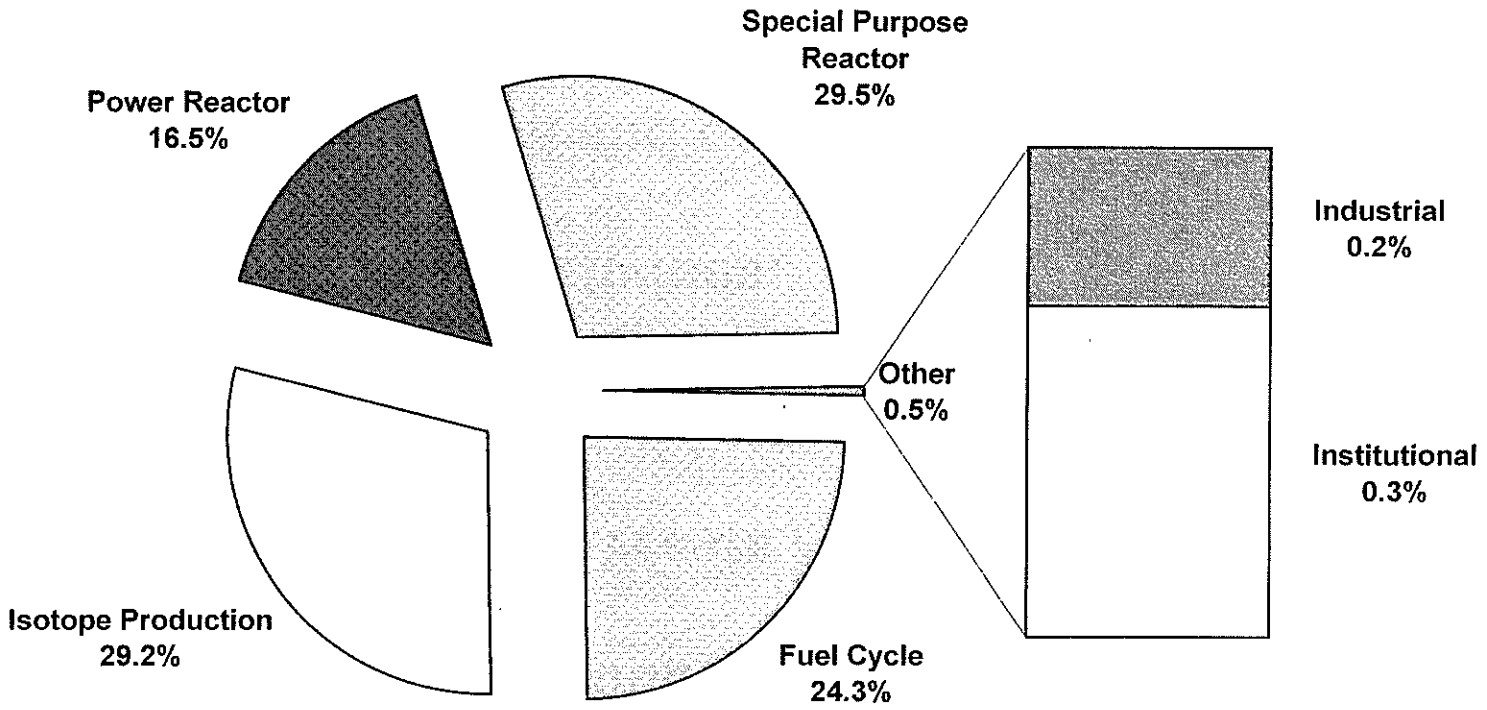
  x Average Radionuclide Concentrations

  + Add-In Activities.

- Potential radiological and costs impacts of alternatives being considered cannot be properly evaluated without considering the variability of radionuclide concentrations, even in wastes assigned to a given profile.

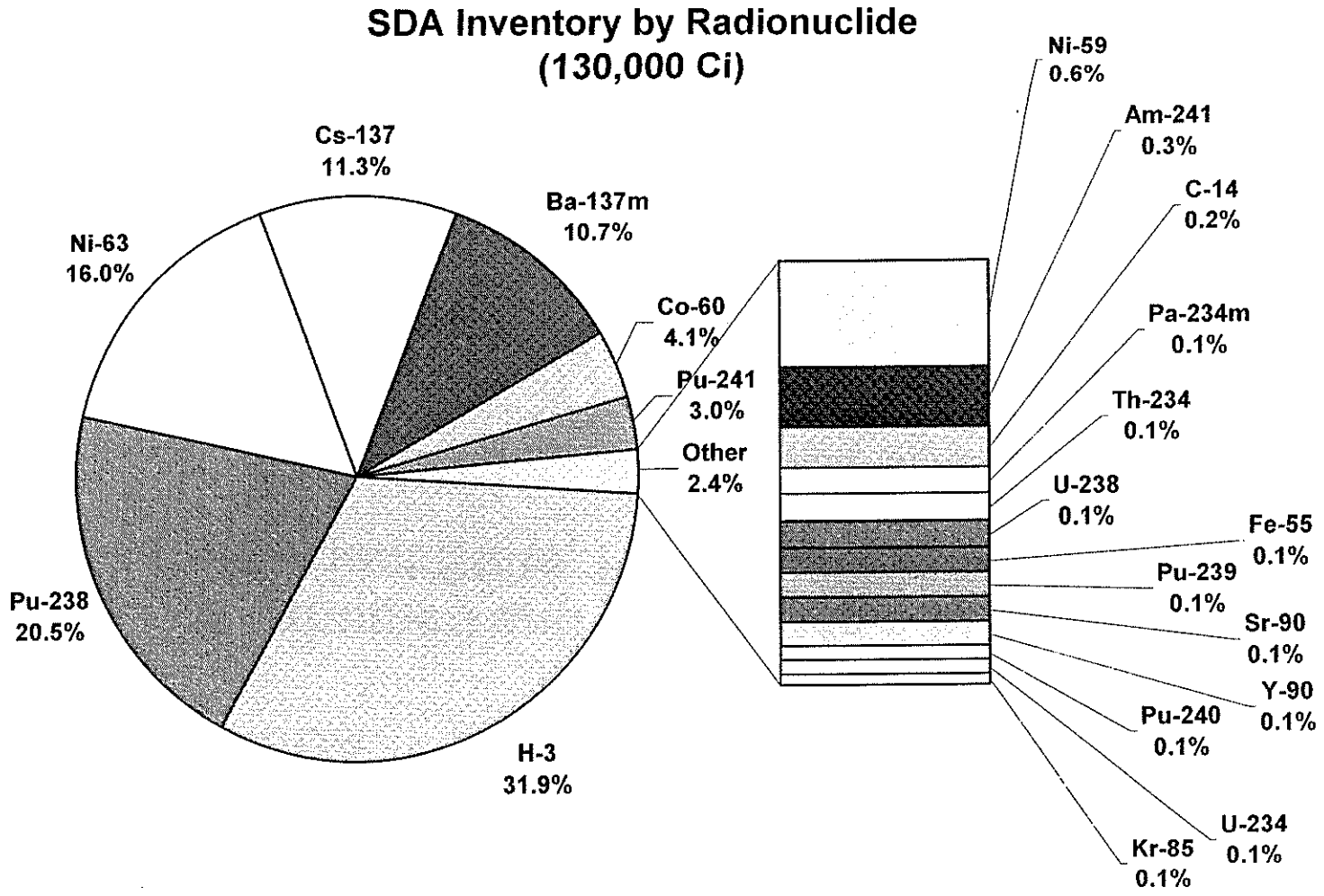
  The necessary calculations have been performed but are too complex to describe in the time available.

SDA Activity by Primary Group
(130,000 Ci)



Reference Date: January 2000

Nuclide	Half-life (y)
H-3	12
C-14	5,730
Co-60	5.27
Ni-63	100
Sr-90	29
Y-90	64.0 hr
Tc-99	213,000
I-129	1.57e+07
Cs-137	30
Ba-137m	2.552 min
U-232	72
U-233	158,000
U-234	244,000
U-235	7.04e+08
U-238	4.47e+09
Pu-238	88
Pu-239	24,100
Pu-240	6,540
Pu-241	14
Np-237	2,140,000
Am-241	432
Cm-243	29
Cm-244	18



SDA WASTE CLASSIFICATION

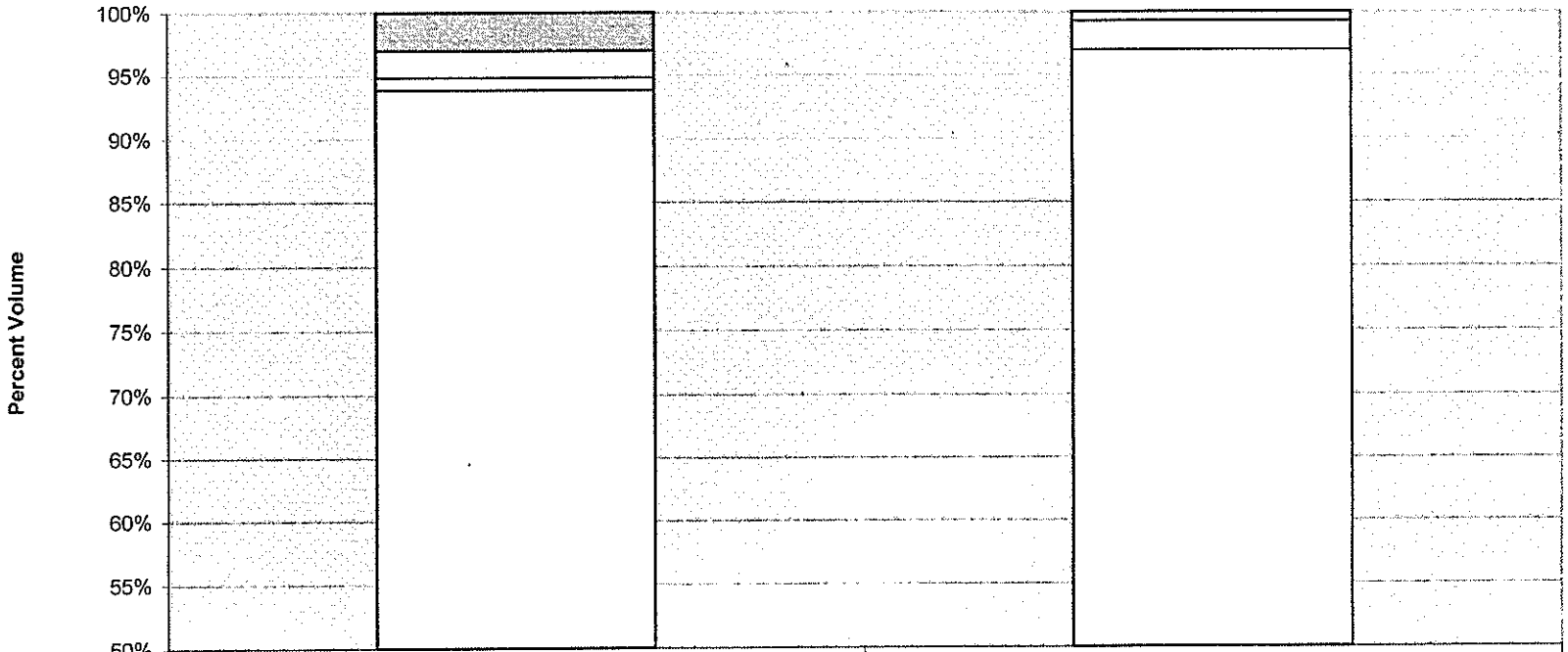
10 CFR Part 61 did not exist during the time that waste was received at the SDA.

If wastes were exhumed and shipped to a LLW site licensed by NRC or Agreement State, Part 61 would apply.

Assumptions:

- **Waste still in original containers.**
- **Waste form requirements not considered.**
- **Based on container volume except for Internals.**
- **Volume for Internals assumed to be half container volume.**

Comparison of SDA and Barnwell Waste Volumes by Class



	Current SDA Estimate, 2000	Barnwell, 1987-89
GTCC	3.1%	0.0%
C	2.1%	0.8%
B	1.0%	2.3%
A	93.8%	96.9%