Title: Los Alamos National Laboratory Nuclear Criticality Safety Pipeline for Expedited Qualification of Personnel

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LOS ALAMOS NATIONAL LABORATORY NUCLEAR CRITICALITY SAFETY PIPELINE FOR EXPEDITED QUALIFICATION OF PERSONNEL

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Additional University Contributors to NCS Pipeline Program

- Dr. Pavel Tsvetkov, Associate Professor at Texas A&M University
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- Dr. David Rockstraw, Professor and Department Head at New Mexico State University
Overview

Today’s discussion
- Issue Description
- Program Elements
- Participating Universities
- Program Benefits
- Conclusion
Key Issue #1

- Attrition of Nuclear Criticality Safety (NCS) Personnel
  - NCS Profession Heavily Skewed Towards Late Career\(^1\)
    - 29.4% with 31+ years of experience
    - 23.5% with 21-30 years experience
  - LANL NCS Experienced Near Complete Attrition from 2008-2012

\(^1\) NCS Division of the American Nuclear Society, “Nuclear Criticality Safety Professionals Compensation Study”, p. 3 (2016)
Key Issue #2

- Extended Qualification Period
  - Average Qualification Time for BS Nuclear Engineer
    - LANL - 24 Months
    - Consistent with observations/experience at other NCS organizations
  - Note: Security Clearance Wait is Having Impact on Qualification Time
Key Issue #3

- **Lack of Relevant University Coursework/Curricula**
  - Idaho State University\(^2\)
    - Course that includes principles in NCS
    - NE4446, *Nuclear Fuel Cycle Systems*
  - University of Tennessee\(^3\)
    - Periodically offers two NCS courses
      - NE421, *Introduction to Criticality Safety*
      - NE543, *Special Topics in Nuclear Criticality Safety*
  - University of Idaho- Idaho Falls\(^4\)
    - Offers a Graduate Certificate

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2 - http://coursecat.isu.edu/undergraduate/allcourses/ne/
3 - http://web.utk.edu/~rpevey/
4 - https://www.uidaho.edu/idahofalls/academic-programs/engr/ne-cert
Program Elements Overview

NCS Pipeline Program Process

1. Student: Upper Level BS or MS
2. Complete University Course
3. Summer Internship @ LANL
4. Internship Continues During Senior Semester(s) (assignments with LANL staff and Univ Faculty)
5. LANL CSA Position
Program Elements – University Coursework

- **University Coursework**
  - Advanced level academic course
    - Targeting junior or senior level undergraduate students
  - Components
    - Criticality Safety Academic Material
    - Guest Lectures from LANL Staff
    - Criticality Safety Problems
    - NCS Evaluation Development Project
  - Course is tailored to participating universities
    - Texas A&M (Nuclear Engineering Department)
      - Taught by Texas A&M Professors using live instruction
      - Fewer fundamental nuclear engineering concepts
      - Increased coverage of process analysis
    - New Mexico State University (Chemical Engineering Department)
      - Facilitated completely online
      - Increased coverage of nuclear engineering fundamentals
LANL Internship

Targeting Successful Students in University Course
- Spend summer with LANL NCS Division

Summer Internship Components
- Students assigned mentor within NCS Division
- Student Projects
  - Primarily consist of Criticality Safety Evaluations
- Student Training
  - LANL Intensive Criticality Safety Analyst Training (2 Weeks)
  - UNM Short Course (1 Week)
  - UNM Assessments Course (1 Week)
  - Future: DOE NCSP Hands On Training Course?

FY17
- Jump started program with 6 summer interns
Following Summer Internship

- Students Still Interested (Maybe 😊) & Perform Well
  - Offered Continued “Casual Status” with LANL
  - Can Perform Research from Offsite
  - Continue Working on Qualification as Criticality Safety Analyst
  - Start Security Clearance Investigation
Program Elements – Desired End Result

- **Following Graduation from University**
  - Students Hired as Full Time LANL Employees
    - Time to Qualification Reduced
      - Goal is Qualification within 6 Months
    - Students Already Self Selected Into NCS Discipline
Participating Universities

- **Texas A&M University**
  - Nuclear Engineering Department
    - Dr. Pavel Tsvetkov, Associate Professor at Texas A&M University
    - Dr. Sunil Chirayath, Associate Professor at Texas A&M University

- **New Mexico State University**
  - Chemical Engineering Department
    - Dr. David Rockstraw, Professor and Department Head at New Mexico State University

- **Potential University Partnerships In Discussion**
  - University of California, Berkeley
  - University of New Mexico
Benefits to Students
- Collaborate, Cutting-edge, and progressive learning opportunity
- Resume Building Experiences and Professional Development
- Access to Technical Subject Matter Experts
- Career Opportunities

Benefits to Participating Universities
- Minimal Cost Elective Course
- Increased Access/Collaboration with National Laboratory
- Opportunity for Students to Obtain Full Time Employment
  - May Increase Enrollment and Distinction of Department

Benefits to LANL
- Significantly Reduced Training Time/Cost
- Increased Likelihood of Retaining Full Time Employee
- Increased Access to Larger Pool of Recruits
NCS Pipeline Program Benefits 2

- **Benefits to LANL**
  - Significantly Reduced Training Time/Cost
  - Increased Likelihood of Retaining Full Time Employee
  - Increased Access to Larger Pool of Recruits

- **Benefits to DOE Complex**
  - Prototype of Sustainable Educational Resource
  - NCS Pipeline Program is Scalable to Include Additional Sites/Universities
Conclusion

- Attrition has a tremendous negative impact on the continuity and success of any organization
  - Been especially impactful at LANL’s NCS Division over the last decade
- NCS Pipeline Program is LANL’s approach for cultivating a new resource in a shorter amount of time than previously possible.
- Program is capable of repetition and replication at similar facilities throughout the complex
- Once launched, program sponsors fully anticipate expansion to other universities and potentially other disciplines
- May serve as a model for implementation throughout the DOE complex.
- Positive impact has yet to be fully defined and may suggest further growth opportunities