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Department of Energy Nuclear Weapons Complex 1985 and 2015

Presented to the ADPSM
Plutonium Operations Lunchtime Lecture Series
(POLLS)

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Generic Overview of a Mature Nuclear Weapons Program

US Department of Energy

Weapons Complex Facilities *circa 1985*

- Uranium ore mined in WY, CO, NM, UT, and TX
- Other components shipped to Pantex Plant
 - Mound Facility, Miamisburg, OH, shipped detonators and explosive timers
 - Bendix Plant, Kansas City, MO, shipped electrical and mechanical components and adhesives
 - Pinellas Plant, St. Petersburg, FL, shipped neutron generators, thermal batteries, capacitors, and switches
- Laboratories provided research, development, design, and engineering
- Nevada Test Site used to test nuclear devices

Where is the Weapons Grade Plutonium? (Metric Tons of Plutonium)*

* "The United States Plutonium Balance 1944-2009", June 2012

(An update of "Plutonium: The first 50 years" U.S. DOE, Feb. 1996, DOE/DP-0137.)

[http://nnsa.energy.gov/sites/default/files/nnsa/06-12-inlinefiles/PU Report Revised 06-26-2012 \(UNC\).pdf](http://nnsa.energy.gov/sites/default/files/nnsa/06-12-inlinefiles/PU%20Report%20Revised%2006-26-2012%20(UNC).pdf)

US Department of Energy Weapons Complex Facilities Closing or Closed Today

Primary Weapons Complex Facilities Today

1979 – Aerial View of TA-55

Plutonium: “Most Toxic Substance Known to Man”??

SUBSTANCE

LETHAL DOSE (mg)

DEATH IN

Ingested:

botulism toxin

0.00005

hours to days

nicotine

60-100

seconds to days

aflatoxin (in mushrooms)

0.01

hours to days

aconitin (in flowers)

1-2

hours

strychnine

100-200

hours

cyanide

200

minutes

plutonium

6000

more than 15 years

In blood:

snake poison

0.005-1

hours to days

plutonium

2

more than 15 years

Inhaled:

nerve gas

1

hours

cadmium vapors

90

hours

plutonium

5

more than 15 years

Plutonium Facts

- Not a naturally occurring element
- Five isotopes, six allotropic forms
- Major isotope: ^{239}Pu , $t_{1/2} = 24,110$ yrs
- Spontaneous alpha decay
- High Density (16-20 g/cc)
- Low Melting Point (641 C)
- Chemically reactive
- Fissile material
- 0.002 w/g

^{238}Pu
 $t_{1/2} = 87.7$ yrs
 0.56 w/g

Actinides	+3 89	+4 90	+4 +5 91	-3 -4 -5 -6 92	-3 -4 -5 -6 93	+3 +4 +5 +6 94	+3 +4 +5 +6 95	+3 +4 +5 +6 96	+3 +4 97	+3 98	+3 99	-3 100	+2 +3 101	+2 +3 102	+2 +3 103
	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr
	Actinium	Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium	Lawrencium
	(227)	232.0381	231.0359	238.029	237.0482	(145)	(145)	(247)	(247)	(251)	(254)	(257)	(258)	(255)	(260)
	-18-9-2	-18-10-2	-20-9-2	-21-9-2	-22-9-2	-23-8-2	-23-8-2	-25-9-2	-27-8-2	-28-8-2	-29-8-2	-30-8-2	-31-8-2	-32-8-2	-32-9-2

Major Constituents in WR Plutonium