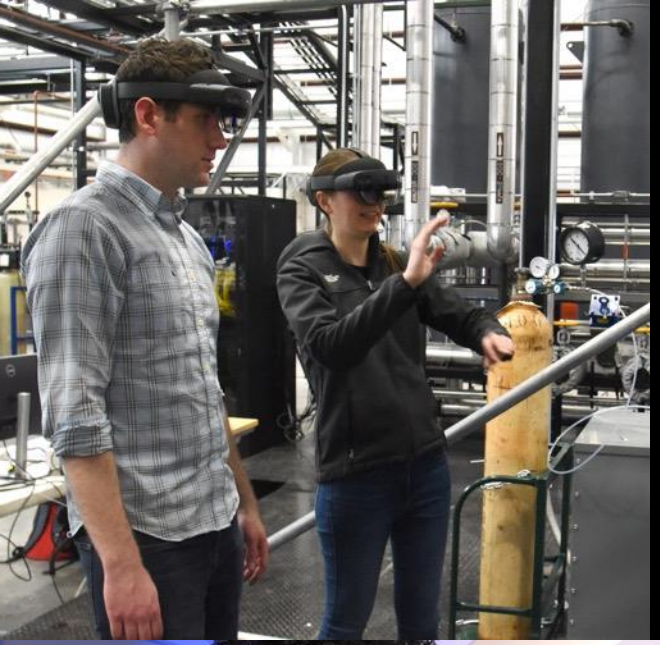
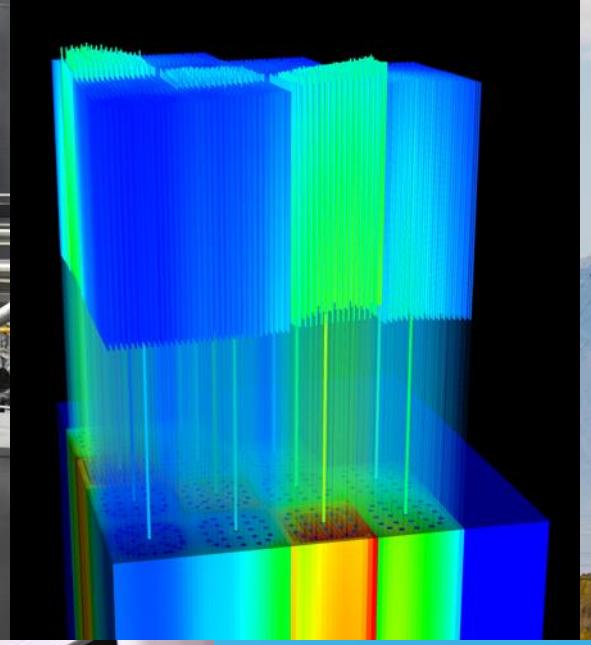
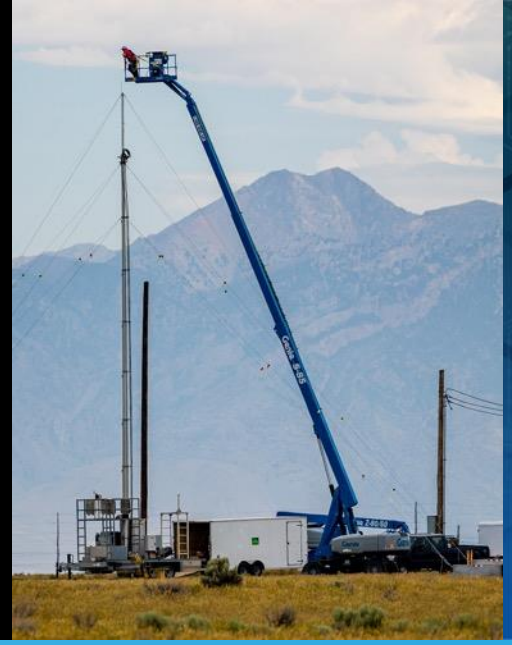






January 25, 2023

Marianne C. Walck
Deputy Laboratory Director for Science and Technology & Chief Research Officer

Philip M. Reppert
Director, Center for Advanced Energy Studies & Idaho University Collaborations

Eric T. Whiting
Division Director Advanced Scientific Computing

Eleanor J. Taylor
Program Manager, National & Homeland Security Workforce Development Program Office

INL/State of Idaho Collaborations:

Center for Advanced Energy Studies, Cybercore Integration Center, Collaborative Computing Center

Presentation to the LINE Commission, Boise, ID

Battelle Energy Alliance manages INL for the U.S. Department of Energy's Office of Nuclear Energy

Idaho National Laboratory

Leveraging INL Collaborations with the State of Idaho: *CAES, C3, and Cybercore*

College of Eastern Idaho

CAES Center for Advanced Energy Studies

BYU IDAHO

CYBERCORE integration center

CSI COLLEGE OF SOUTHERN IDAHO

LEWIS CLARK STATE COLLEGE

BOISE STATE UNIVERSITY

University of Idaho

North Idaho College

CWI COLLEGE OF WESTERN IDAHO

Idaho State University

Established 2006
Building Constructed 2009

Center for Advanced Energy Studies

Philip M. Reppert
Director, Center for Advanced Energy Studies & Idaho University Collaborations

What is CAES?

- A collaboration between INL, Boise State University, Idaho State University, University of Idaho
- CAES main laboratory is located in Idaho Falls adjacent to INL and University Place
- CAES provides opportunities for students to experience experiential learning in a real-world national laboratory setting.
- CAES touch communities across the state of Idaho.

IDAHO NATIONAL LABORATORY

CAES Mission & Vision

Mission

Create new knowledge and the next generation of technology leaders through research and education with academic-industry-government collaborations.

Vision

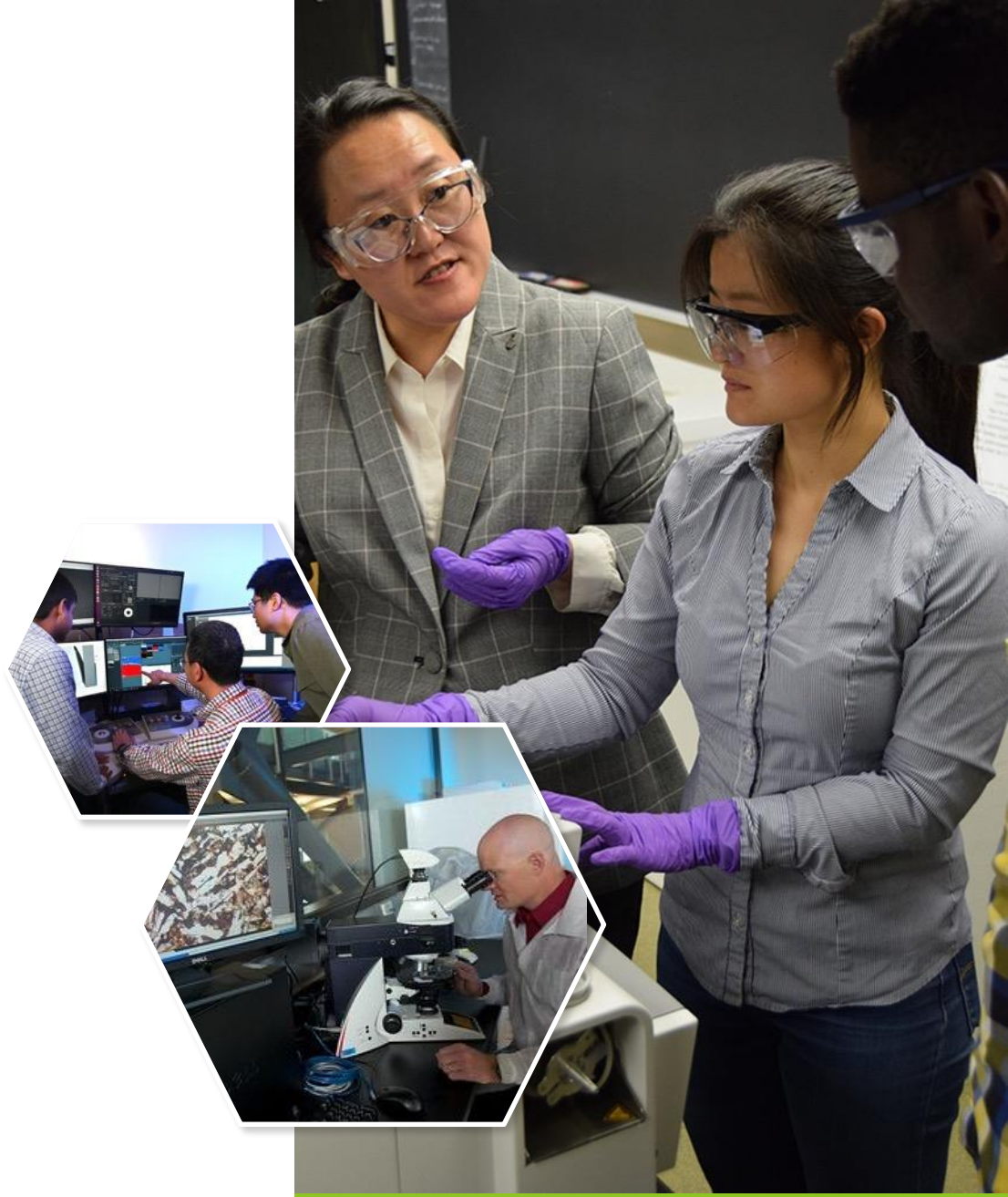
Through world-class collaborative research, CAES innovates to secure the nation's energy future.

Three Primary Focus Areas

The three focus areas at CAES are related to the broad interdisciplinary field of nuclear engineering. They also support aspects of clean-energy development.

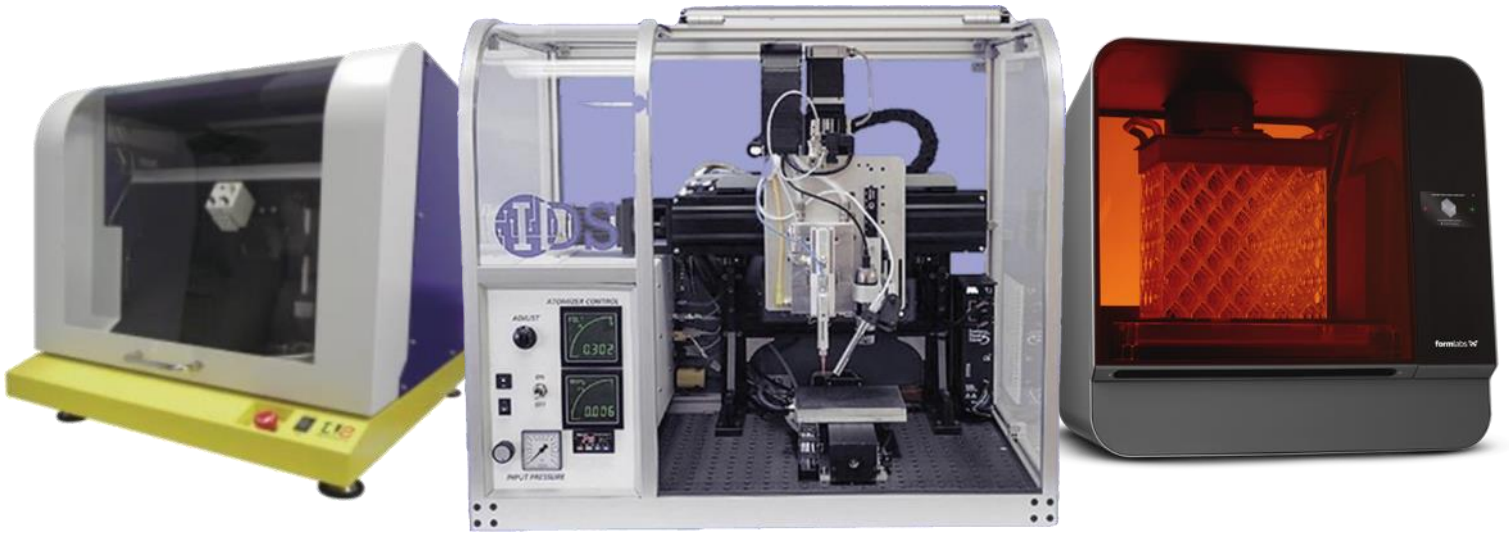
- Advanced Manufacturing
- Potential area: Critical Minerals/Geothermal
- Potential area: Energy Storage/Transfer

Two previous CAES focus areas, Cybersecurity and Computing, Data, and Visualization, have enabled the formation of C3 and Cybercore.



Advanced Manufacturing Highlights

- New Scanning-Transmission Electron Microscope (S-TEM)
- New 3-D powder bed metal printer
- New nano printers



CAES Highlights

- National Science Foundation Scholarships in STEM program award of $5M to Boise State University
- Higher Education Research Council-Idaho Global Entrepreneurial Mission: $2.1M award to team led by University of Idaho's Michael Haney
- Idaho Global Entrepreneurial Mission award ($348K) to University of Idaho's Amin Mirkouei to research and develop a new technique for drilling and extracting rare earth elements.
- $450K NRC grant for Idaho State University's Amir Ali to create a program enabling thermal hydraulic research in ISU's Nuclear Engineering department.
- BSU, ISU receive DOE EPSCoR grants for projects involving INL
- Research Experience for Undergraduates: Advanced Manufacturing for a Sustainable Energy Future Program

Future Goal –
More Industry Involvement in CAES

Benefits of Industry Involvement

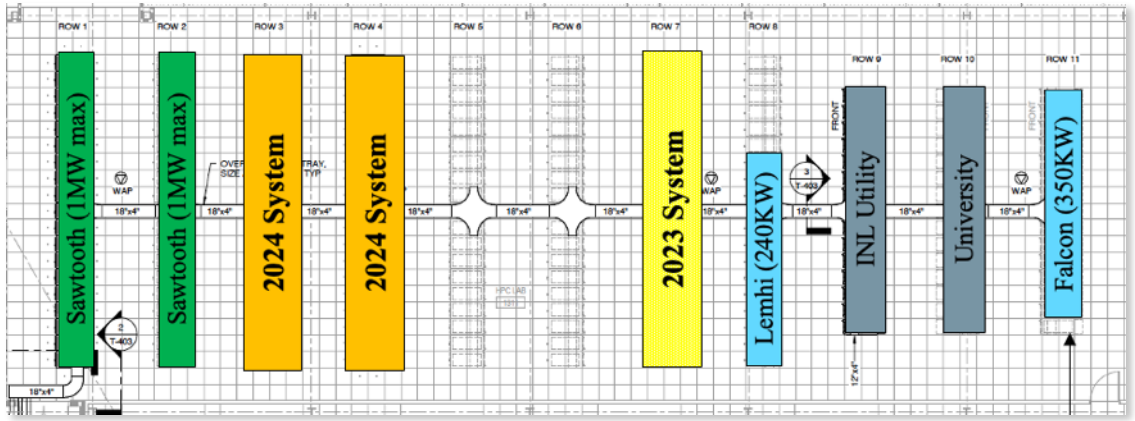
- Additional sources of funding to support students
- Keep Idaho companies on the forefront of new technology development
- Pipeline of Idaho students to Idaho industry
- Develop internships for Idaho students
- Growing collaborations with industry

Collaborative Computing Center (C3)

Eric T. Whiting
Division Director Advanced Scientific Computing

Collaborative Computing Center *(C3)*

- Financed by the State of Idaho – Leased by INL
  - Constructed 2018-2019
  - By 2020 more than $40M of computers installed
- 196 maximum occupancy
  - 157 staff assigned to C3
  - 75 interns Summer 2022, including 18 from Idaho Schools
- Data center -- 4 MW with the ability to expand to 8 MW
- Centralized location for computational staff and visitors

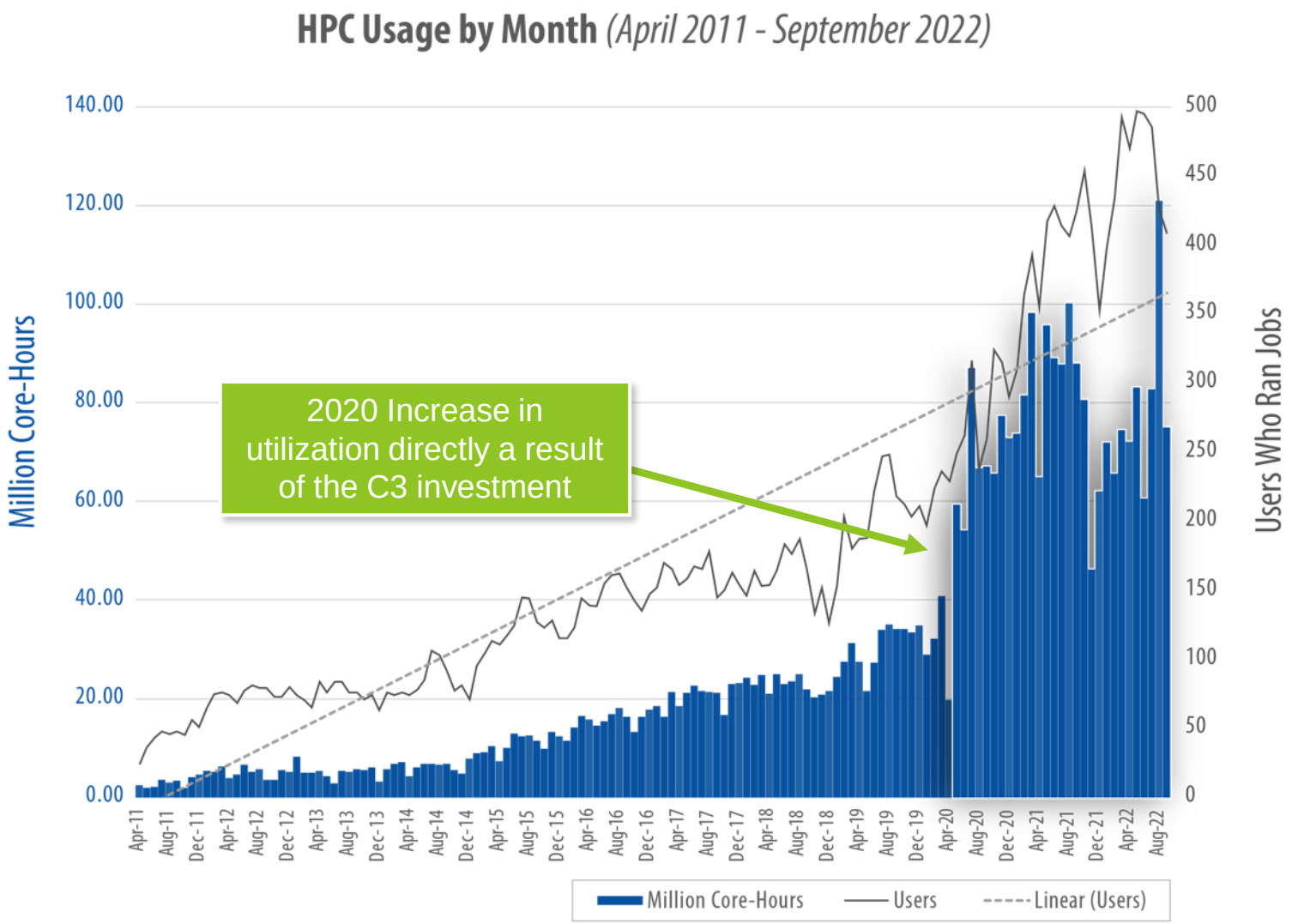


Transformers, cooling towers, pumps, power will be required for future systems

High Performance Computing rows 1-8
1.0 MW per row, 19 racks per row UPS/Utility selectable

Rows 9-10
1.0 MW per row, 19 racks per row UPS/Utility selectable

HPC Growth and Engagement



User Count	Affiliation
694	Idaho National Laboratory
116	Naval Nuclear Laboratory
64	Argonne National Laboratory
53	TerraPower
43	MPR Associates
42	Oak Ridge National Laboratory
33	Framatome
32	North Carolina State University
30	**Idaho State University**
28	University of Tennessee Knoxville
27	Westinghouse Electric Company
26	**University of Idaho**
24	**Boise State University**
24	Nuclear Regulatory Commission
22	BWX Technologies, Inc
21	University of Wisconsin-Madison
19	Texas A&M University
18	Pennsylvania State University
17	Los Alamos National Laboratory
17	Oregon State University
14	Holtec International
14	Massachusetts Institute of Technology
13	Oklo Inc
12	Radiant Industries Incorporated
12	University of Michigan
10	Missouri University of Science and Technology
10	Purdue University
9	Georgia Institute of Technology
9	University of South Carolina

Table: Top 35 institutions with largest user count utilizing INL HPC systems as of September 30, 2022

Falcon – *for Idaho*

- INL's Falcon Supercomputer is now managed and operated by the CAES universities
- System provides 34,992 compute cores to Idaho Universities and ranks in the top 25 of university computing systems in the US
- Falcon timeline:
  - 2014 installed
  - 2017 upgraded
  - 2020 moved to C3
  - 2022 transferred to CAES management
- $10M total INL investment

Cybercore Integration Center

Eleanor J. Taylor
Program Manager, National & Homeland Security Workforce Development Program Office

INL National & Homeland Security Directorate Workforce Development Program Office

Address the most critical control systems challenges that require a national collaborative, inter-disciplinary environment

Drive a culture change in engineering

Increase cybersecurity of systems deployed and under development

Enhanced partnerships

Advance control systems cybersecurity gaps

Accelerate workforce development

Support demand for control system cybersecurity talent

Cybercore University Collaboration Laboratory

- **Partner** to advance control systems cybersecurity
- **Deliver** on MOU commitments with the state of Idaho and strengthen education ecosystem
- **Access** to collective resources and equipment
- **Exchange** of scientific and engineering information and collaboration
- **Align** interdisciplinary programs to address national challenges

Idaho National Laboratory

Boise State University

University of Idaho

Idaho State University

IRON Idaho Regional Optical Network

CYBERCORE integration center

Cybercore Summer Camp

Started as an Intro Camp reaching a handful of students and has continued to grow with offerings now available across the state….

- Intro and Advanced Camps
- More offerings across the state
- Teaming across institutions

Future focus…..

- Teachers
- Adult learners
- Additional locations and partners

Cybercore Research and Education Partnerships

Industrial Cybersecurity Community of Practice (ICSCOP)

- Consists of over 300 participants nationwide and 12 countries from industry, academia, and government with bi-annual public workshops
- Opportunity to demonstrate capability and expertise at national scale

National Research Model –
Idaho Cyber Research Project (ICRP)

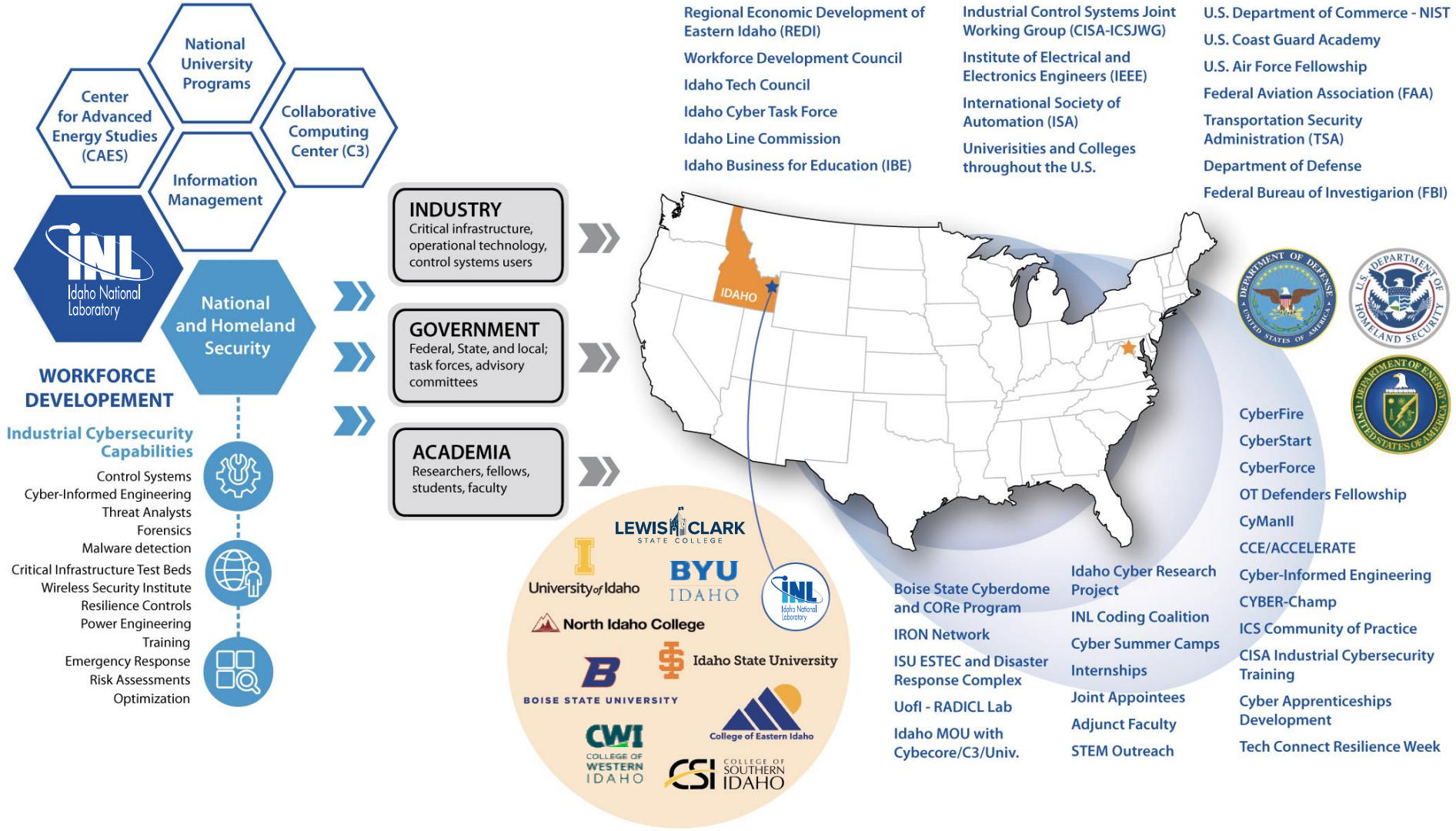
- Provide student and faculty development opportunities
- Maximize and leverage existing programs and resources

Idaho Engagements & Research Projects

- Cyber Informed Engineering (CIE)
- Consequence driven Cyber informed Engineering (CCE)
- Curriculum Development and Hands-On Training
- Laboratory Directed Research and Development (LDRD)
- Cyber CHAMP Assessments
- Community Cyber Guidebooks
- Community College Pilots
- STEM Outreach

Idaho Interns Lab Wide	2018	2019	2020	2021
Total	97	111	118	159
Cyber Focused	22	45	52	54

National Industrial Cybersecurity Workforce Impact



Idaho National Laboratory