Partnering to Build a Nuclear Pipeline

Amy Lientz
Director Supply Chain, Energy Industry

Developing people and business for our energy future

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Our Eighty Year Past is Shaping the Nuclear Energy Future

- **1938**: First self-sustaining chain reaction, CP-1
- **1942**: Chicago Pile-1
- **1948**: First self-sustaining chain reaction, CP-1
- **1951**: December 20, 1951, Experimental Breeder Reactor-I
- **1954**: January 21, 1954, First nuclear submarine USS Nautilus
- **1956**: 1963, Experimental Breeder Reactor-II went critical
- **1959**: 1959 Transient Reactor Test Facility
- **1962**: 1963, Experimental Breeder Reactor-II went critical
- **1967**: 1967 – Advanced Test Reactor, critical
- **1969**: 1967 – Advanced Test Reactor, critical
- **1972**: 1972, Power Burst Facility, (PBF)
- **1973**: 1973, Loss of Fluid Test Reactor, (LOFT)
- **1978**: 1978
- **1986**: 1986, EBR-II demonstrates inherent reactor safety
- **1998**: 1998
- **2007**: 2007, Nuclear Science User Facilities

- **2008**: Shippingport Atomic Power Station - 1957
- **2018**: Transient Reactor Test Facility, restarted

**Nuclear Fission**

- **1957**: Chicago Pile-1
- **1953**: Atoms for Peace
- **1957**: First commercial nuclear power generation, Shippingport
- **1968**: 1968
- **1978**: 1978
- **1988**: 1988
- **1998**: 1998
- **2008**: 2008
- **2018**: 2018

**Nuclear Energy Reimagined**

- **1942**: Chicago Pile-1
- **1953**: Atoms for Peace
- **1957**: Shippingport Atomic Power Station
- **2018**: Nuclear Energy Reimagined
Advanced Reactor Pipeline Vision

**Demonstrate <10MW micro-reactor by early 2020s**
- Resolve key advanced reactor issues
- Open new markets for nuclear energy
- Provide a ‘win’ to build positive momentum

**Commercial micro-reactors deployed**
- Support deployment of micro-reactors for key remote site power and process heat customers

**SMR operating by 2026**
- Enable deployment through siting and technical support
- Joint Use Modular Plant (JUMP) leased for federal RDD&D

**Versatile Test Reactor (VTR) operating by 2026**
- Re-establish leadership in fast-spectrum testing and fuel development capability
- Supported by micro-reactor demonstration
- Support non-LWR advanced reactor demonstration

**Non-LWR advanced demonstration reactors by 2030**
- Demonstrate non-LWR technology replacement of U.S. baseload clean power capacity
We Need Talent.
Science, Engineering and Technician Workforce Opportunities

- Advanced technician/skills: welding, operations, radiological and lab technicians
- Advanced Energy Systems
- Advanced Manufacturing
- Biological Processing
- Catalysis
- Chemistry/Chemical Engineering
- Computational Science
- Control Systems Cyber Security
- Critical infrastructure analysts
- Cyber Security
- Electrical Engineering
- Electrochemistry
- Industrial Controls/Control Systems
- Material Science (including Ceramics)
- Materials Engineering
- Mechanical Engineering
- Membrane Science/Separations
- Nuclear Engineering/Science (multi sub disciplines)
- Power Engineering
- Reactor Physics
- Supercritical Fluids/Pressure Chemistry
- Wireless Communications Engineers
Current and Future Landscape: Challenges to Achieve Success

- Foreseeable Growth
- Retirement Rate is Increasing
- Competition for Talent
- National STEM Job Hiring Crisis
- Integrated Energy Systems require integrated curriculum
- Soft Skills and Working Skills Often Lacking
## Partnering for Success

### Education Programs, Communications, Government Affairs, Economic Development

#### Human Resources

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<tr>
<th>Outreach &amp; Assessment</th>
<th>Skill Development, Capability Access</th>
<th>Work-Based Experience</th>
<th>Recruiting and Hiring</th>
<th>Retention</th>
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<td><strong>EMPLOYER</strong></td>
<td><strong>PROVIDER</strong></td>
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<td>Inventory and share talent needs</td>
<td>Inspire young adults</td>
<td>Assist on curriculumPartner for support (equipment, facilities, etc.)</td>
<td>Provide on-site opportunity: interns, faculty exchanges</td>
<td>Convert interns, postdocs, veterans to employees Make offers quickly</td>
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<td>Build teacher skills</td>
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<td>Provide courses</td>
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<td>Partner for faculty, research, equipment, facilities, people</td>
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<td>Match students to experience (projects, co-ops, internships)</td>
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<td>Provide coaching, resume support, career advice</td>
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<td>Know industry skill needs, obtain grants, add programs, measure success</td>
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Community Partners that are Building Talent

**Educational Partners:**
Deliver curriculum that improves candidate quality, increases skills of incumbent employees

**Workforce Organizations:**
Partner and collaborate to recruit, screen, test, advise and obtain grant funds to build candidate pools


IAEA, US Nuclear Industry Consortium, Nuclear Energy Institute, American Nuclear Society, National Academy of Sciences, Battelle STEM, DOE, DoD
Workforce Development – Post High School through Career

- **Objective** – Train, develop and positively influence the next generation of energy workforce

- **Target Audience**
  - INL employees (skills enhancement or new skill development)
  - Community/future employees

- **Existing Relationships**
  - Collaborations with Higher Education Programs
  - Employee Education
    - Nuclear Quality Assurance (CEI)
  - Sample of Workforce Development Support
    - Fire Protection (UI)
    - Welding (College of Eastern Idaho)
  - Certifications & Associates Degrees
    - ISU’s Energy Systems Technology and Education Center (ESTEC)
      - Cyber-Physical Security
      - Electrical Engineering Technology
      - Instrumentation Engineering Technology
      - Mechanical Engineering Technology
      - Nuclear Operations Technology
Successful Public Private Initiatives to Build Talent

- The new Cyber and Computing capabilities are leading to: Expanded internships, faculty recruiting, more joint appointments, enhanced employee education programs
- Joint proposals for state funding have brought new training programs, curriculum support, equipment, and new faculty in cyber and nuclear programs
- Investments by the state and INL are expanding the Idaho Regional Optical Network to connect INL with Idaho Universities and other national research institutions
- INL leads the way to connect opportunities to K-12 STEM programs that support our mission:
  - Mission driven programs into K-12 programs for students and teachers
  - Education grants to build the pipeline in a future energy pipeline
  - FutureTech – a new CEI facility
  - Nuclear Careers Roadmap tool for teachers
  - Nuclear curriculum in the classroom (ANS partner)
  - STEM Action Center matching $ partner for grants
Collaborative Computing Center
FY 2019 YTD Intern/Apprentice Population

FY 19 Lab Wide

- FY 2019 YTD Intern/Apprentice Population
  - 390, 89%
  - 47, 11%

FY 19 Lab Wide

- FY 19 YTD Intern Population
- 10 Most Popular Majors

FY 19 Intern Applicant Statistics

- 1,892 Applicants
- 269 Institutions
- 22.7% Female
- 39.11% Ethnic Minority
- 1.59% Veteran
- 3.49% Disabled

FY19 Intern Applicant Statistics

- AS
- BS
- MS
- PHD

- Computer Engineering: 9
- Chemistry: 10
- Civil Engineering: 11
- Materials Science and Engineering: 14
- Physics: 16
- Electrical Engineering: 24
- Chemical Engineering: 26
- Computer Science: 39
- Mechanical Engineering: 41
- Nuclear Engineering: 19

Total: 83