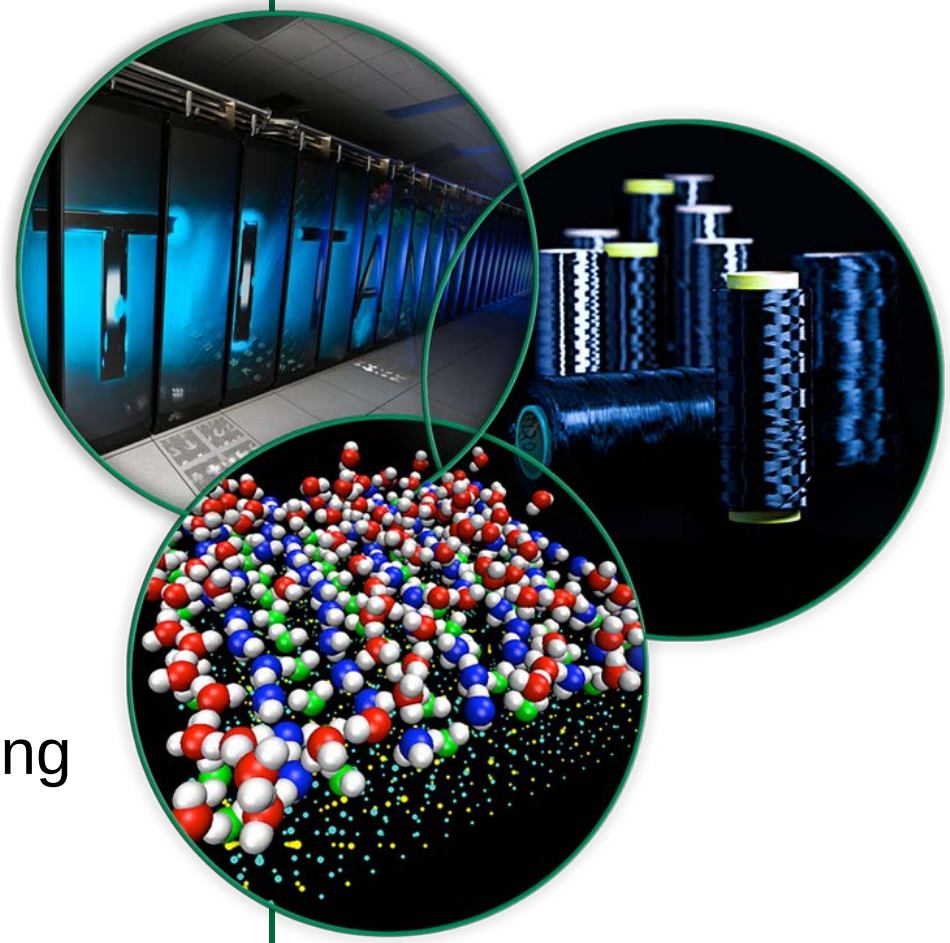
Status of the Development and Deployment of the NCSP Training and Education Courses



Sedat Goluoglu
Course Coordinator

NCSP Program Review Meeting
Los Alamos, NM
March 27, 2014

U.S. DEPARTMENT OF ENERGY

OAK RIDGE NATIONAL LABORATORY
MANAGED BY UT-BATTELLE FOR THE DEPARTMENT OF ENERGY

US DOE NCSP T&E Course Vision[1]

- **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)

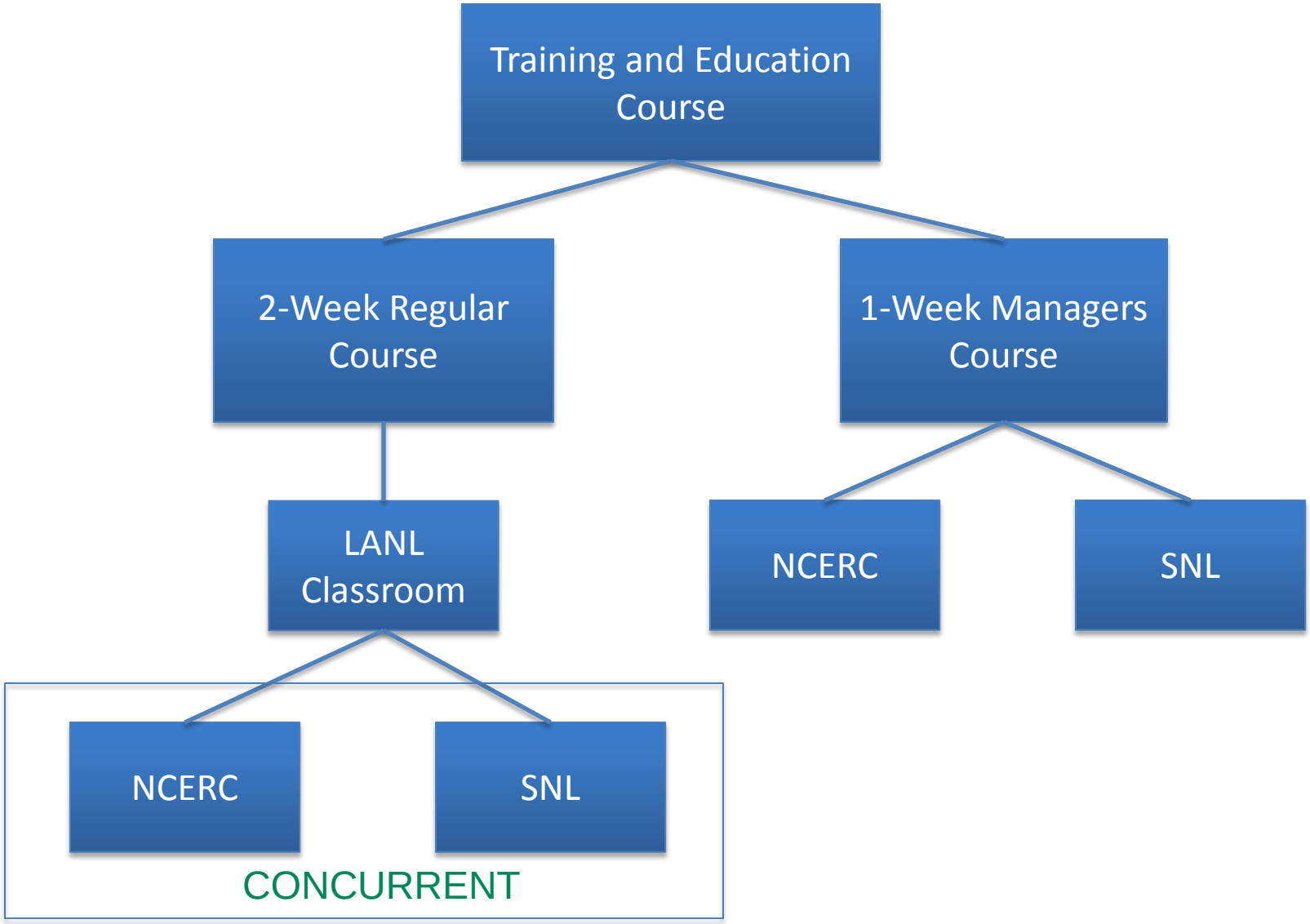
US DOE NCSP T&E Course Mission

- **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&E General Course Objectives*

- **Provide a 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 including precision and uncertainty of NDA and DA requirements**
- **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


Training and Education Course
2-Week Regular Course
1-Week Managers Course
LANL Classroom
NCERC
SNL
NCERC
SNL
CONCURRENT

T&E Specific Course Description (1st week)

Team of Instructors from ORNL, LANL, SNL, DOE

1. **Facility access training necessary for the full 2-weeks of the course**
   - **Completed prior to start of courses to save time and ensure access**
2. **Historical perspectives and accident scenarios**
3. **Tour of the Los Alamos National Laboratory TA-55/PF-4 and explanation of operations and equipment**
4. **Review of ANSI/ANS-8.XX standards and their applications to DOE NCS programs**
5. **Explanations and example applications of DOE HQ interpretations of DOE Orders, standards, guides, and DOE's position on how national consensus standards are applied to relevant operations and programs**

T&E Specific Course Description (1st week)

6. **Review of NCS fundamentals and process criticality accidents**
7. **Examples of human factors and equipment reliability relative to typical fissionable material process operations**
8. **Hazards analysis**
9. **Interpretation and application of non-destructive analyses (NDA) methods and results to nuclear criticality safety evaluations**
10. **Exercises in the preparation of DOE-STD-3007-2007 compliant criticality safety evaluations that integrate topics 3 – 9.**

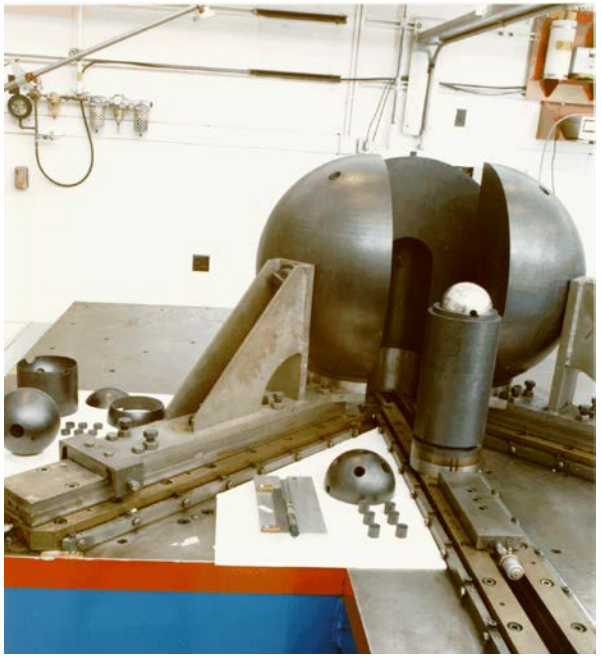
T&E Specific Course Description (2nd week)

Team of Instructors from LANL, SNL, LLNL

- **Tour experiments facilities**
- **Receive 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**
- **Analyze supervised experiments results**

NCERC Hands-on Course

93% HEU metal, nat. U refl.

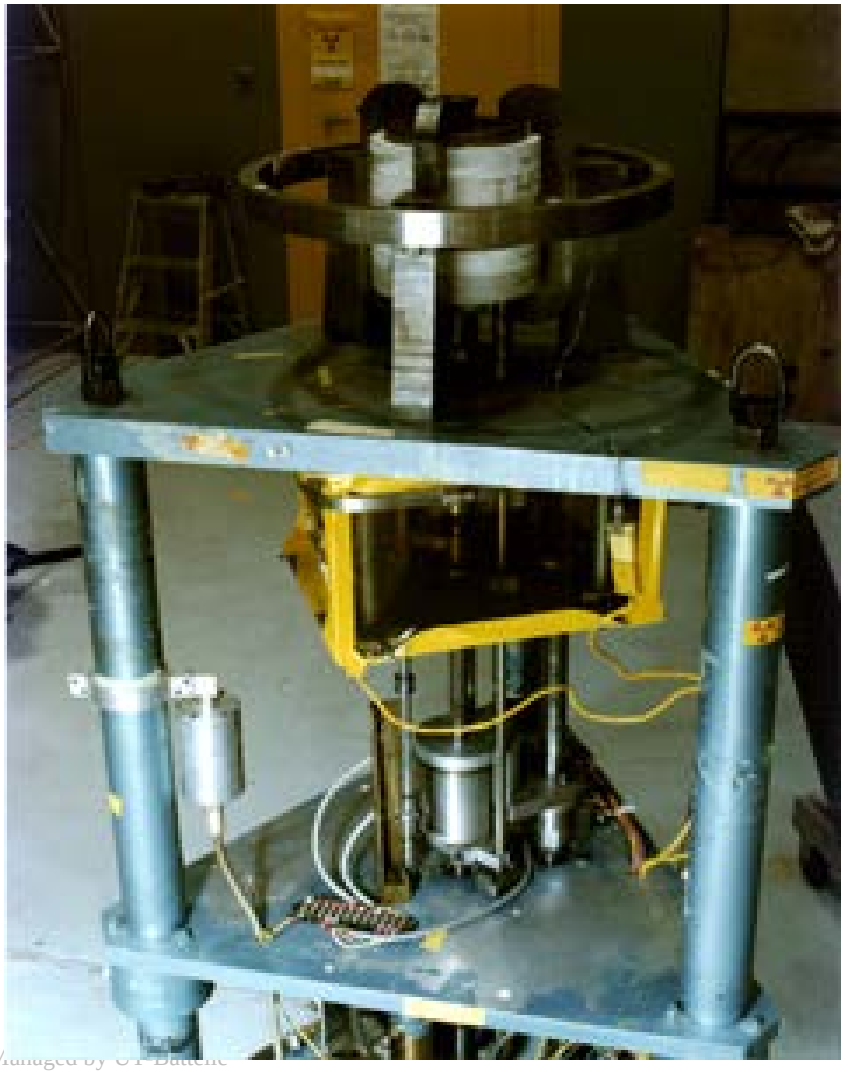


93.2% HEU metal foils

8 HEU shells (93.2%)

α-phase Pu, poly refl.

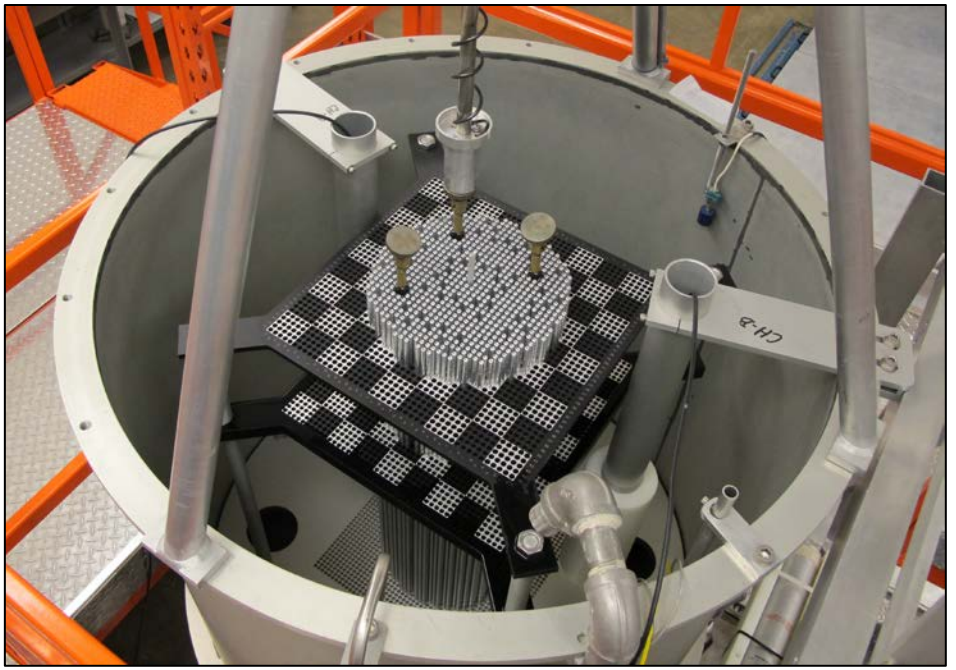
Godiva IV Added in FY13



- First included in FY14 course
- Current applications include
  - sample reactivity worth studies,
  - reactor kinetics benchmark studies,
  - reactor dynamic excursion studies,
  - sample neutron activation studies,
  - dosimetry measurements,
  - criticality alarm testing,
  - critical assembly operator training, and
  - criticality safety training demonstrations.

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

T&E Managers Course Description (1 week)

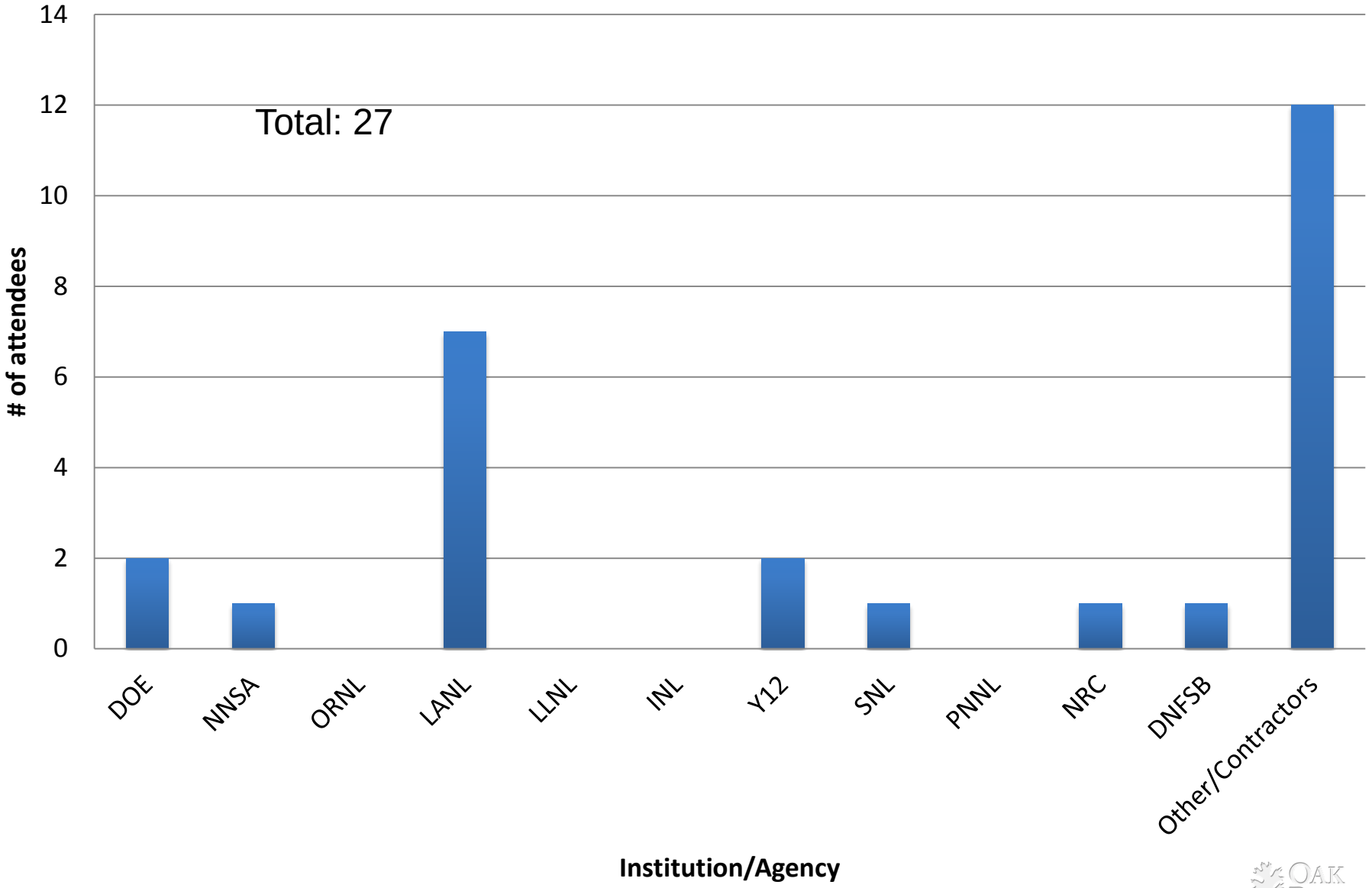
- **Facility access training necessary for the course**
  - **Completed prior to start of course to save time and ensure access**
- **Familiarization with ANSI/ANS-8.XX standards and their applications to DOE NCS programs**
- **Familiarization with neutron multiplying system characteristics**
- **Explanations of DOE HQ interpretations of DOE rules, DOE standards, and DOE guides**
- **Role of human factors and equipment reliability relative to typical fissionable material process operations**
- **Role of non-Destructive Analyses**
- **Sub-critical & Critical experimentation: Historical perspective, accident scenarios, lessons learned**
- **Conduct and analyze subcritical and critical experiments**

Course Timeline

- **First Pilot**
  - **Classroom at LANL August 8-12, 2011**
  - **Hands-on: August 15-19, 2011 SNL**

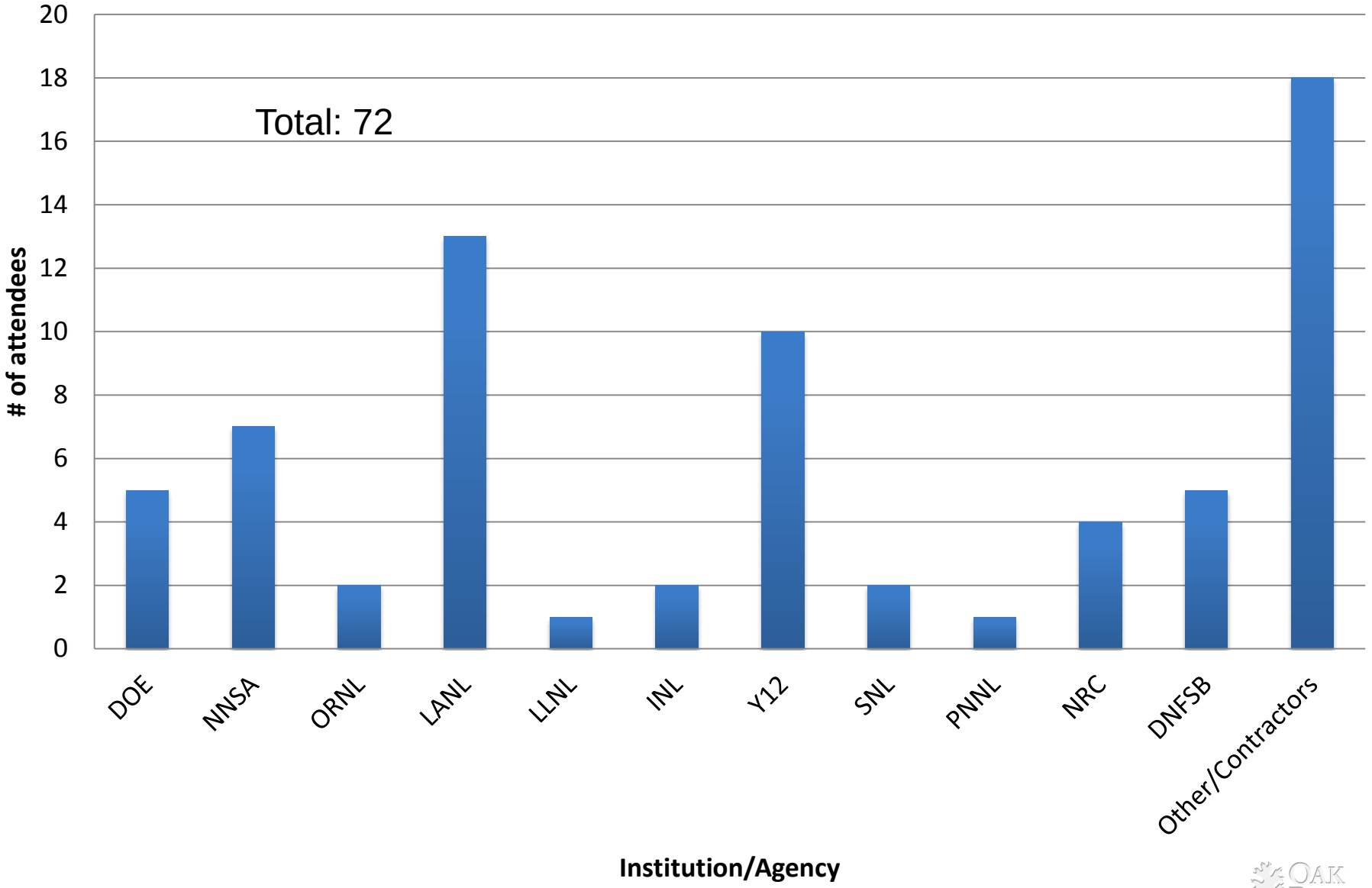
    August 29-Sept. 1, 2011 NCERC
- **Five 2-week T&E Courses for Criticality Safety Professionals (CSPs) (3 in FY12, 2 in FY13, 1 in FY14)**
- **One 1-week Managers Course at NCERC (in FY13)**
- **1-week Managers Course at SNL (in FY13)**
- **Two 2-week courses for CSPs and two 1-week courses for managers planned for FY15 and beyond**
- **Special 1 day course for NFO and NSTEC managers (FY14)**
- **Special courses as needed and approved by NCSP Manager**

FY13 NCSP 2-Week T&EC Attendance



Other/Contractors (FY13)	
Isotek	1
USEC	1
CH2M	1
UF	1
Transport Logistics International	1
Iowa State University	1
Savannah River Remediation	1
ITG	1
Global Nuclear Fuels America	2
Nuclear Waste Partnership	1

Cumulative NCSP 2-Week T&EC Attendance



Other/Contractors (Cumulative)	
Nuclear Safety Associates	1
UNLV	1
Washington River Protection Solutions	1
Sellafield Ltd	1
Bechtel National Inc	2
Isotek	1
USEC	1
CH2M	1
UF	1
Transport Logistics International	1
Iowa State University	1
Savannah River Remediation	1
ITG	1
Global Nuclear Fuels America	2
Nuclear Waste Partnership	1

NCSP T&EC for Managers

- **Total 5 courses**
  - **1 at NCERC**
  - **1 at SNL**
  - **3 special LANL only at SNL (FY14)**
- **Total 69 trained (24 in FY13)**
  - **62 LANL (22 in FY13)**
  - **2 NNSA (1 in FY13)**
  - **1 LLNL (1 in FY13)**
  - **1 INL**
  - **2 AECL**
- **1 more LANL-only Planned in May 5-9, 2014**
  - **16 signed up**

Completion Certificates

- **CSPs must attend both classroom and one of the hands-on weeks.**
- **Must demonstrate comprehension by passing closed-book exams with 80% or better for both weeks to receive a certificate of completion and 70% test, 30% participation during the hands-on week**
- **If failed, may attend the course again (with approval)**
- **Discontinuous attendance allowed on a case by case basis (to be completed within 1 year)**
  - **No certificate until both completed successfully**

NCSP
NUCLEAR CRITICALITY SAFETY PROGRAM

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.

March 31-April 4, 2014 (LANL)
April 7-11, 2014 (NCERC)

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 National Criticality Experiments Research Center.

Nuclear Criticality Safety Program Manager,
National Nuclear Security Administration

Los Alamos NATIONAL LABORATORY
Sandia National Laboratories
OAK RIDGE National Laboratory
Lawrence Livermore National Laboratory
NCERC NATIONAL CRITICALITY EXPERIMENTS RESEARCH CENTER

NCSP
NUCLEAR CRITICALITY SAFETY PROGRAM

The United States Department of Energy
Nuclear Criticality Safety Program

recognizes and appreciates the participation of

Your Name Here

in the

Criticality Safety Training and Education Course

February 24-28, 2014 (SNL)

This certificate is issued upon successful attendance and demonstration of familiarization of the topics and skills that are offered at the National Criticality Experiments Research Center for managers, supervisors and fissile material handlers.

Nuclear Criticality Safety Program Manager,
National Nuclear Security Administration

Los Alamos NATIONAL LABORATORY

Sandia National Laboratories

OAK RIDGE National Laboratory

Lawrence Livermore National Laboratory

NCERC NATIONAL CRITICALITY EXPERIMENTS RESEARCH CENTER

FY14 Course Dates

- **Two-week CSP courses**
  - **Classroom: Dec 2-6, 2013;**
    NCERC & SNL: Dec 8-13, 2013
  - **Classroom: Mar 31-Apr 4, 2014;**
    NCERC & SNL: Apr 7-11, 2014
- **One-week managers course**
  - **NCERC: Feb 3-7, 2014 (postponed to Aug. 18-22)**
  - **SNL: Feb 24-28, 2014**
- **Special one-week course for AWE**
  - **NCERC: Mar 3-7, 2014 (cancelled)**
- **Special one-day course for NFO and NSTEC**
  - **February 25, 2014**

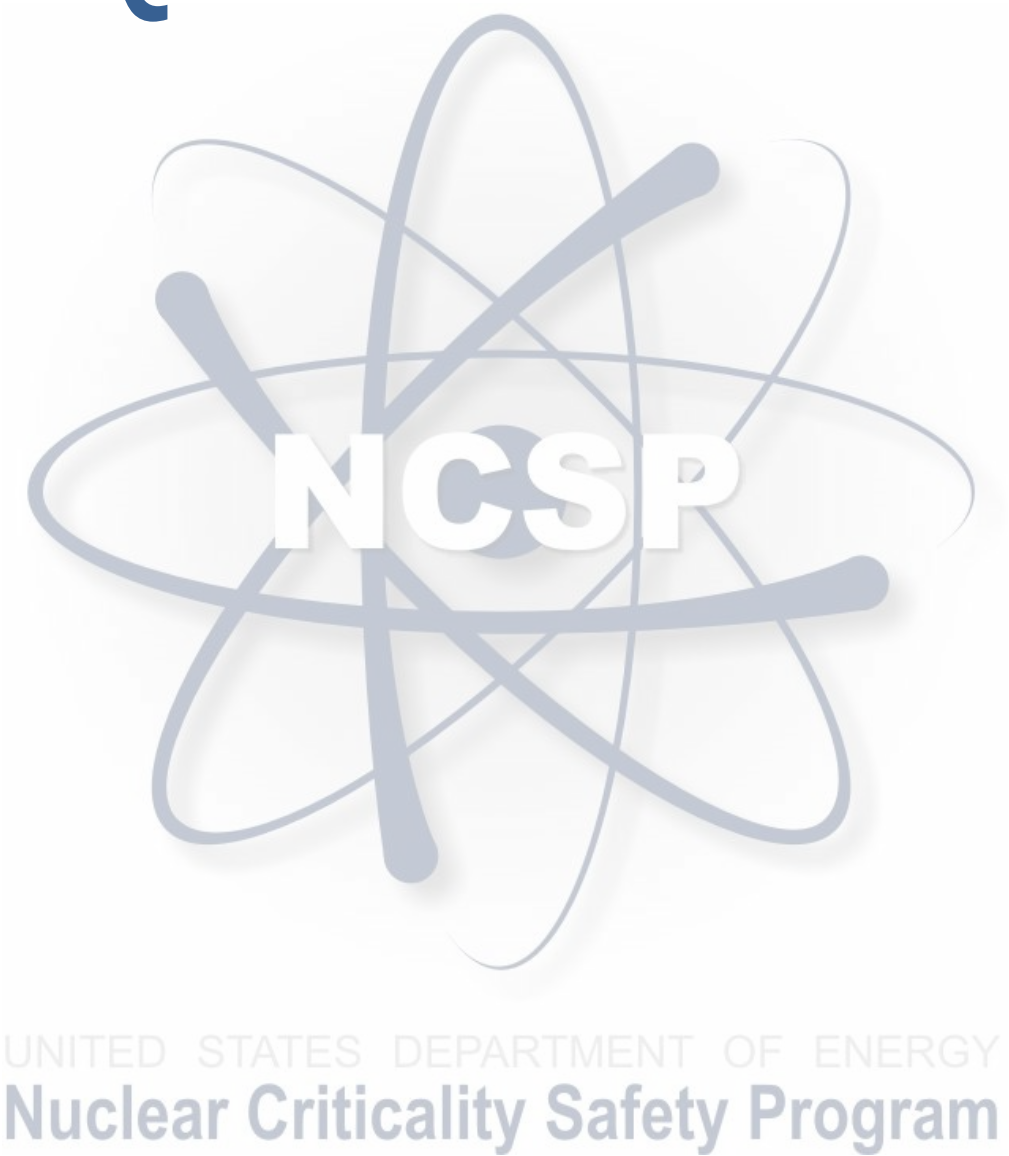
US DOE NCSP T&E Course Vision

- **Be a continually improving, adaptable, and transparent project ….**
  - **Student evaluations (overwhelmingly positive!)**
  - **Instructor feedback (continuous improvement)**
  - **Contributor feedback (continuous improvement)**
  - **Management feedback**
  - **CSSG feedback**

What is next?

- **Better incorporate Human Factors and NDA into the course**
  - **Cover earlier in the week**
  - **Case studies**
  - **Integrate into the course rather than having large block of course modules**

Questions?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UNITED STATES DEPARTMENT OF ENERGY
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