LA-UR-14-28631

Management Perspective on Recent Accomplishments and Future Plans for NCERC

2014 ANS Winter Meeting and Nuclear Technology Expo

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Outline

- Background on TA-18 and NCERC
- Management Perspective of NCERC Operations
  - Recent Accomplishments 2012 – 2013
  - Newest NCERC Capabilities
  - Current Critical and Sub-critical Experiments
  - Non-DOE and International Collaborations
  - Integral Experiment Request and Approval Process
- The Future of NCERC

National Criticality Experiments Research Center

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- We used to be the Los Alamos Critical Experiments Facility (LACEF) at TA-18
- Operated for ~60 years at TA-18
- Originally known as Pajarito Site
  - High explosives firing site until 1945
  - Pre 1955 → weapons program/nuclear physics
  - 1955~1972 → Rover period
  - Post 1972 → basic science, R&D, national security issues
- Moved to the DAF at the NNSS in Nevada
  - Hazard Category 2 ops approved in May 2011

A collection of general purpose laboratories capable of subcritical, delayed, and super-prompt critical operations using large quantities special nuclear material

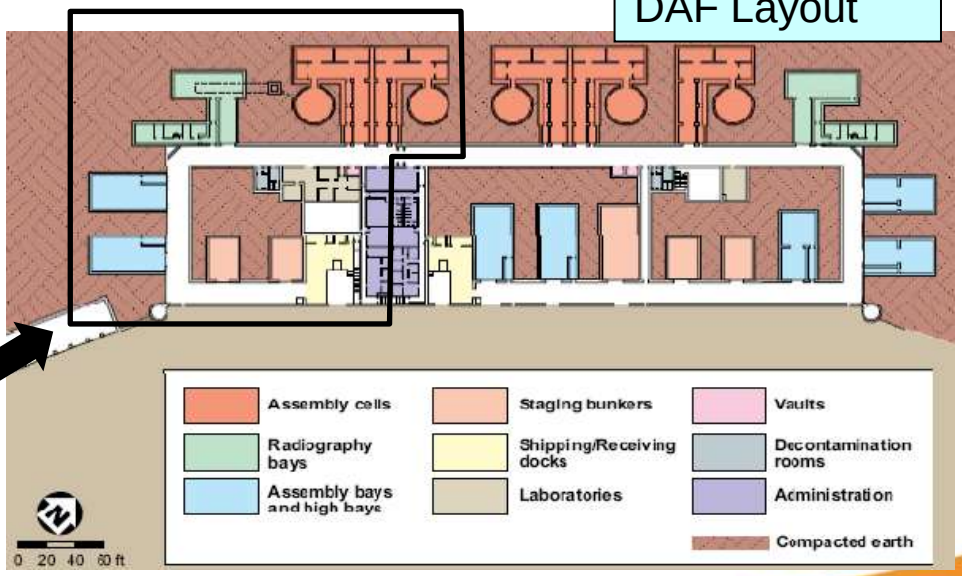
TA-18, Pajarito Site
Los Alamos National Laboratory

Device Assembly Facility (DAF) at the NNSS

Device Assembly Facility (DAF) and the National Criticality Experiments Research Center (NCERC)

- The DAF is a heavily reinforced, concrete structure with approximately 100,000 ft^2 of floor space, located in a 19-acre, high-security area in the central portion of the NNSS
- Safe & secure staging of materials
- Nuclear enabled infrastructure and safety programs
- Large quantities of material allowed in many independent buildings

DAF Layout



NCERC
NATIONAL CRITICALITY EXPERIMENTS RESEARCH CENTER

NCERC Mission

Mission

Nuclear Criticality Safety / Nuclear Material Management

Nuclear Emergency Response

Nuclear Nonproliferation / Safeguards / Arms Control

Support for DHS / DNDO

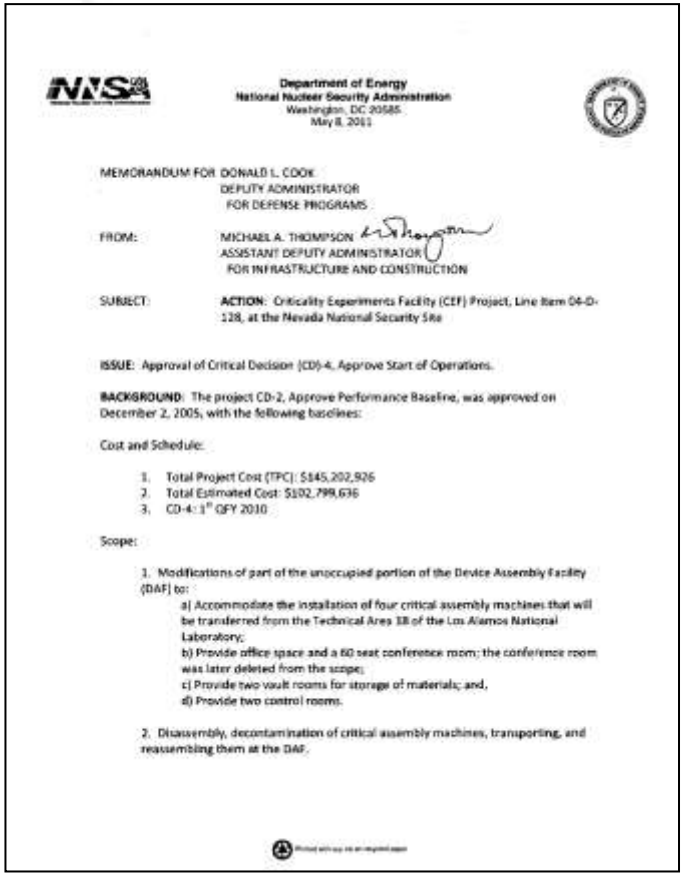
Support for DTRA / NASA / Naval Reactors / GNEP

Stockpile Stewardship Science

Common denominator for all programmatic missions is the capability to handle and conduct experiments with large quantities of special nuclear material.

Key NCERC Dates/Milestones

Date	Milestone
September 2004	First DAF Shipment of TA-18 Material
December 2004	First DAF Shipment of Security Category I Material
September 2005	DAF Approved for Hazard Category 2 Operations
October 2005	Final Shipment to Reduce TA-18 < Security Category II
June 2007	NMHM Project Ops Approval (opening containers / constructing RTOs / NCSP subcritical experiments)
August 2009	Startup of Portable Radiography
May 2011	CD-4 Approval - NCERC Approved for Hazard Category 2 Operations
June 1, 2011	First NCERC Hot Operation (Vault Op)
June 15, 2011	First Critical – Planet with Class Foils



NNSA

Department of Energy
National Nuclear Security Administration
Washington, DC 20585
May 8, 2011

MEMORANDUM FOR DONALD L. COOK
DEPUTY ADMINISTRATOR
FOR DEFENSE PROGRAMS

FROM: MICHAEL A. THOMPSON
ASSISTANT DEPUTY ADMINISTRATOR
FOR INFRASTRUCTURE AND CONSTRUCTION

SUBJECT: **ACTION**: Criticality Experiments Facility (CEF) Project, Line Item 04-D-128, at the Nevada National Security Site

ISSUE: Approval of Critical Decision (CD)-4, Approve Start of Operations.

BACKGROUND: The project CD-2, Approve Performance Baseline, was approved on December 2, 2005, with the following baselines:

Cost and Schedule:

1. Total Project Cost (TPC): $145,202,926
2. Total Estimated Cost: $102,799,636
3. CD-4: 1st QFY 2010

Scope:

1. Modifications of part of the unoccupied portion of the Device Assembly Facility (DAF) to:
   a) Accommodate the installation of four critical assembly machines that will be transferred from the Technical Area 18 of the Los Alamos National Laboratory;
   b) Provide office space and a 60 seat conference room; the conference room was later deleted from the scope;
   c) Provide two vault rooms for storage of materials; and,
   d) Provide two control rooms.

2. Disassembly, decontamination of critical assembly machines, transporting, and reassembling them at the DAF.

Management Perspective of NCERC Operations

- The decision to shut down TA-18 and relocate the mission was very difficult on the LANL staff

- But the business case for TA-18 mission relocation and the early move project was sound

  - Original decision to relocate was made in 1999 with a target date of 2014
  - Security costs were very expensive prior to 9/11/2001 … on the order of $20M per year
  - Post 9/11/2001, security costs were projected to go to ~$60M per year
  - Decision was made to accelerate the move; TA-18 downgraded from Security Category I to Category III in Oct 2005 a full nine years ahead of schedule
  - Realized cost saving of $360M

Management Perspective of NCERC Operations (continued)

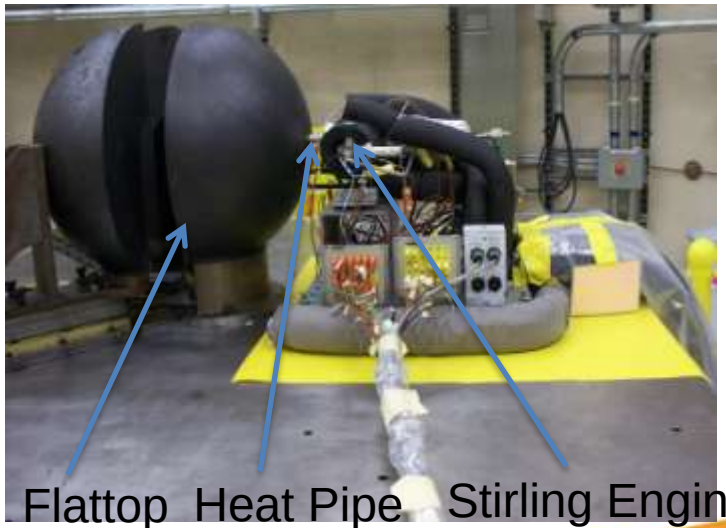
- NCERC as a DOE O 413 line-item project
  - DOE/NNSA's recent attempts at designing, constructing and starting up Hazard Category 2 nuclear facilities have not faired well (e.g., CMRR, UPF, MOX)
  - Most have costs that have soared into the billions of dollars
  - The TA-18 mission relocation project was initially projected at $150M and came in at approximately $160M
  - This project stands out as an example of how a Security Cat I / Hazard Cat 2 nuclear facility construction project can and should be executed

Recent Accomplishments 2012 – 2013

- Successful startup of four critical assemblies at NCERC (two general purpose vertical lift assemblies: Comet, Planet, one benchmark assembly: Flattop, and a fast burst reactor: Godiva IV)

Assembly	Date of First Critical
Planet (Class Foil Experiment)	June 15, 2011
Comet (Zeus Experiment)	August 15, 2011
Flattop (HEU core)	November 30, 2011
Flattop (Pu core)	Recently Authorized (Demo not complete)
Godiva IV	October 24, 2012
Godiva IV (First Super-Prompt Critical Operation)	September 10, 2013

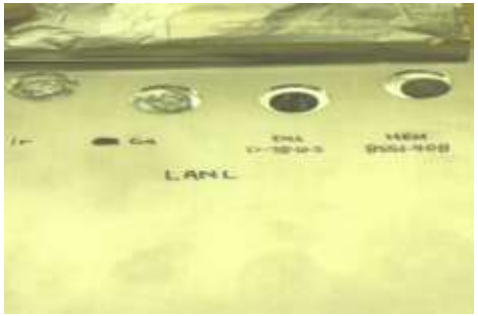
- Demonstration Using Flattop Fissions (DUFF) in collaboration with NASA
  - First-ever heat pipe cooled fission experiment
  - First-ever Stirling engine operation with fission heat
  - Demonstration of nuclear reactivity feedback / load following with prototype components

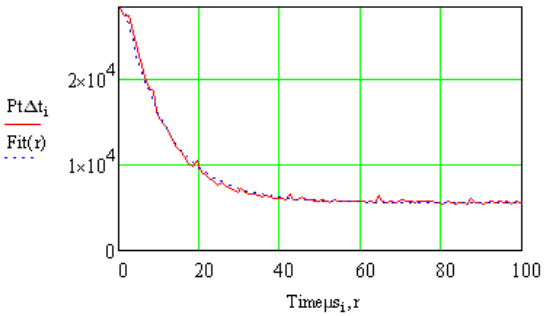


Newest NCERC Capabilities

- Designing and gaining authorization to install a rapid pneumatic transfer system to handle small samples during irradiations.

- Modern data acquisition systems are being deployed to perform traditional spectral index and Rossi-alpha measurements





Current Critical and Sub-critical Experiments (Small Snapshot)

- Class Foils/Lucite moderator experiment used on Planet for demonstrating criticality safety concepts for training criticality safety analysts and managers
- Nickel-reflected plutonium metal sphere subcritical benchmark measurements for International Criticality Safety Benchmark Evaluation Project (ICSBEP)
- Characterization of Godiva IV radiation fields in preparation for international inter-comparison of nuclear accident dosimetry
- Irradiation of reaction rate foils for various organizations such as DOE, DHS, DTRA, OGAs, etc.

Non-DOE and International Collaborations

- While the DOE NCSP is the principal programmatic sponsor of NCERC, supporting non-DOE organizations and international collaborations remains one of our highest priorities
  - Including training, R&D, experimentation, equipment testing and data collection where both critical and subcritical configurations of SNM are required
- Non-DOE partners include:
  - NASA, DHS, DTRA, OGAs, universities and commercial partners
- International collaborations include:
  - AWE, IRSN, CEA and JAEA
- Long term vision for international collaborations include hands on work with SNM
  - This does pose some interesting challenges with respect to security clearances, and access and training requirements, but we are confident that it can be achieved

Integral Experiment Request and Approval Process

- The process ensures each requestor's nuclear data needs are well understood and met by integrating all capabilities of the NCSP to design and approve the requested experiment
- The process is divided into five steps called Critical/Subcritical Experiment Decisions (CEDs).
  - Justification (CED-0)
  - Preliminary Design (CED-1)
  - Final Design (CED-2)
  - Execution (CED-3)
  - Publication of Data (CED-4)

Integral Experiment Request and Approval Process

- The NCSP Manager approves each CED
  - Process typically takes two to three years
- Recent process improvements have incorporated several changes to reduce the complexity and save time
- Graded approach has been introduced
- Other recent process improvements
  - The ability to perform routine operations (training), operational checks, or machine operational improvements (testing new equipment) where experimental data collection is not the goal
  - The ability to reopen any experiment at the CED-3 (repeat an experiment)
  - Expanded authority for the IER Team Lead in selecting team members and to disposition comments

The Future of NCERC

- While the relocation of the TA-18 mission to NCERC posed some huge challenges, it also provided some unique opportunities:
  - Transform and rebuild a sixty year old facility
  - Cleaning up the SNM inventory such that only national asset material was retained
  - Redesigning, rebuilding and updating the critical assembly control systems and instrumentation
  - Modernizing/updating the authorization basis documentation and all operating procedures
  - Redefining the operational paradigm to leverage collaborative opportunities presented by the REOP process at the NNSS

- Changes coming in the next one to two years …
  - CN4 of the authorization basis allowing for full, unrestricted critical experiments with Pu (subcritical experiments are already authorized)
  - Integral experiments with ^{233}U
  - Follow-on experiments for NASA
  - Expanded collaborations with JAEA, the UK and France