



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

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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<sup>1</sup>
    - 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<sup>2</sup>
    - Course that includes principles in NCS
    - NE4446, *Nuclear Fuel Cycle Systems*
  - University of Tennessee<sup>3</sup>
    - Periodically offers two NCS courses
      - NE421, *Introduction to Criticality Safety*
      - NE543, *Special Topics in Nuclear Criticality Safety*
  - University of Idaho- Idaho Falls<sup>4</sup>
    - Offers a Graduate Certificate

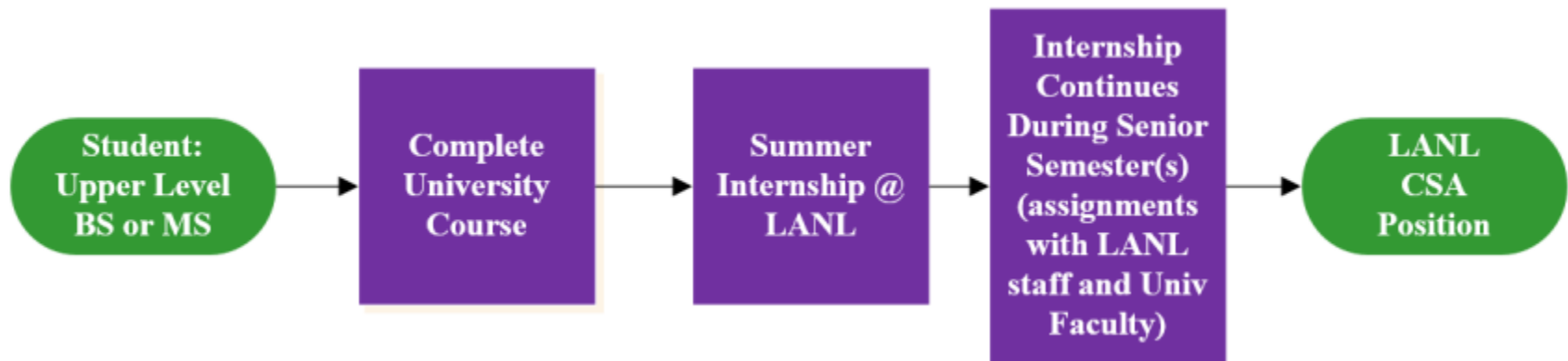
2 - <http://coursecat.isu.edu/undergraduate/allcourses/ne/>

3 - <http://web.utk.edu/~rpevey/>

4 - <https://www.uidaho.edu/idahofalls/academic-programs/engr/ne-cert>

# Program Elements Overview

## NCS Pipeline Program Process



# 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



# Program Elements – LANL Summer Internship

- **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

# Program Elements – LANL Internship Continued

- **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 1

- **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

# 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**