Partnering to Build a Nuclear Pipeline

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Developing people and business for our energy future

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www.inl.gov

Idaho National Laboratory

Our Eighty Year Past is Shaping the Nuclear Energy Future

1938 First self-sustaining chain reaction, CP-1, 1942 — Nuclear Fission

1948 December 20, 1951, Experimental Breeder Reactor-I

1958 January 21, 1954, First nuclear submarine USS Nautilus; First commercial nuclear power generation, Shippingport, 1957; 1959 Transient Reactor Test Facility

1963, Experimental Breeder Reactor-II went critical

1968 1967 – Advanced Test Reactor, critical

1973, Loss of Fluid Test Reactor, (LOFT)

1978 1972, Power Burst Facility, (PBF)

1988 1986, EBR-II demonstrates inherent reactor safety

1998 2007, Nuclear Science User Facilities

2008

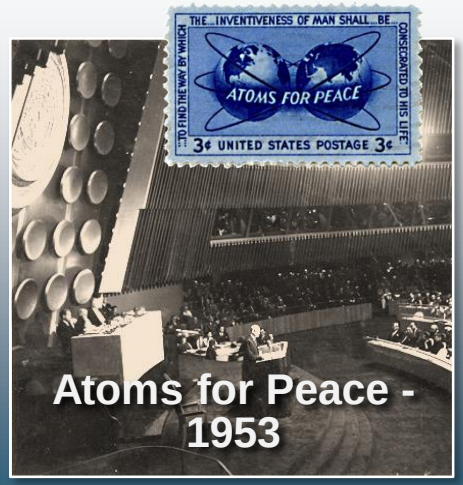
2018, Transient Reactor Test Facility, restarted

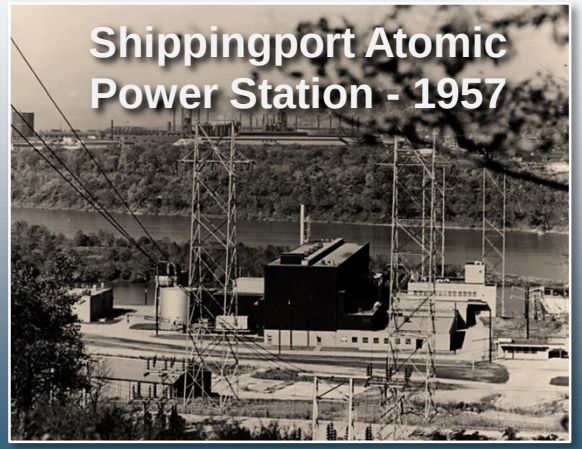
GAIN

2018

- Advanced Reactors
- Versatile Test Reactor

VTR VERSATILE TEST REACTOR

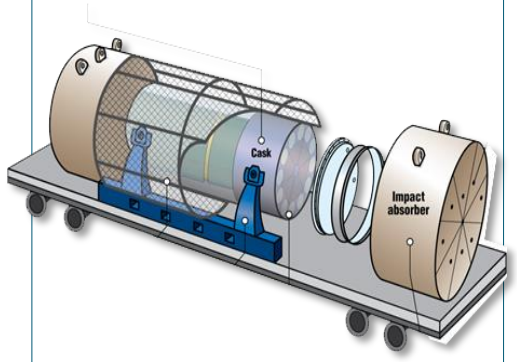




Advanced Reactor Pipeline Vision

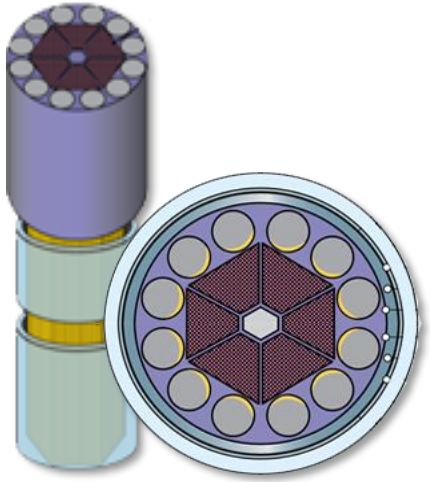
Demonstrate <10MW micro-reactor by early 2020s

- Resolve key advanced reactor issues
- Open new markets for nuclear energy
- Provide a ‘win’ to build positive momentum



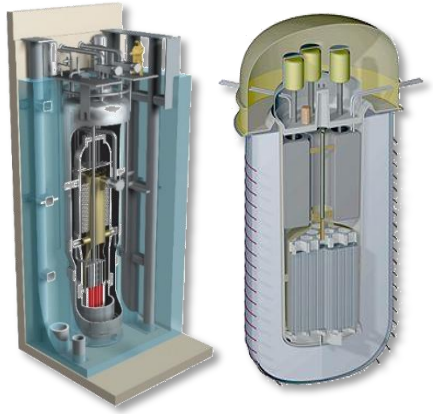
Commercial micro-reactors deployed

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



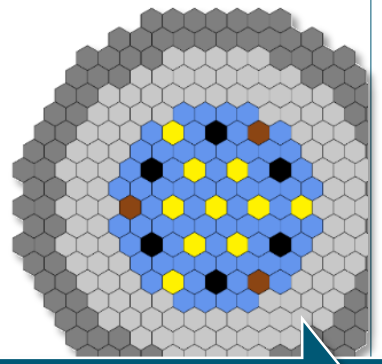
SMR operating by 2026

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



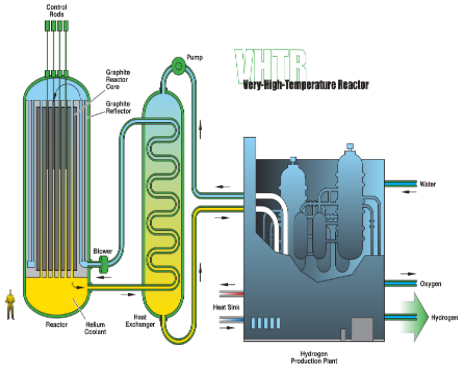
Versatile Test Reactor (VTR) operating by 2026

- Re-establish leadership in fast-spectrum testing and fuel development capability
- Supported by micro-reactor demonstration
- Support non-LWR advanced reactor demonstration



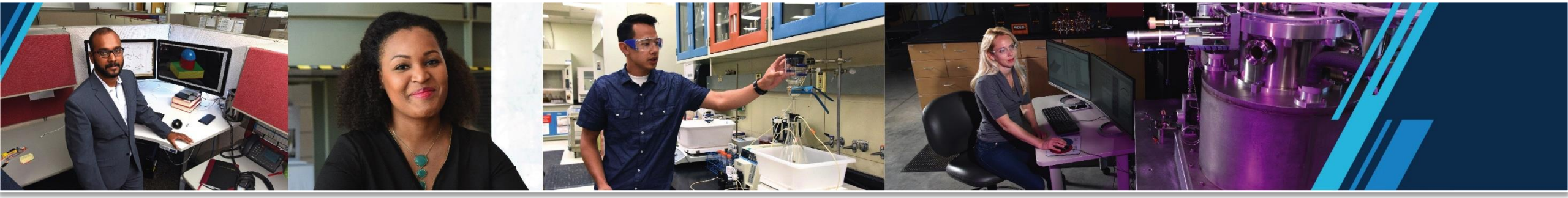
Non-LWR advanced demonstration reactors by 2030

- Demonstrate non-LWR technology replacement of U.S. baseload clean power capacity



2021 2025 2026 2028 2030

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

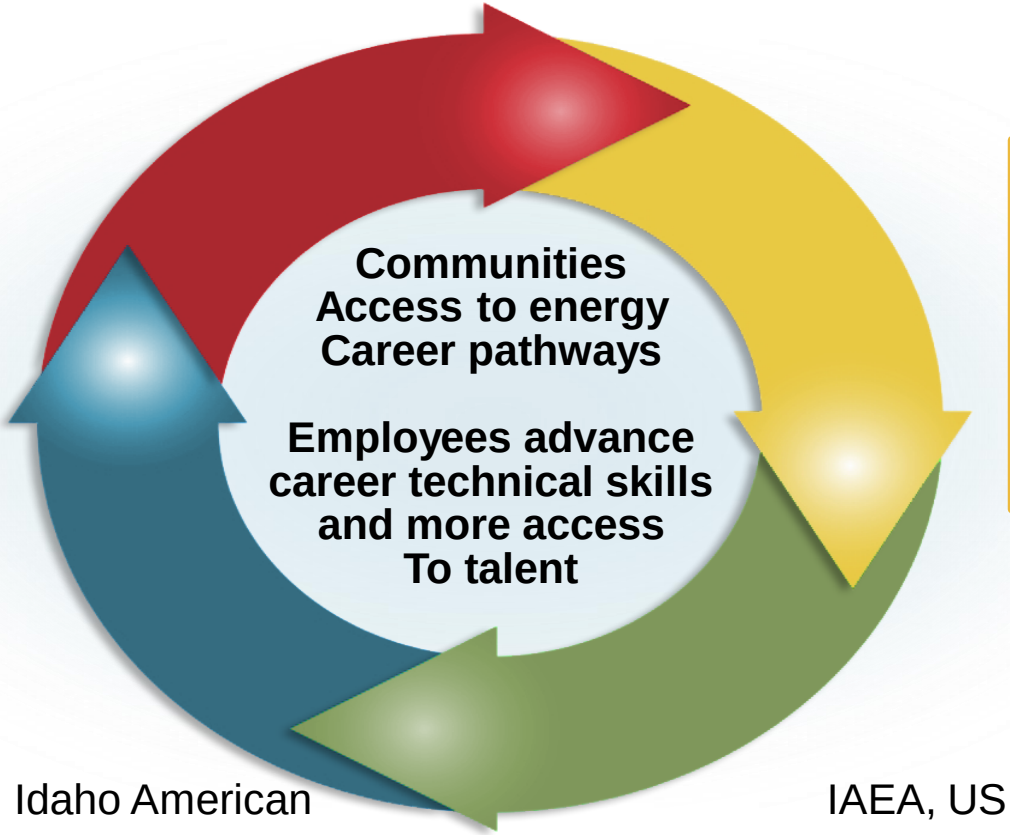
Education Programs, Communications, Government Affairs, Economic Development

Human Resources

	Outreach & Assessment	Skill Development, Capability Access	Work-Based Experience	Recruiting and Hiring	Retention
EMPLOYER	**Inventory and share talent needs**	**Assist on curriculum** **Partner for support *(equipment, facilities, etc.)***	Provide on-site opportunity: interns, faculty exchanges	Convert interns, postdocs, veterans to employees Make offers quickly	Provide training courses, offer and expand employee education programs
PROVIDER	Inspire young adults Build teacher skills	Provide courses Partner for faculty, research, equipment, facilities, people	Match students to experience (projects, co –ops, internships)	Provide coaching, resume support, career advice	Know industry skill needs, obtain grants, add programs, measure success

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

Idaho Technology Council, Idaho American General Contractor Association, Idaho Labor and Workforce organizations, Tribes, Idaho Business for Education, Idaho Rural Partnership, Economic Development organizations, Idaho Women's Business Center, Idaho Hispanic Chamber, Veterans organizations

IAEA, US Nuclear Industry Consortium, Nuclear Energy Institute, American Nuclear Society, National Academy of Sciences, Battelle STEM, DOE, DoD

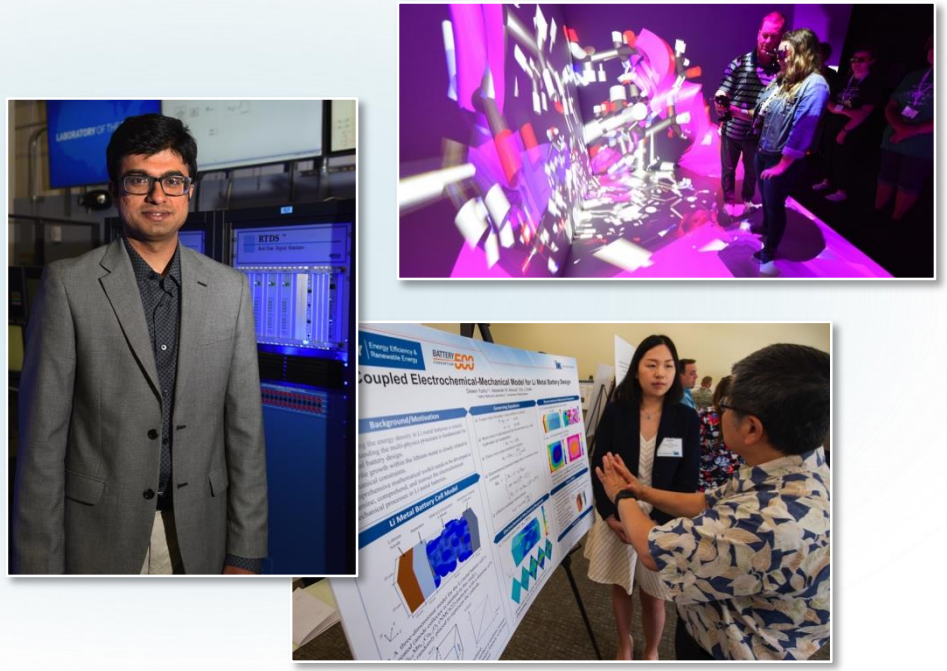
Workforce Development – Post High School through Career

- **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

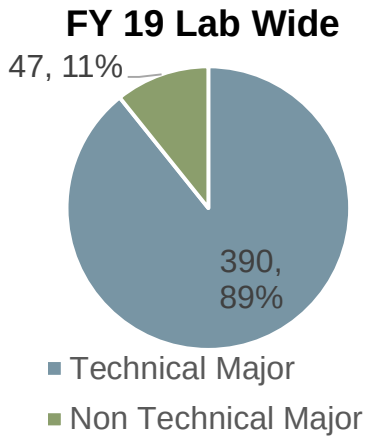


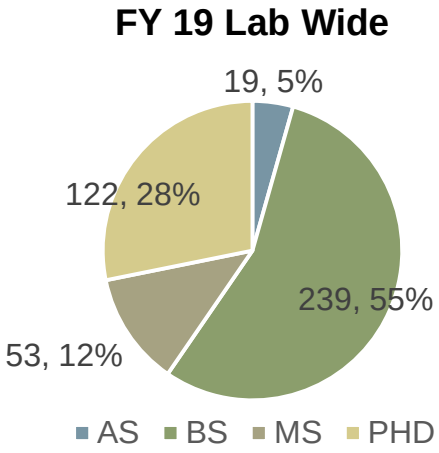
Collaborative Computing Center

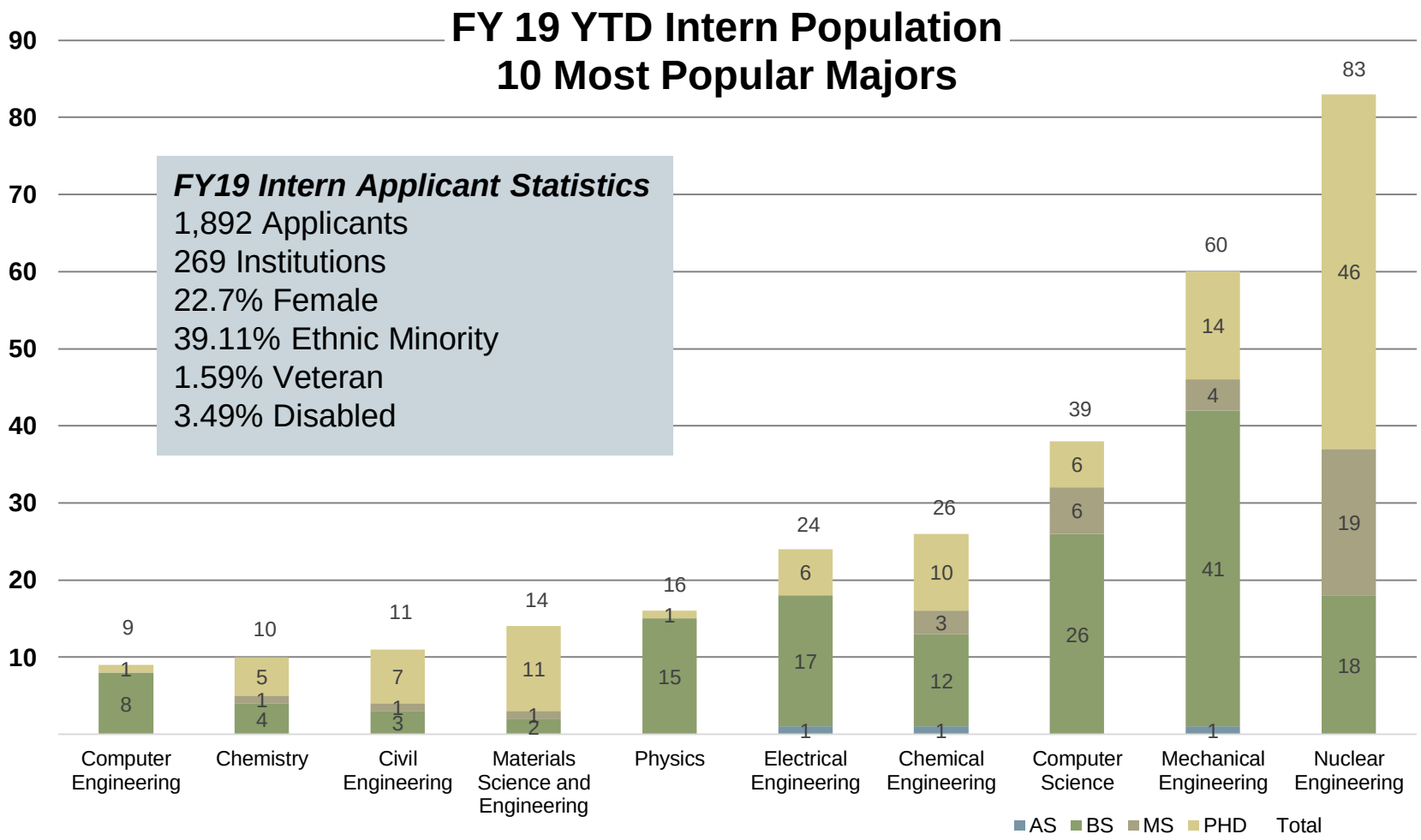
Cybercore Integration Center

IRON
Idaho Regional Optical Network

FY 2019 YTD Intern/Apprentice Population





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