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

Presented at American Nuclear Society Nuclear Criticality Safety Division Topical Meeting in Carlsbad, NM

September 13, 2017

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Acknowledgements

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Additional University Contributors to NCS Pipeline Program

- Dr. Pavel Tsvetkov, Associate Professor at Texas A&M University
- Dr. Sunil Chirayath, Associate Professor at Texas A&M University
- 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
    - 29.4% with 31+ years of experience
    - 23.5% with 21-30 years experience
  - LANL NCS Experienced Near Complete Attrition from 2008-2012

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
NCS Pipeline Program Benefits

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
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
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