

# US DOE NCSP Hands-on Subcritical and Critical Experiments Training and Education Course

**Sedat Goluoglu**

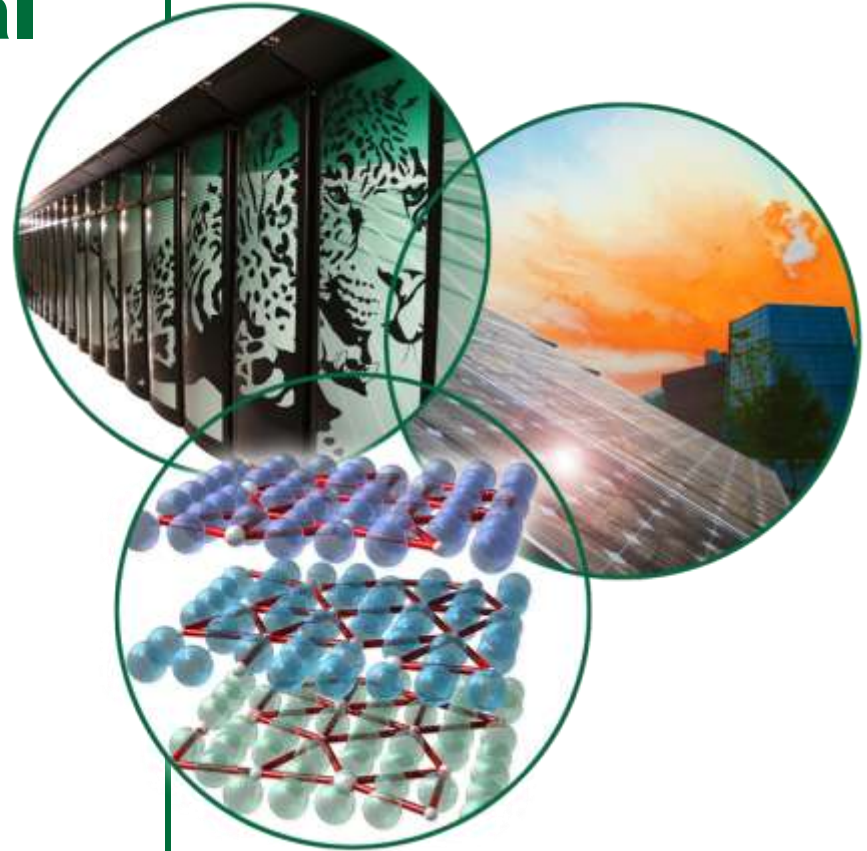
**Calvin M. Hopper**

**Project Coordinators**

ANS Winter Meeting

San Diego, CA

November 13, 2012



# Outline

- **Vision**
- **Mission**
- **Course description**
- **Timeline for implementation**
- **Pilot(s)**
- **Current Status**

# US DOE NCSP T&E Course Vision<sup>(1)</sup>

- **Be a continually improving, adaptable, and transparent project that is responsive to the essential training and educational needs of DOE facility staffs that are responsible for developing, implementing, and maintaining nuclear criticality safety programs**
- **Identify, develop, provide, and promote practical and excellent technical training and educational resources that foster competency in the art, science, and implementation of nuclear criticality safety and are adaptable and responsive to the needs of those responsible for developing, implementing, and maintaining criticality safety**

*(1) The Mission and Vision of the United States Department of Energy Nuclear Criticality Safety Program for the Fiscal Years 2009 – 2018, (<http://ncsp.llnl.gov/NCSP-MV-COMPRESSED.pdf>)*

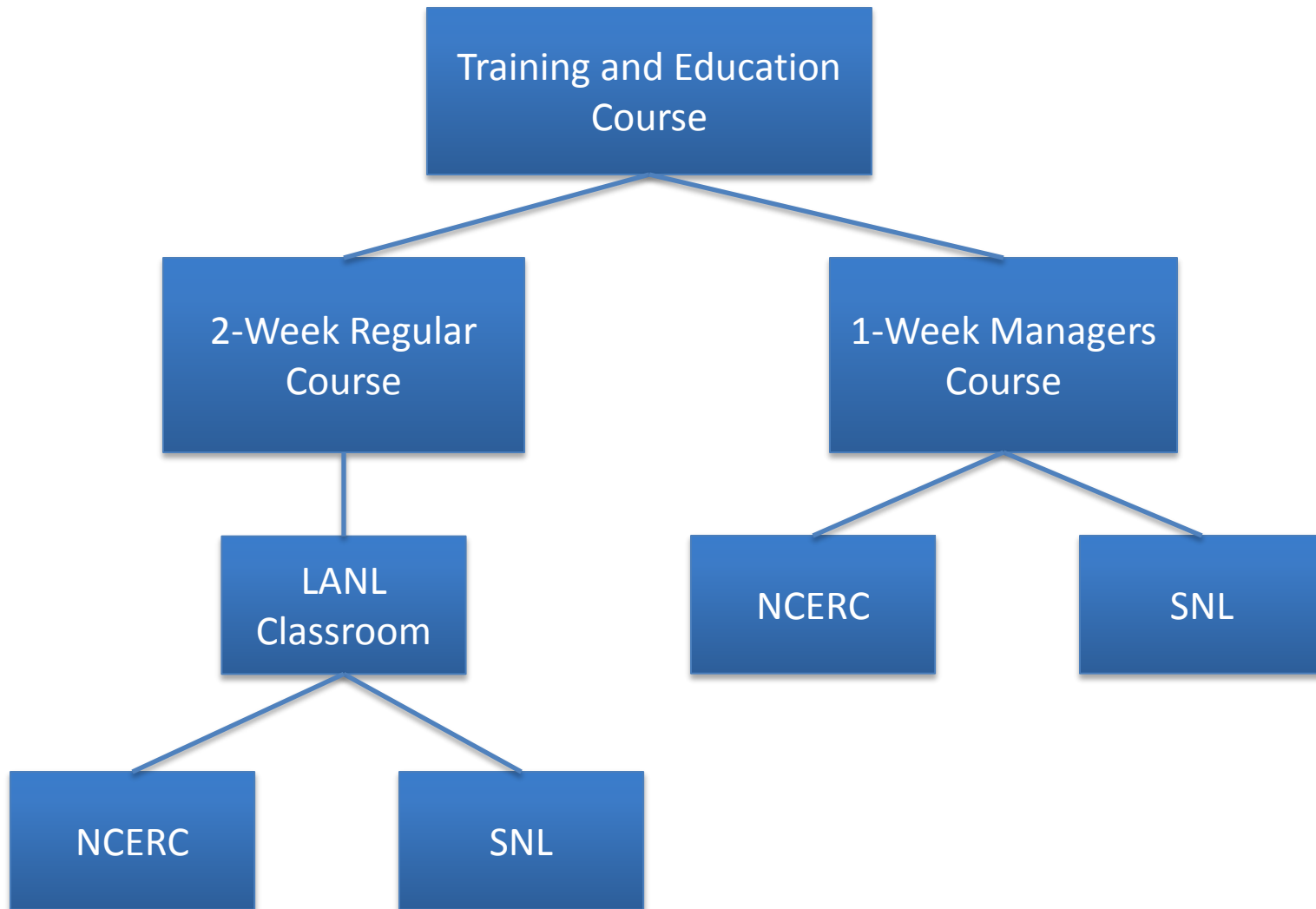
# US DOE NCSP T&E Program Mission

- The T&E Program mission is to provide DOD or DOE security cleared or non-cleared nuclear criticality safety engineers and managers with quality uniform training and education regarding “hands-on” sub-critical and critical experiments training and classroom education on the application of DOE HQ interpretations and positions regarding such topics as regulations, guides, orders, standards, utilization of non-destructive analysis results, safety evaluations/analyses, and other topics as judged appropriate by the DOE NCSP Manager

# T&EP General Course Objectives\*

- Provide a DOE consistent level of DOE interpretation, understanding, awareness and applications regarding
  - DOE Orders, Guides, ANS Standards, Rules
  - Performance of Criticality Safety Evaluations
  - Hazards Analysis Methods and Implementation/maintenance of NCS Controls
- Ensure versatility for cleared and un-cleared students
- Provide alternate/backup facility capabilities for hands-on training
- Provide experimental hands-on training addressing
  - Characteristics of Neutron Multiplying Systems
  - Discussion of
    - Theory
    - Implications for the Safety of Fissionable Material Operations

\* CSSG Tasking 2009-03, Recommendations for the Future DOE NCSP Training and Education Infrastructure Program



# T&EP Specific Course Description (1<sup>st</sup> week)

1. Facility access training necessary for the full 2-weeks of the course (SNL, LANL, DAF)
  - Completed prior to start of courses to save time and ensure access
2. Tour of the Los Alamos National Laboratory TA-55/PF-4 (LANL)
3. Review of ANSI/ANS-8.XX standards and their applications to DOE NCS programs (LANL)
4. Explanations and example applications of DOE HQ interpretations of DOE rules, standards and guides, and national consensus standards (DOE)
5. Examples of human factors and equipment reliability relative to typical fissionable material process operations (SNL)
6. Hazards analysis (LANL)
7. Interpretation and application of non-destructive analyses (NDA) methods and results to nuclear criticality safety evaluations (NSL-ORNL)
8. Exercises in the preparation of DOE-STD-3007-2007 compliant criticality safety evaluations (LANL) that integrate topics 2. – 7.

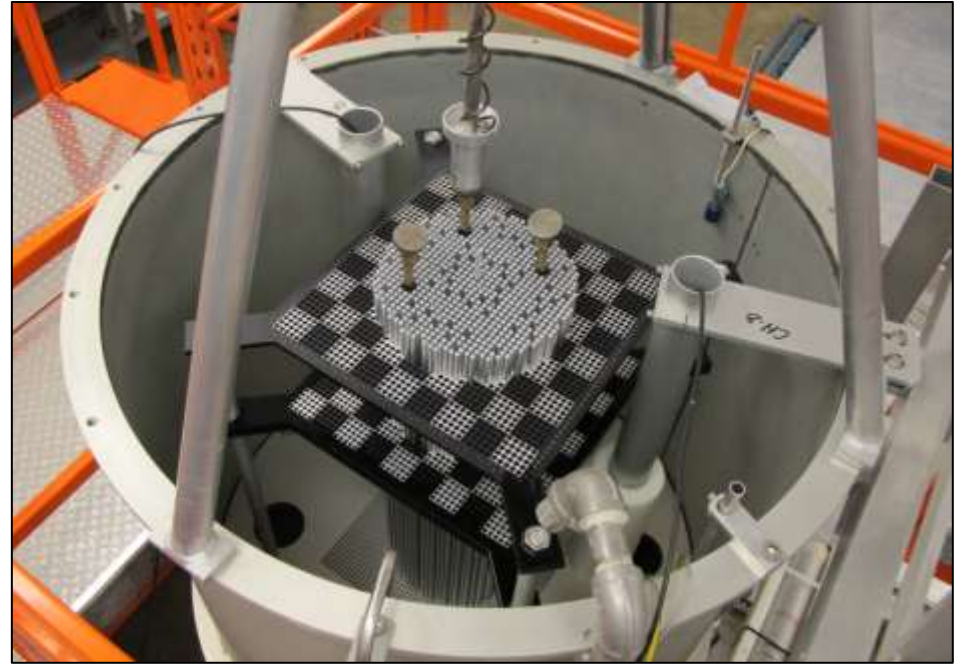
# T&EP Specific Course Description (2<sup>nd</sup> week)

- Tour experiments facilities (SNL, NCERC)
- Receive SNL or NCERC classroom refresher training and education in
  - Reactor theory, subcritical multiplication, inverse multiplication techniques, and nuclear instrumentation,
  - Sub-critical & Critical experimentation
    - Historical perspective
    - Accident scenarios
    - Lessons learned
  - Development of experimental plans
  - “Hands-on” sub-critical experiments
  - Remote assembly critical experiments
- Conduct supervised experiments (SNL or NCERC)
- Analyze supervised experiments results (SNL or NCERC)



# SNL Hands-on Course

- The hands-on subcritical and critical experiments are performed in the SNL SPRF/CX lattice water tank

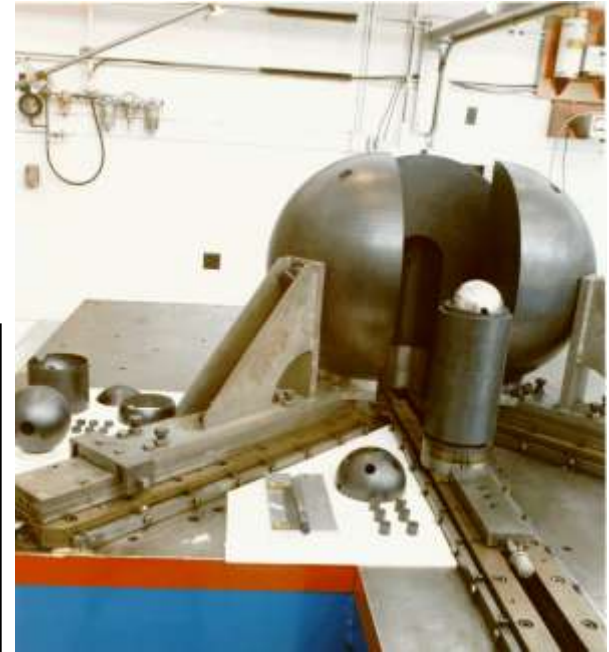


- EX1: Approach to critical on fuel loading
- EX2: Approach to critical on moderator height
- EX3: Approach to critical on fuel separation
- EX4: Interior fuel rod removal

# NCERC Hands-on Course



93% HEU metal, nat. U refl.



93.2% HEU metal foils



8 HEU shells (93.2%)



$\alpha$ -phase Pu, poly refl.



# T&EP Implementation Timeline

- RFPs solicited from potential contributing organizations Q1 & Q2 FY10 (9 contractors, 5 universities, 5 labs, 2 individuals)
- RFPs evaluated Q3 FY10
- Selection of program contributors completed Q4 FY10



- Collaborative planning begun Q4 FY10
- DOE NCSP T&EP 5-year plan submitted Q3 FY10
- T&EP Strategic Plan submitted Q4 FY10
- T&EP schedule & calendar distributed Q2 FY11
- T&EP first Pilot held Q4 FY11
- Review and comments resolution in December 2011
- T&EP semi Pilot/Course held Q2 FY12

# First Pilot

- **August 8-12, 2011 LANL Classroom Training**
  - **Instructors from LANL, DOE, ORNL, SNL**
- **Hands-on:**
  - **August 15-19, 2011 SNL Hands-on Course**
    - **Instructors from SNL**
  - **August 29-Sept. 1, 2011 NCERC Hands-on Course**
    - **Instructors from LLNL, LANL**
- **Pilot Attendee/Reviewers: Calvin Hopper, Mike Dunn, Jeff Chapman, Gladys Udentia, Jim Felty, Lori Scott, Adolf Garcia, Jerry Hicks, Rick Anderson, Mark Lee, Pat Moss**

# Second Pilot/Training

- **January 23-27, 2012 LANL Classroom Training**
  - **Instructors from LANL, DOE, ORNL, SNL**
- **Hands-on:**
  - **January 30-February 3, 2012 NCERC Hands-on Course**
    - **Instructors from LLNL, LANL**
  - **February 6-10, 2012 SNL Hands-on Course**
    - **Instructors from SNL**
- **Attendee/Reviewers: Sedat Goluoglu, Gladys Udentia, Jim Felty, Lori Scott, Jerry Hicks, Catherine Percher, Allison Miller**
- **Attendees: Brent Beatty, Joe Christensen, Denis Beller**



# Current Status

- **2 T&E courses offered in FY12 (March course cancelled)**
  - **May 14-18 LANL Classroom Training**
  - **May 21-24 NCERC (Cancelled) Hands-on Course**
  - **May 21-25 SNL Hands-on Course**
  - **August 20-24 LANL Classroom Training**
  - **August 27-31 NCERC Hands-on Course**
  - **August 27-31 SNL Hands-on Course**
- **Allow discontinuous attendance**
  - **Issue certificate after completing both weeks**

# Current Status, cont.

- **4 Classes anticipated for FY13 and beyond**
  - **Two 1-week long Courses for Managers at SNL and NCERC**
    - **March 18-22 @NCERC**
    - **September 9-13 @SNL**
  - **Two regular courses at LANL (classroom) and SNL (hands-on) and NCERC (hands-on)**
    - **Jan. 28 – Feb. 1, 2013 Classroom @LANL**
    - **Feb. 4-8, 2013 Hands-on @NCERC and SNL**
    - **May 6-10, 2013 Classroom @LANL**
    - **May 13-17, 2013 Hands-on @NCERC and SNL**

# Reminder

***This Course is to supplement NCSE training and education that is typically not available from the employer***

**(i.e., hands-on critical and sub-critical experiment training in experiments facilities, education in DOE Headquarters regulatory interpretations, and expectations for site nuclear criticality safety programs – e.g., review of process criticality accidents, criticality safety evaluations, computations education)**



# Completion Certificates

- **Must attend both classroom and one of the hands-on weeks.**
- **Must demonstrate comprehension: must pass closed-book tests with 80% or better for both weeks to receive a certificate of completion.**
- **If failed, may attend the course again (with approval)**



# The United States Department of Energy Nuclear Criticality Safety Program

recognizes and appreciates the participation of

## Your Name Here

in the *Criticality Safety Engineer Hands-On Training and Education Course.*

January 23-27, 2012 (LANL)

February 6-10, 2012 (SNL)

*This certificate is issued upon successful attendance and demonstration of comprehension of the topics and skills that are offered at the Los Alamos National Laboratory classroom education and TA55/PF4 Facilities and the Sandia National Laboratory.*

*Jerry N. McKernan*  
Nuclear Criticality Safety Program Manager,  
National Nuclear Security Administration



# Questions?