LA-UR- 11-00505

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Title:	Programmatic Mission Transformation - Chemistry and Metallurgy Research Replacement (CMRR) Project
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Intended for:	High Level Presentation for NNSA Customers and Congressional Staff by LANL and NNSA Senior Management

Form 836 (7/06)

programmatic mission transformation

Chemistry and Metallurgy Research Replacement (CMRR) Project




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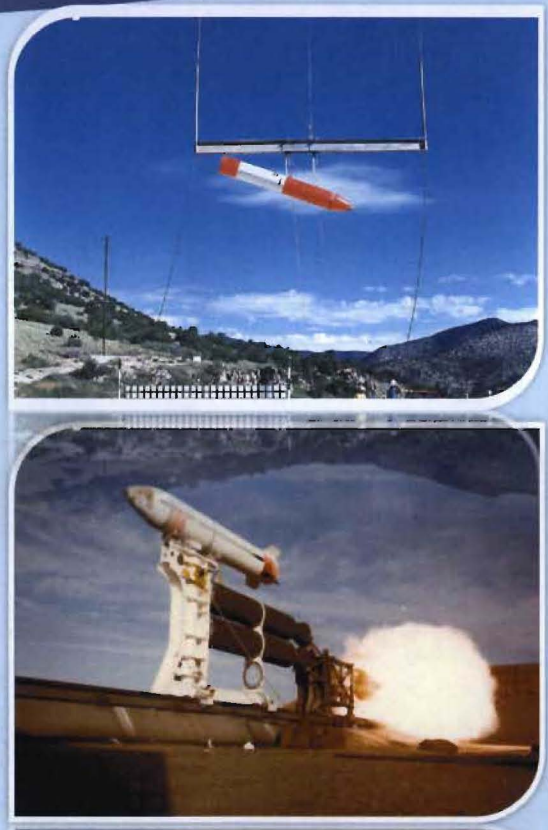
NNSA

Nuclear Posture and Policy Objectives

- Preventing nuclear proliferation and nuclear terrorism
- Reducing the role of nuclear weapons in US national security strategy
- Maintaining strategic deterrence and stability at reduced nuclear force levels
- Strengthening regional deterrence and reassuring US allies and partners
- Sustaining a safe, secure, and effective nuclear arsenal



Left Upper and Bottom: *Drop Tower, Sled Track*
Right: *24 Launch Tubes*

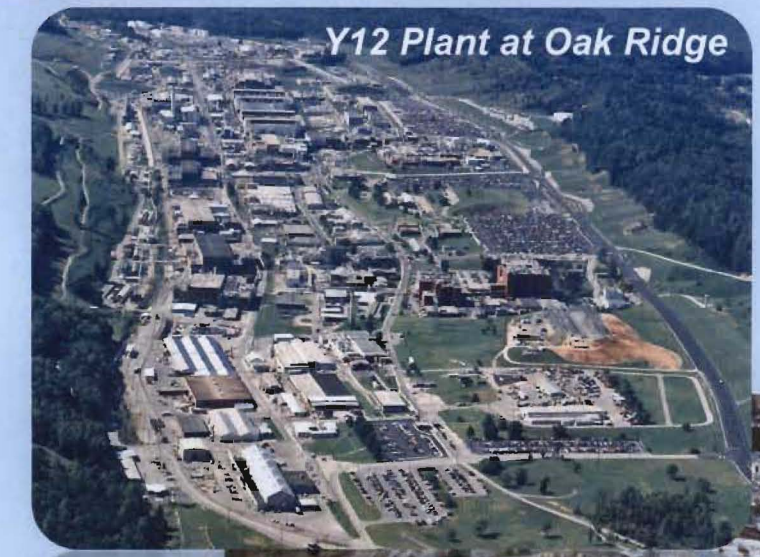
The Enablers

Bottom Line:

A robust program and facility infrastructure ***enables*** stockpile reductions.

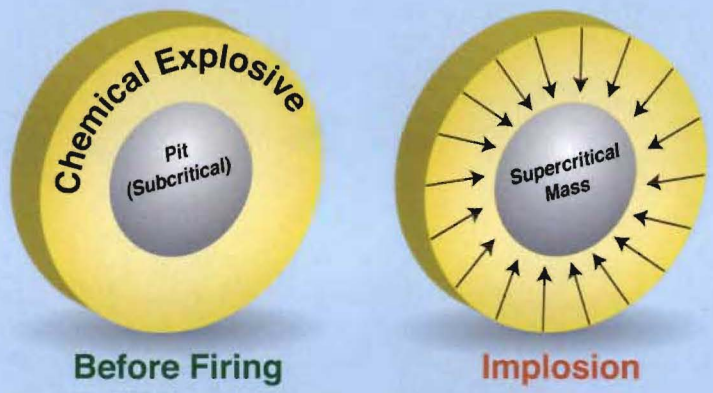
"…implementation of the Stockpile Stewardship Program and the nuclear Infrastructure investments … will allow the United States to shift away from retaining large numbers of non-deployed warheads … allowing major reductions in the nuclear stockpile."

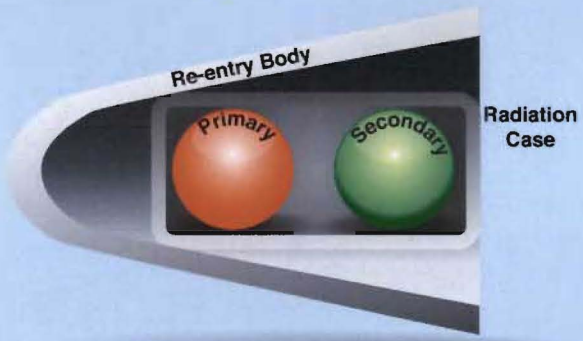
~*Nuclear Posture Review 2010, page XI*



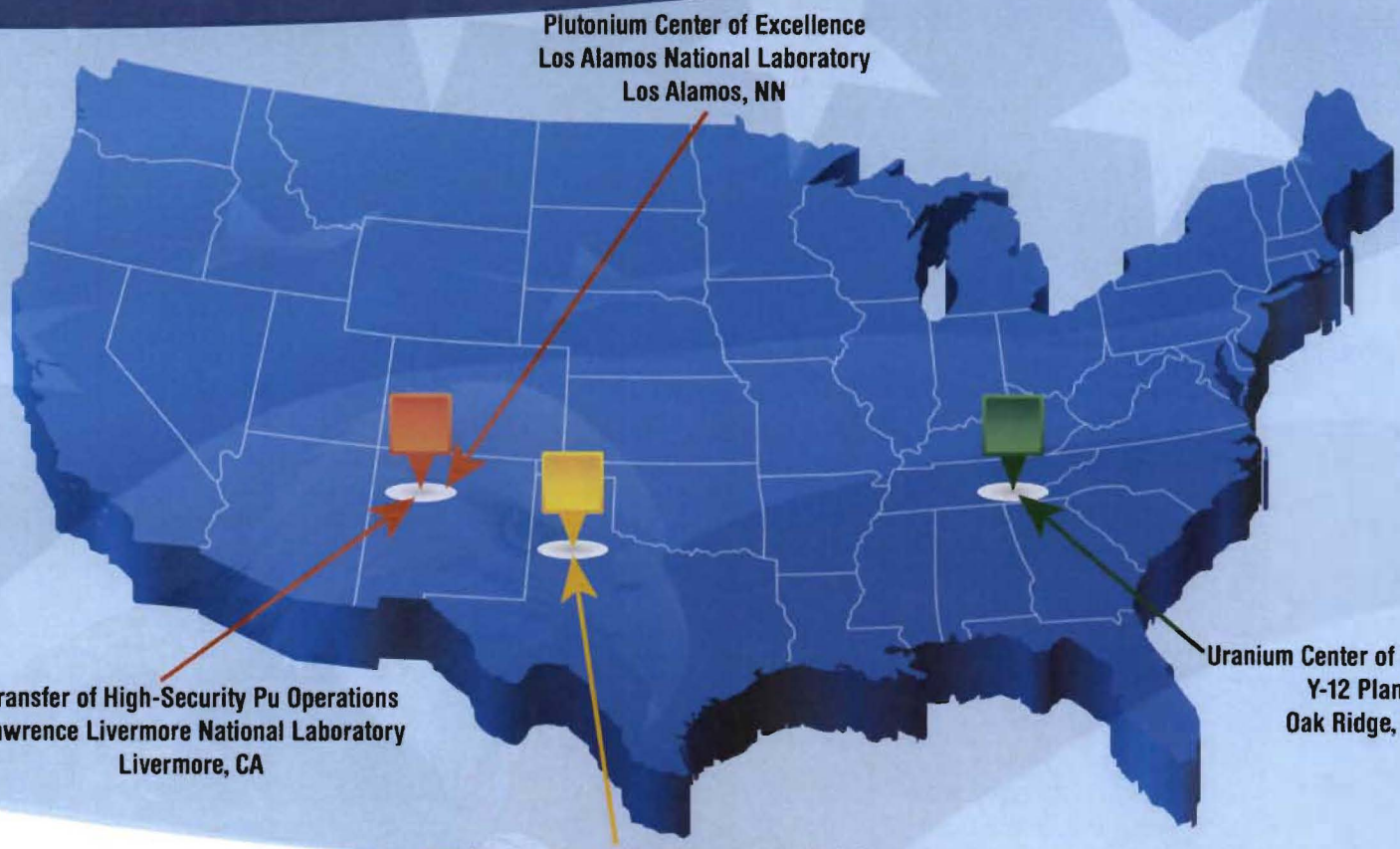
Pits and Weapons

- Energy from fissions in the pit drive the secondary, both of which produce the weapon's yield





Complex Transformation



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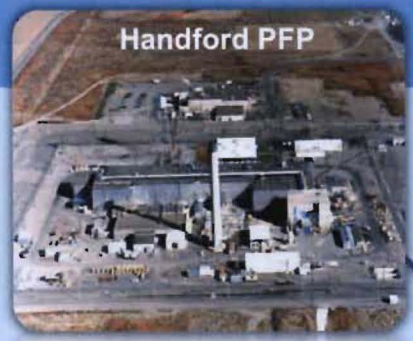
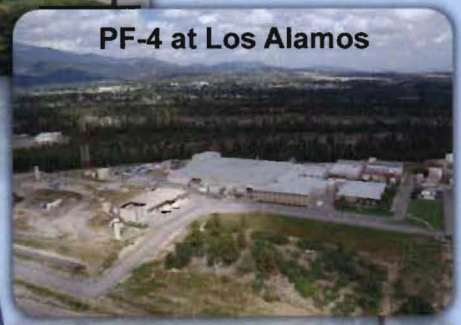
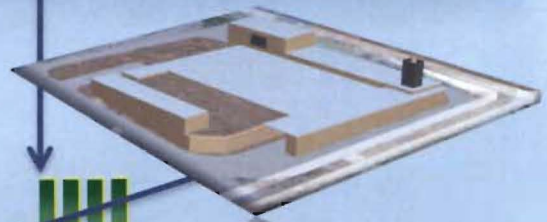
Record of Decision: Federal Register, Vol. 73, No. 245, Dec. 19, 2008, pg. 77644

DOE Security Category I/II Pu Processing Consolidation



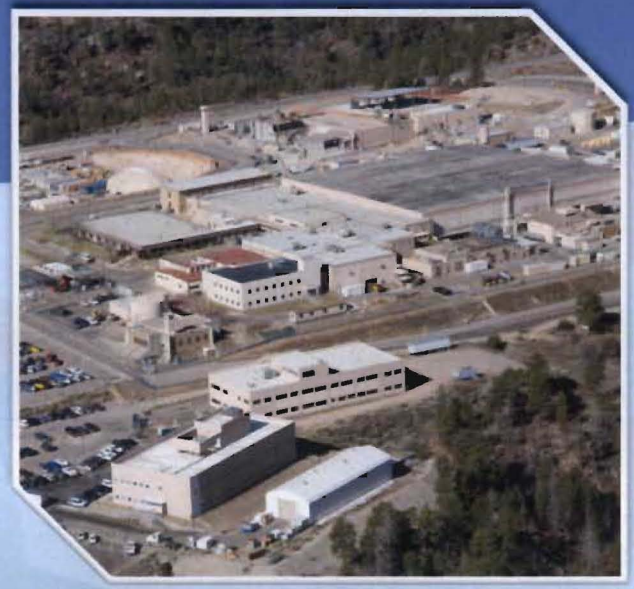




MOX FFF at SRS

Plutonium Center of Excellence Missions

Pu Manufacturing



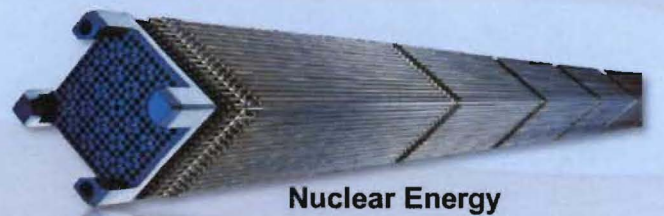
The Cornerstone: Plutonium Facility, PF-4
(Mission Operations and Supports)

Emergency Response

Materials Disposition

Pit Certification

Plutonium Storage



Nuclear Energy

Pu-238

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Plutonium Center of Excellence
Current Facilities

Plutonium Facility, PF-4

Chemistry and Metallurgy Research (CMR)

TA-54 Waste Operations

Radioactive Liquid Waste Treatment Facility (RLWTF)

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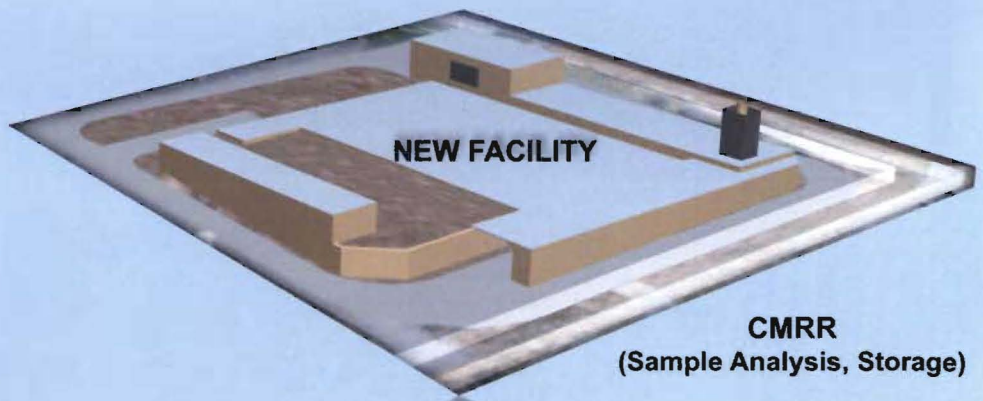
Plutonium Center of Excellence
Future Facilities

Plutonium Facility, PF-4

Upgraded Radioactive Liquid Waste Treatment Facility (RLWTF)

NEW FACILITY



CMRR
(Sample Analysis, Storage)

Consolidated Waste Capability (Solid Waste Processing)

NEW FACILITY

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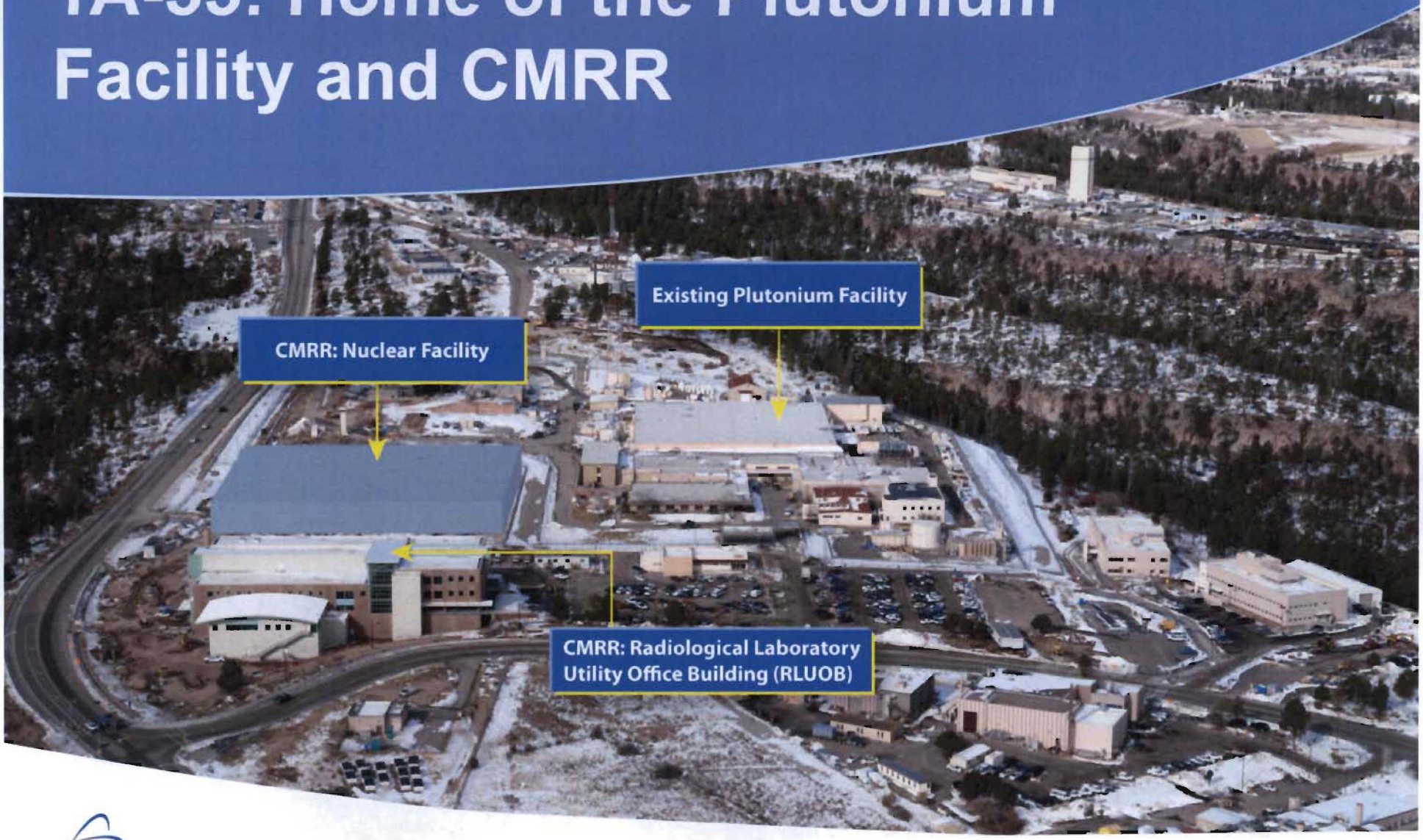
TA-55: Home of the Plutonium Facility and CMRR



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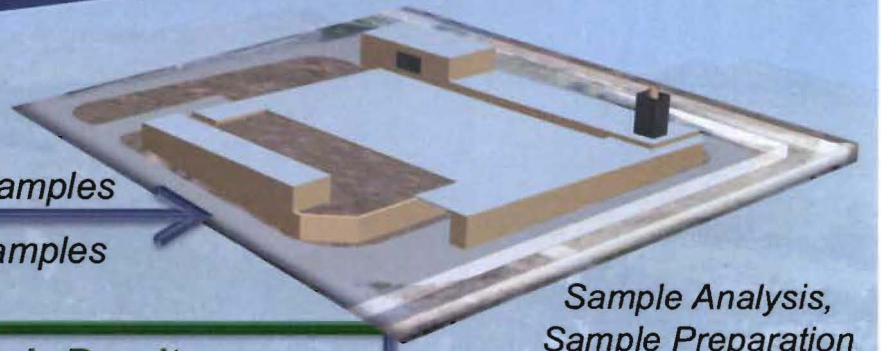
Facility Interfaces and Purposes

CMRR: Nuclear Facility



Plutonium Facility, PF-4

Programmatic Operations

Chemistry Samples

Materials Samples

Analysis Results

Sample Analysis, Sample Preparation for RLUOB

Very Small Pu Samples

CMRR: RLUOB

Sample Analysis

Analysis Results

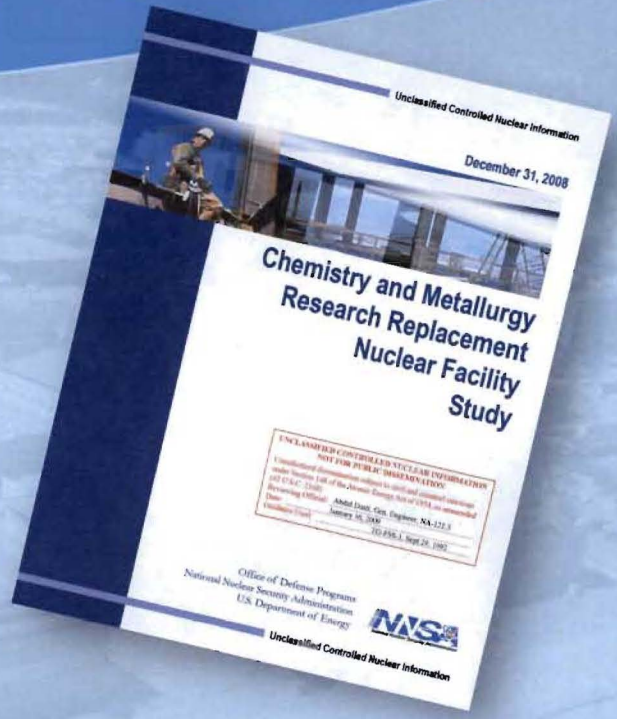
Sustaining Mission Support Until the CMRR Nuclear Facility Opens

The CMR building is reaching its end of life

- Most chemical analysis to remain in CMR
- Continuing infrastructure and maintenance investment until CMRR is completed
- Increased risk of facility operational reliability issues

Safety and Programmatic Risk Reduction

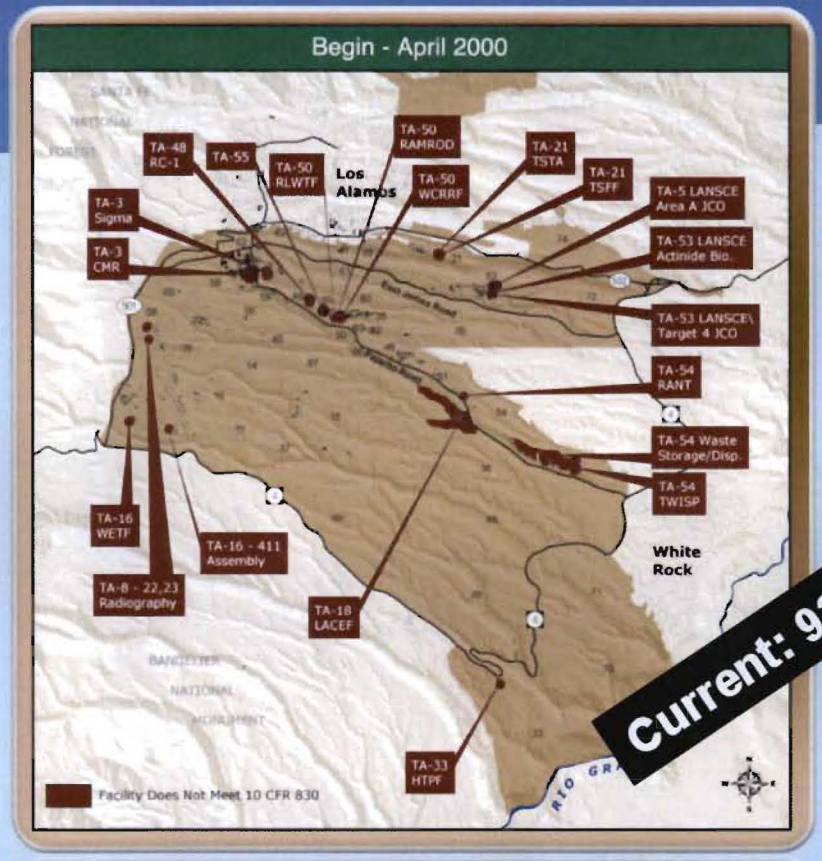
- Material reduction in the building
- Some operations moved to PF-4

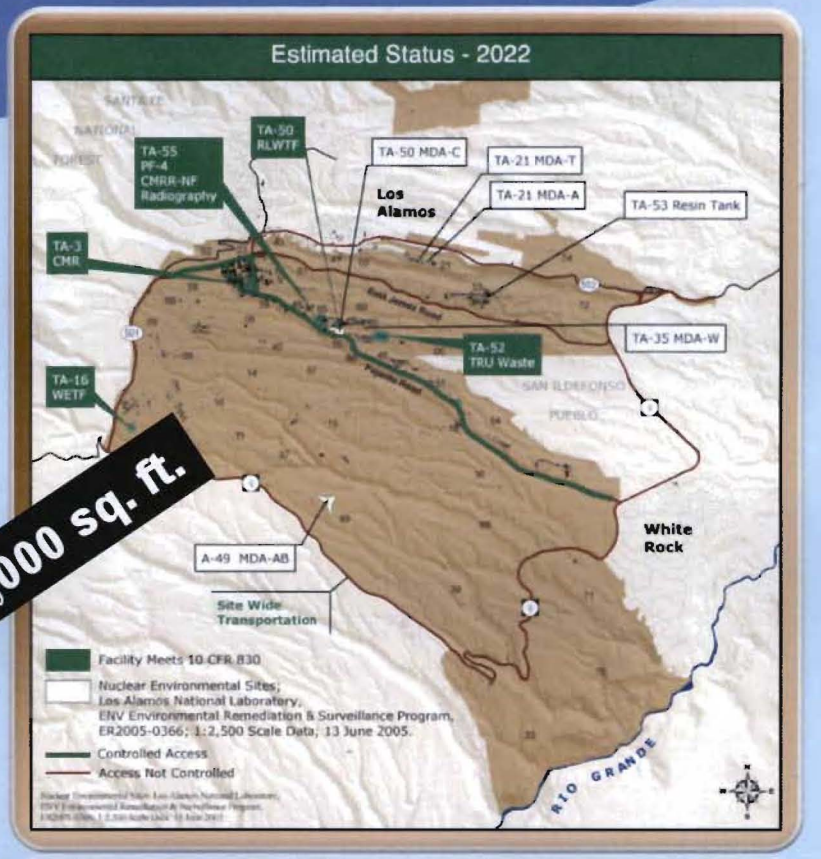


"The NNSA Administrator endorses the requirement for a CMRR-NF as part of the need to replace CMR, consolidate plutonium activities and material at LANL, and achieve a Plutonium Center of Excellence."

~CMRR Nuclear Facility Study, December 31st, 2008

Los Alamos Nuclear Consolidation





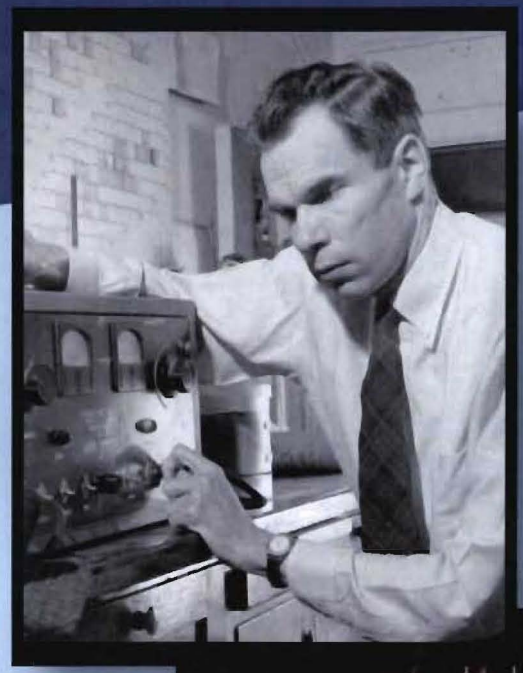
Current: 930,000 sq. ft.

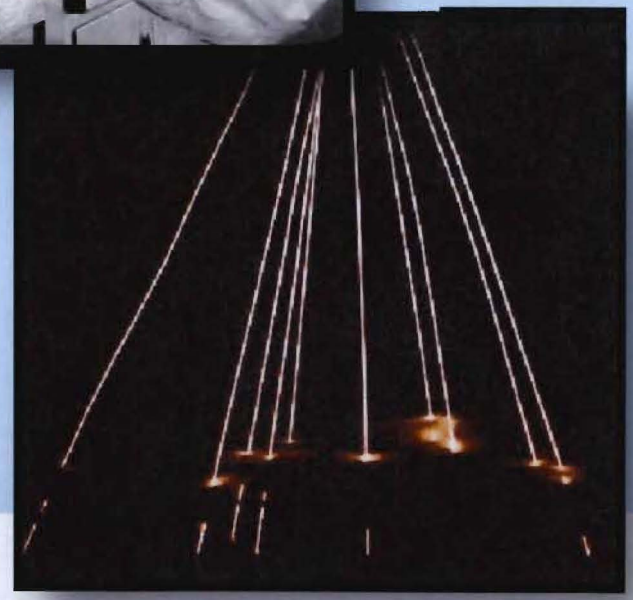
Begin: 1,780,000 sq. ft.

End: 590,000 sq. ft. after CMR D&D (post 2022)

What is Plutonium?

- Plutonium is the 94th element in the periodic table and was first separated by Glenn Seaborg and his team in 1941
- Primary applications
  - Use in nuclear explosives
  - Use as a fuel for nuclear reactors
- Any reactor that contains uranium will create plutonium as a byproduct

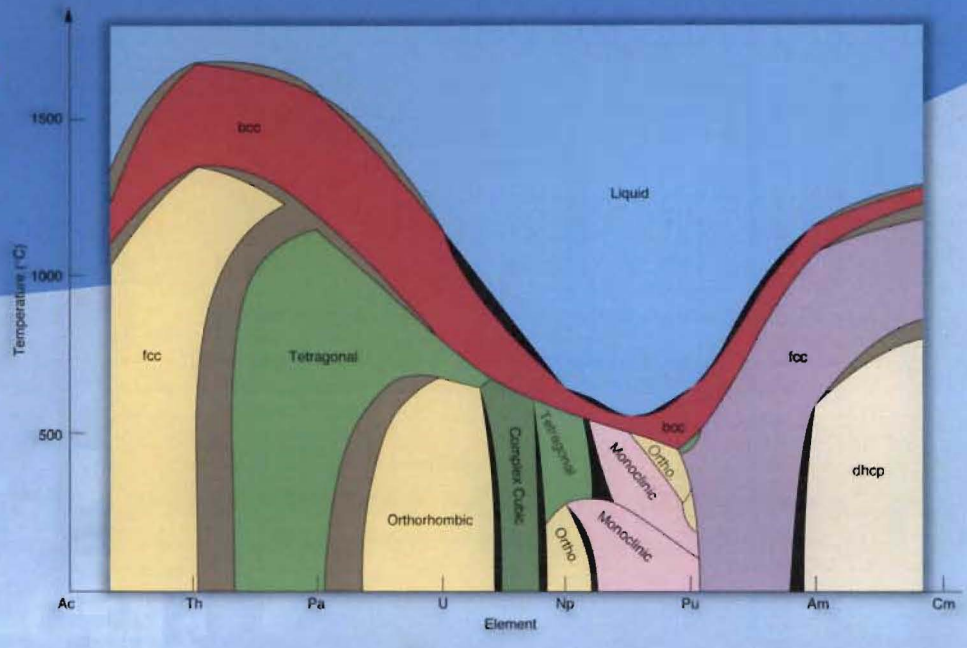


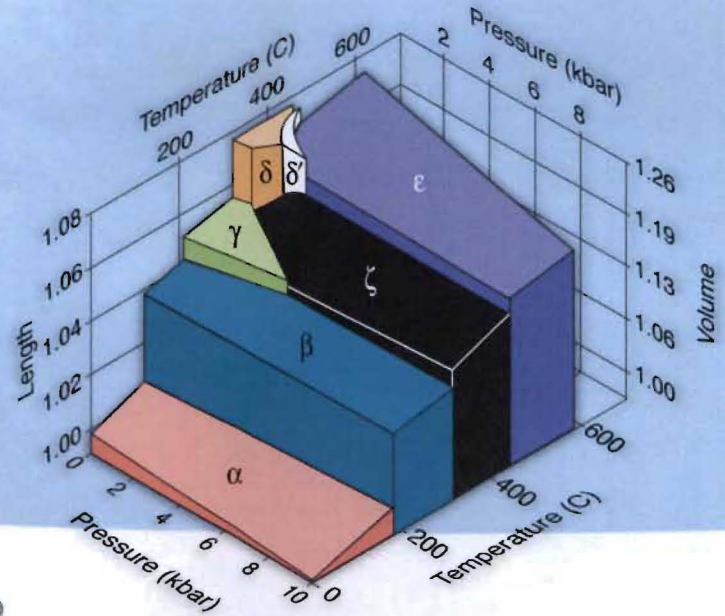


As long as nuclear explosives and nuclear reactor exist, the US will need to maintain the capability to handle, store, process, and produce plutonium-bearing materials

Plutonium Science

- Plutonium is one of the most interesting materials known to mankind
  - Many crystal structures
  - Large variations in density and physical properties
  - Sensitive to small changes in pressure and temperature
- Because of its interesting properties, Pu materials must be well characterized to ensure
  - Safe handling
  - Material certification
  - Feedback of material information for models



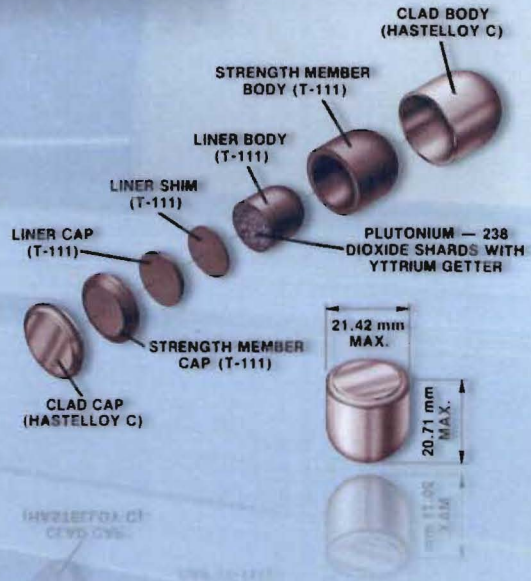


Global Impacts of Plutonium Science

- Pu-238 power components in Cassini mission to Saturn and Mars Science Laboratory
- Mixed-oxide fuel test assemblies placed in Catawba reactor for characterization in preparation for disposing of weapons-usable plutonium in electricity-producing reactors ("swords to plowshares")
- Material exchange programs for assessing detection and analysis capabilities
- Pu neutron sources used for oil-well logging
- Chemistry and material characterization capabilities provide forensic tools for global nuclear security

Pu-238

Fuel Rod Assembly



Milliwatt Generator Heat Source

Plutonium on "The Hill"

- The CMRR Project includes a storage unit vault capable of storing up to 6 metric tons of plutonium
  - The total US holdings of weapons-grade plutonium is approximately 85 metric tons.*
- Los Alamos is designated as the Plutonium Center of Excellence, and as such may experience increased mission requirements
- Plutonium will be leaving "the Hill"
  - Excess Pu, Materials Disposition
  - TRU waste to the Waste Isolation Pilot Plant
- Plutonium may be coming to "the Hill"
  - Programmatic Pu missions (e.g., pit manufacturing, disassembly, mixed oxide), which also entail increased off-site shipments
  - Lawrence Livermore National Laboratory programmatic materials
- Los Alamos will maintain material holdings within limits specified under Environmental Impact Statement analyses and decisions

*"Plutonium: The First 50 Years," U.S. Department of Energy, DOE/DP-0137, Feb. 1996.

How Much Plutonium?

- The CMRR Radiological Facility can contain a maximum of 8.4 g Pu-239 equivalent*, which is about 6.1 g of weapons-grade Pu
- This amount of plutonium is approximately the same as the mass of US quarter coin (5.7 g)
- Plutonium has a relatively large density, so if it were all in metal form in one place, it would be about the size (volume) of US dime

*DOE-STD-1027-92, Change No. 1, September 1997

Another How Much Plutonium

Total amount of weapons-grade Pu allowed in the CMRR RLUOB

~5 g metal

~0.5 g metal

~0.25 g metal

~150 mg metal

~100 mg metal

Workers Benefits from CMRR

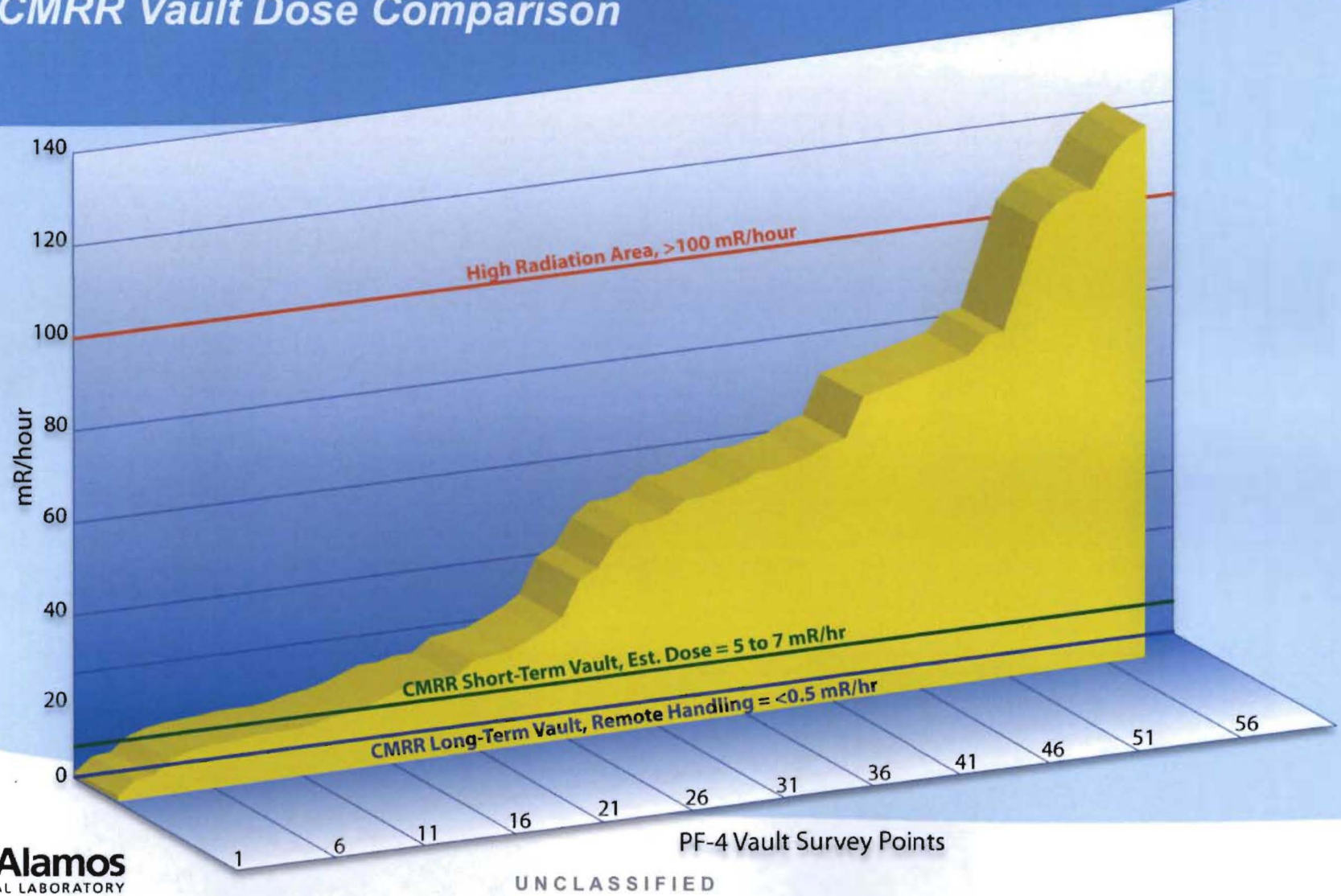
- CMRR are the modern facilities
  - Integrated safety and security designs and engineering controls
    - Modern fire-protection infrastructure
    - Segmentation of radiological and non-radiological activities for improved safety and lower operating costs
    - Ergonomic glovebox design
    - Secured material and storage
    - Improved operational safety from increased usage of gloveboxes vs. hoods
  - Replacing aging infrastructure
    - Less downtime for maintenance
    - Less legacy contamination issues from degraded infrastructure
  - Better worker and public safety by significantly reducing nuclear-material shipments between the CMR Building at TA-55


Glass Encapsulation


Arc Melter

Improved Safety for Plutonium Workers

Long-Term and Short-Term Vault Storage PF-4 and CMRR Vault Dose Comparison



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NNSA

Life Cycle of Nuclear Materials

Materials Disposition

Plutonium Supply

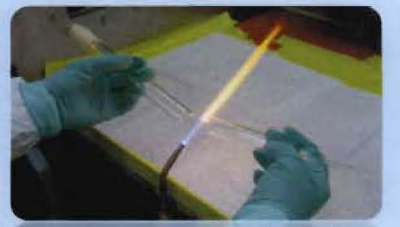
Mixed Oxide Fuel

Pit Disassembly

Plutonium Alloy

Waste Disposal

Standard Fabrication



Stockpile Surveillance

Pit Manufacturing

Facility Support

Pit Certification

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