

# CAES STRATEGY

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COLLABORATION INSPIRING INNOVATION AND IMPACT

2019-2039



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# FROM THE DIRECTORS

The Center for Advanced Energy Studies (CAES) Leadership Team is proud to present the 2019-2039 CAES Strategic Plan. We are a research, education, and innovation consortium that brings together a world-class national laboratory with the four public research universities in Idaho and Wyoming.

More than a decade ago, the U.S. Department of Energy and the State of Idaho envisioned the development of a centralized research campus near Idaho National Laboratory. Closely integrating the state's public research universities with a national laboratory would allow critical energy challenges to be solved through collaborative research, while encouraging economic development and workforce training opportunities to support communities across the region. CAES is the culmination of that vision.

CAES offers more than its state-of-the-art Idaho Falls headquarters facility. In addition, CAES brings together the people, perspectives, and experiences needed to address complex global energy challenges: **CAES harnesses the power of collaboration.** Together, the five CAES entities represent more than 8,000 researchers, engineers, and university faculty, more than 63,000 students, nearly 100 laboratories or engineering facilities representing more than 2.5 million square feet of space, at least 1,100 academic degrees and certificate offerings, and \$1.8 billion dollars in annual research funding. In the coming decades, we will focus in on leveraging our collective expertise, capabilities, facilities, and diversity; on creating win-win opportunities that make us stronger than the sum of the parts; and on developing CAES into a force multiplier.

CAES benefits from a proud tradition, a dedicated leadership team, broad community support, and research wins in the form of joint federal projects awarded, collaborative publications, joint appointments, and a series of new and advanced facilities. As energy, environmental, and national security challenges loom large, we believe we can be doing even more. Here, we set the vision and framework for collaborative action to: strengthen student-research-industry experiences

and contributions through touchpoints and teaming opportunities; accelerate development and private-sector uptake of energy technologies; and generate greater positive impacts for the region, the nation, and the world by leveraging the wealth of ideas, resources, and talent across the CAES enterprise.

At CAES, we pair university students with national laboratory researchers to receive hands-on experience and mentorship, leading to valuable future career opportunities. We bring together university and national laboratory experts to teach specialized certificate programs unique to the energy field. We provide the tools, training, teaming, and facility access that enable researchers to compete for and win major federal research hubs. And we build out a regional innovation ecosystem supporting existing and incoming private-sector partners or even the next big energy start-up. CAES collaboration is this, and so much more.

This strategy is a living document which outlines the vision, framework, and milestones we will focus on over the next several years to reach our collective goals. We hope you find it both inspiring and accessible. Should you have any questions or comments, please connect with us.

We look forward to collaborating,



Noël Bakhtian, Ph.D.  
Director



Amy Moll, Ph.D.  
Associate Director



Richard Christensen, Ph.D.  
Associate Director



Don Roth, Ph.D.  
Associate Director



Richard Jacobsen, Ph.D.  
Associate Director

November 7, 2018

## VISION AND MISSION

The Center for Advanced Energy Studies (CAES) is a research, education, and innovation consortium among Idaho National Laboratory (INL), Boise State University (BSU), Idaho State University (ISU), the University of Idaho (UI), and the University of Wyoming (UW). The center is committed to conducting cutting-edge energy research, educating the next generation of scientists and engineers, and partnering with industry to advance competitiveness. CAES activities take place at the 55,000 square-foot headquarters facility in Idaho Falls as well as at each of the five home institutions.

CAES was conceived as a catalyst. It was formed to activate world-class research assets at INL in combination with research universities in the region. As part of the U.S. Department of Energy's (DOE's) complex of national laboratories, INL performs work in each of the strategic goal areas of DOE: energy, national security, science, and environment. DOE and the State of Idaho recognized that each could derive even greater value through formal engagements between INL and the universities.

CAES is about the power of partnership—solving challenges as a team. Several CAES institutions, working together, can provide value in a way an individual CAES institution working alone cannot. The CAES

## A BETTER ENERGY FUTURE

### Collaboration Inspiring Innovation and Impact

The center is committed to conducting cutting-edge energy research, educating the next generation of scientists and engineers, and partnering with industry to advance competitiveness.

collaboration expands the competitiveness and impact of member research and enhances energy-related educational opportunities.

With this reinvigorated strategy, CAES is focusing future collaborative efforts to better discover and bring to market the approaches, technologies, and solutions that will have measurable and lasting impacts for the people of Idaho and Wyoming and, eventually, will help people around the world move up the chain of human progress and prosperity.

### CAES VISION

Our vision is to create a better energy future through collaboration that inspires energy leadership, ignites technology innovation, and catalyzes global impact.

### CAES MISSION

CAES is the collaboration that inspires innovation and impact by leveraging our collective capabilities to empower students, researchers, faculty, and industry to accelerate energy solutions.

## STRATEGIC PILLARS AND FOCUS AREAS

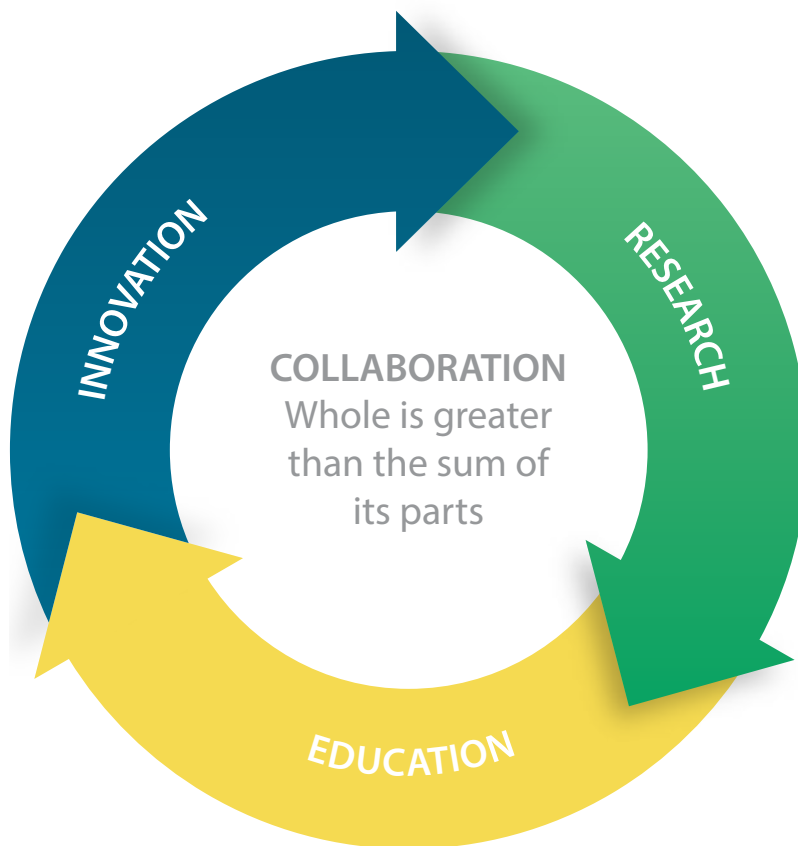
### Strategic Pillars

At its core, CAES exists to strengthen the connections, exchanges, and resources—the essence of collaboration—to inspire new ideas, approaches, and impacts. CAES succeeds when experts engage around the obstacles, breakthroughs, puzzles, and insights that spur new thinking, fire the imagination, and deliver tangible benefits. CAES is creating a more collaborative culture focused on common goals and objectives to drive lasting benefits for the people of Idaho, Wyoming, the region, and the nation.

The CAES strategy rests on three strategic pillars: Research, Education, and Innovation. The unique capabilities, expertise, facilities, and perspectives that come together through the consortium develop more than new energy technologies and solutions. Together, we inspire and

develop the energy workforce of the future, we stimulate intellectual exploration through fundamental and applied science, and we bring industry and business together with researchers, students, and faculty working together toward solutions. In the process, we build the relationships that lead to personal and professional development, and lasting career opportunities.

- **Research.** CAES's collaborative research broadens our teams and brings together world-class capabilities, facilities, and expertise. Together, we develop viable new technologies, effective policy recommendations, and networks of subject-matter experts. By connecting and streamlining collaboration, CAES expands the state, federal, and private-sector customers we serve. We grow by cultivating and aggregating capabilities around



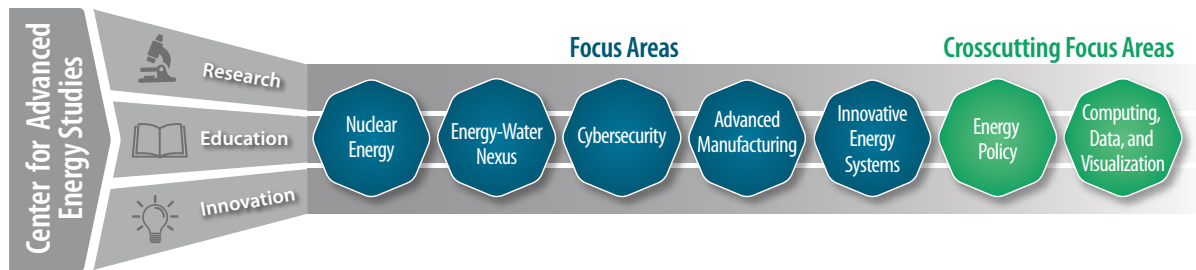
our Focus Areas to develop world-class research collaboration, establish research hubs around energy-research challenges, and connect facilities and laboratories both physically and virtually to accelerate productivity and the impact of advanced energy research.

- **Education.** CAES's collaborative education augments the personalized learning experiences of students in the region through unique experiences afforded by the national laboratory that are not otherwise available. Through collaboration in academics, we strengthen the pipeline connecting higher education to the workforces at the laboratory, in regional industry, and at the universities themselves. We strengthen the curricula offered by each university, not by offering degrees and certificates directly through CAES, but by combining and expanding upon the accredited offerings of our universities in ways not possible individually. We encourage qualified researchers to bring their expertise into the classroom, and we help faculty devote more time and energy to specialized research. Through collaborative training we sustain continuing education at all levels across the region and maintain the skills and abilities needed for success in all aspects of advanced energy research and development.
- **Innovation.** CAES's collaborative innovation supports entrepreneurial opportunities, industry partnerships, and tech-to-market impact. By fostering regional start-up companies and facilitating industry partners, CAES plays a critical role in transitioning research and development to market impact. We pair key regional industries with researchers, faculty, and students to deliver high-impact solutions and new business opportunities.

We leverage intellectual property created at INL and the universities to bring research and development to market and, in turn, benefit our communities and businesses. We contribute to a skilled and capable workforce, and we support job creation and economic development empowered by new energy technologies and approaches.

Students at all levels are the key to an energy future built on the best in research, education, and innovation. From early outreach and engagement through higher education and beyond, CAES offers experiences and opportunities for early career talent that are simply not possible for member institutions alone, or in other parts of the country or the world. Our students can see and experience the amazing things happening in energy and technology, sparking curiosity and lifting go-on rates. The connections we bring across research, academia, and industry build relationships and opportunities that draw undergraduate and graduate students to the area, lifting enrollments and growing our universities. These connections also firm up employment and retention rates across the region through new opportunities, thriving industries, a growing innovation economy, vibrant communities, and a blossoming new generation of future energy leaders.

Activities across each of the three strategic pillars will drive solutions in each of a handful of CAES Focus Areas. Each area represents a significant intersection of opportunity where CAES capabilities overlay in positive ways with needs and challenges across the region and the nation. These Focus Areas build on CAES achievements over the past decade and drive toward future growth, opportunity, and prosperity.



## Strategic Focus Areas: Grand Challenges

The leadership of CAES, in collaboration with researchers, faculty, and leaders from all the CAES entities, worked together to evaluate the most relevant areas on which to focus the consortium's efforts. Through workshops and meetings, we determined that CAES is best equipped to cultivate and mobilize the people, resources, and intellect to create real impact on the following Focus Areas. These areas will evolve over time as the world's energy and environmental priorities and challenges shift. In developing the CAES strategy, the team also recognized that these Focus Areas represent important energy Grand Challenges:

- Nuclear Energy.** It takes 19 trillion watts to power the planet each and every day, according to the U.S. Energy Information Administration. By 2050, that number could climb to 27 trillion watts. Our world is faced with the dual challenge of reducing carbon emissions while expanding access to resilient sources of power. To maximize nuclear energy's contributions, CAES will play a pivotal role in addressing significant needs in areas including simulation and visualization, advanced materials, microreactors and advanced nuclear systems, fuels and materials, and policy and public engagement.
- Energy-Water Nexus.** Energy and water are inextricably linked. In a world with 7 billion people and a growing population, the desire for widespread economic growth, and the variability imposed by climate change, we face significant resource challenges to supply the energy, food, and water needed to support communities around the world. CAES applies its collective knowledge and expertise through contributions in energy-water efficiency, advanced industrial processing such as food production, water treatment and management, geothermal technology, carbon sequestration, heat transfer and energy recovery, and produced water.
- Cybersecurity.** Our world benefits from advances in automation and interconnectivity, yet progress is diminished when operations are exposed to remote and malicious interference. CAES will help protect our energy systems and infrastructure through new approaches to cyber-informed design of embedded systems, control-systems security, power-grid resilience, and training and education support.
- Advanced Manufacturing.** Advances in technology measure a society's progress. In the field of manufacturing, the development of new materials, sensors, and processes will drive automation and improve efficiency benefitting human endeavors in energy, medicine, food production, and other areas. CAES' collaborative approach will add new knowledge and technologies related to computational materials science and engineering, printable sensors on nuclear fuel, characterization, materials for harsh environments, and advanced manufacturing methods for the fuel itself.
- Innovative Energy Systems.** The one-size-fits-all approach to energy generation, transmission, and distribution is a concept of the past. Now and into the future, our energy mix will consist of multiple production sources, varied delivery mechanisms, and evolving conservation strategies. CAES supports the evolution in renewable energy production, grid enhancement, energy storage, and carbon-reduction strategies through research and discovery in areas including waste-heat utilization, molten-salt thermal storage, integrated modeling and systems management, and grid optimization.
- Energy Policy (cross-cutting).** Policy-makers need timely, accurate, and reliable information to manage energy priorities on behalf of their constituents, communities, and regional industries. The CAES Energy Policy Institute (EPI) informs on all aspects of energy systems change with an integrated approach,



which incorporates strategic planning and regulation, technology and systems, economics, and science. EPI aims to advance energy decision-making and priorities with evidence-based analyses on subjects including resilient energy systems and critical infrastructure; design of power markets; economics and regulatory aspects of advanced energy systems; inter-jurisdictional oversight of cyber risk to energy projects, and the role of public engagement in novel energy pathways.

- **Computing, Data, and Visualization** (cross-cutting). Advanced computing, interconnectivity, and big data have opened new frontiers for virtually unfettered progress in modeling and visualization of complex

systems. The potential for advanced energy science and technology pushes the limits of real-time analytics, data complexity, and the ability to manage heterogenous and multiscale data sources. With expansive resources—including dual Computer Assisted Virtual Environments (CAVEs), multiple supercomputers, and leading expertise—CAES can harness these assets to benefit researchers, educators, students, and innovators across all Focus Areas.

The CAES strategy translates these Focus Areas into regional, national, and even global positive impacts by applying a logic model that helps align the resources and inputs available to CAES through the actions and outputs that lead most directly and effectively to lasting benefits.



## Logic Model

Logic models aid evaluation of program effectiveness, planning, promoting social benefits and impacts by establishing long-term goals and mapping to identify inputs and the necessary interim steps to achieve the desired impacts. This focus on impacts keeps CAES decision making aligned toward

fulfilling the mission, achieving the vision, and avoiding pitfalls that hamper progress.

The CAES logic model provides a framework that connects our unique capabilities to the energy and economic development goals and objectives for the region and nation.



### Inputs

- People
- Funding
- Collaboration Space
- Equipment
- Expertise
- Ideas
- Partners
- Capabilities
- Open Facilities
- Collaborative Spirit

### Activities

- Collaborative Research
- Collaborative Study
- Cross-Sector Engagement
- Novel Approaches
- Working Groups
- Shark Tanks
- PI-PI Matchmaking
- Workshops
- Training
- Internships, Fellowships, Co-ops
- Shared Access

### Outputs

- Career Advancement
- New Tools, Resources, Touchpoints
- Data, Publications
- Expert Reviews, Guidance
- Broad Curricula
- Responsive Capabilities
- Improved Methods
- Successful Pilots
- Startup Businesses

### Outcomes

- Viable New Technologies
- Startup Companies
- Expert Networks
- Effective Policies
- Patents, IP
- Advanced Personalized Learning
- Joint Certifications, Degrees
- Expanded Enrollments
- More and Diverse Funding
- More Jobs

### Impacts

- Expand Clean, Resilient Energy Options
- Support National Security Mission
- Accelerate R&D through Hubs, Centers
- Grow the Next Generation of Energy Leaders
- Industry Uptake of New Technology
- Sustain Talent Pipeline
- Economic Development

## STRATEGIC OBJECTIVES

CAES is a catalyst to address our most ambitious energy challenges at the regional, national, and even global level. This is where the strategic pillars activate to produce a robust and resilient energy future. No single individual or institution can possibly do this alone and afford, let alone anticipate, what capabilities they might need next. Only true collaboration makes the idea attainable. This is the heart of the CAES strategic objectives, which embody a vision of a CAES future for each strategic pillar:

- **Collaborative Research—Centers of Excellence.** Imagine a future where principal investigators (PIs) connect with other PIs, all possessing the tools, networks, and access to diversified funding streams needed to accelerate their research; where a university professor has as much access to national laboratory equipment, facilities, and user facilities at neighboring universities as to their own laboratory; and where multi-institutional teams are created and equipped with the support needed to spin off world-class collaborative centers around key Focus Areas vital to the interests of the region and nation.
- **Collaborative Education—CAES Academy.** Imagine full access to a suite of expansive educational experiences. CAES Academy can provide hosted research positions at the national laboratory for students and faculty alike to build on learning in the classroom. It can provide teaching and mentoring opportunities for laboratory researchers to share their expertise and perspective. And it can bring together university courses and laboratory modules into unique and targeted degree offerings and training opportunities. CAES Academy is not a building or a degree-granting institution. Rather, it is a construct for optimizing and creating new joint educational offerings through the CAES universities with support from INL, to build a future workforce with the experiences and relationships needed for success.
- **Collaborative Innovation—Energy Innovation Districts.** Imagine a vibrant community focused on prosperity, growth, and development where new ideas are welcomed, challenged, tested, and developed; where new research, partnership, funding, and work opportunities are the norm; where educational institutions and the laboratory anchor a dynamic work-play-live-learn district that focuses resources toward spinning out technology, private-sector advancements, and start-up ventures.

## STRATEGY MATRIX

The CAES strategy matrix provides a structured framework to be championed by the CAES leadership team. It identifies the critical outcomes (5–10 years), strategic initiatives (2–5 years), and near-term activities (0–2 years) necessary to accomplish CAES strategic objectives (10–20 years) for INL, BSU, ISU, UI, UW, and other public and private stakeholders. The strategy matrix captures the framework established to achieve the vision and mission through the strategic pillars of Research, Education, and Innovation, as they are applied to the Focus Areas.

The tactical actions listed as 0–2-year activities represent the sum of potential and recommended activities for the CAES leadership team to consider, pilot, evaluate, and prioritize as the collective members see fit. It is neither an expectation nor a recommendation that all the potential activities listed be implemented within two years. It is recommended that this array of activities inform prioritization and decision making going forward, along with inputs, experiences, and lessons learned gained as progress toward the long-term vision for CAES moves forward.

### Collaborative Research—Centers of Excellence

Collaborative research will facilitate the growth of everything from one-on-one teams to future centers of excellence that will leverage expertise and capabilities to increase the pace and impact of advanced energy research. This objective uses fundamental principles like faculty, researcher, and student collaboration, aggregated research capabilities, interconnected facilities, and joint proposals to:

- Leverage related capabilities to expand research funding, portfolios, and impacts of universities, INL, and industry
- Bundle related work and expertise to seek major proposals and additional funding sources
- Decrease bureaucratic hurdles while increasing laboratory usage and real-time information sharing among researchers
- Aggregate emerging and unique capabilities into research centers of excellence

## COLLABORATIVE RESEARCH

### Establishing the Research Collaboration Ecosystem

CAES strives to become the best in class at creating and resourcing collaborative research teams and projects among faculty, researchers, industry, and students.

Centers of Excellence begin by building CAES capacity in fostering effective one-on-one research collaboration as the building blocks to attract expertise and leverage joint resources. Combined capabilities can win larger and more diverse funding opportunities, with teams coalescing around Focus Areas and funding-agent requirements. The end-game is supporting the development of centers of excellence with the ability to become sustainable, specialized spin-offs performing across all or a subset of Research, Education, and Innovation, as appropriate. Relevant examples or templates for future CAES centers of excellence can be found in the INL Cybercore Integration Center, the INL Collaborative Computing Center, and the CAES Energy Policy Institute.

Efforts to realize the benefits of this 10–20-year strategic objective are focused on three 5–10-year critical outcomes in the Research Pillar:

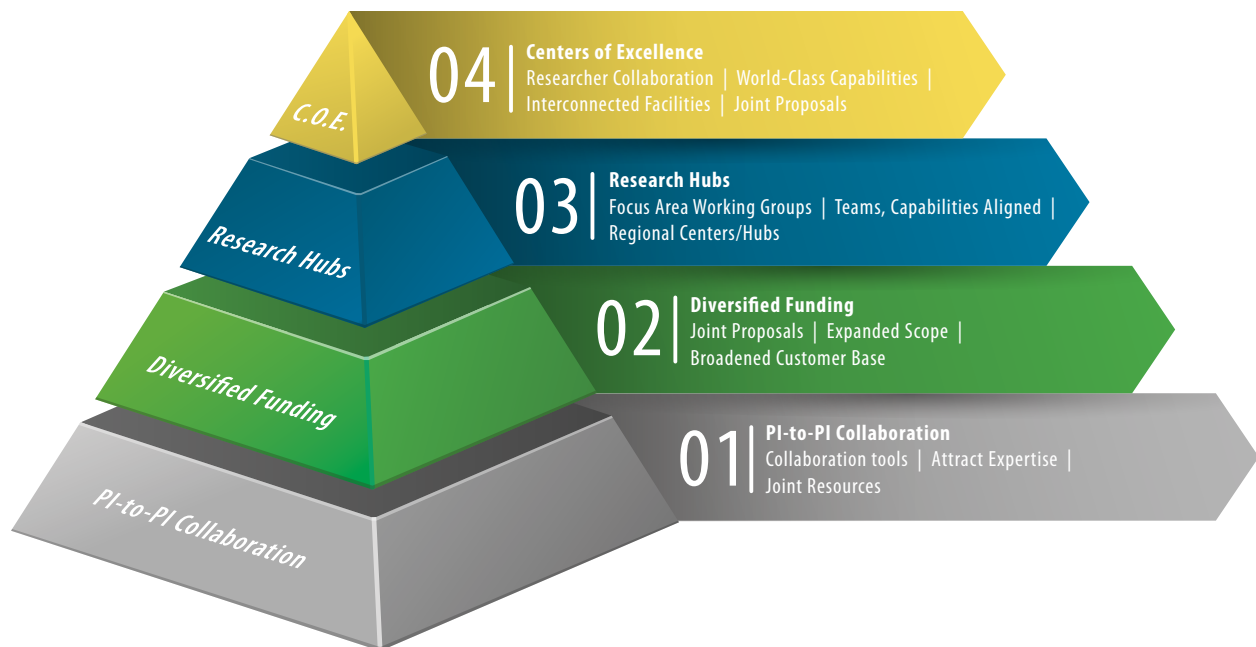
- **Research Collaboration Ecosystem.** To build toward self-sustaining centers of excellence, CAES strives to become best-in-class at creating and resourcing collaborative research teams and projects among faculty, researchers, industry, and students. By examining barriers and gaps, establishing tools and platforms, and piloting joint funding pools, CAES will cultivate a thriving PI-to-PI collaborative

environment structured around activities like introductions, resources, state-of-the-art collaboration technology, and joint appointments, formalized through CAES Associate designations.

- **Research Hubs.** The development of high-value research hubs integrates one-on-one interactions into multi-institutional research efforts aligned around CAES Focus Areas. To accomplish this, CAES provides the structure, process, tools, and resources to build Focus Area working groups. By transitioning individual projects and bringing together sets of internal and external partners into more-complex projects and solutions, these collaborative research efforts build and expand opportunities for funding. As research teams in distinct Focus Areas succeed, the CAES approach to integration will attract broader regional and national support. Examples of relevant research hubs include the DOE Energy Frontier Research Centers (attracting federal funding of \$2–4 million per year, per center) and the National Science Foundation’s Industry-University Cooperative Research Centers (attracting escalating funding through planning, Phase I, and Phase II center development).

- **Connected Research Environment.** This concept hinges on seamless (virtual and physical) cross-campus access to CAES facilities and laboratories in Idaho Falls, as well as those designated at member universities. The benefit to researchers is a much broader array of leveraged capabilities that can be more readily accessed, scheduled, and coordinated toward major proposals and highly sought technological advances. This outcome will rely on early initiatives, such as streamlining key features across facilities, including access and training, and developing a virtual CAES connected campus.

The activities and initiatives building toward these critical outcomes are described in the tables below and leverage the capabilities—or inputs—CAES makes available.



Strategic Objectives (10–20 Years)	<b>Collaborative Research: Centers of Excellence</b> Faculty/researcher/student collaboration   Aggregated research capabilities   Interconnected facilities   Joint proposals		
Critical Outcomes (5–10 Years)	<b>R1. Research Collaboration Ecosystem</b> Collaboration tools   Fruitful PI-PI engagement   Attract expertise   Successful proposals	<b>R2. Research Hubs</b> Focus Area working groups   Teams aligned around capabilities   Proven collaborative success   Winning, branded regional centers/hubs. [See I2.2.2]	<b>R3. Connected Research Environment</b> Seamless cross-campus access   Leveraged laboratories   Shared data   Uniform facilities management
Strategic Initiatives (2–5 Years)	R1.1. Create thriving PI-to-PI collaborative environment (e.g., introductions, resources, state-of-the-art collaboration technology, joint appointments, CAES Associate designation)	R2.1. Build and sustain a research collaboration ecosystem, enabling successful 1-on-1 collaborations, as building block to more-complex collaborative ventures. [See R1]	R3.1. Streamline access, training, security, safety, legal, etc. across CAES-affiliated facilities and equipment
	R1.2. Build record of success on incoming, diversified funding dollars (federal/state government, industry, philanthropies, etc.)	R2.2. Create and sustain structure, process, tools, and resources to integrate 1-on-1 interactions into multi-institutional research efforts aligned around Focus Areas (Focus Areas are jointly identified for years 0–2 and are subject to refresh every 2–5 years)	R3.2. Establish the CAES connected campus, a virtual network of data-connected facilities, equipment, and people
	R1.3. Attract internal (existing) / external (new) talent to CAES, including students, postdocs, researchers, and faculty	R2.3. Build name recognition in Focus Areas for the region and the individual CAES entities, both resulting in, and growing out of, official research-hub wins (e.g., EFRCs, IUCRCs, STCs, MRSECs, etc.)	R3.3. Build new physical/virtual capabilities, accrue equipment, create facilities to support research Focus Areas
Tactical Actions (0–2 Years)	R1.1.1. Determine barriers/gaps to existing collaborative efforts and research best practices across similar centers	R2.1.1. [See R1.1.1–R1.1.3]	R3.1.1. Review access requirements, barriers across member facilities
	R1.1.2. Establish tools and platforms (e.g., virtual, in-person) for matchmaking (e.g., capability/contact lists or apps, workshops, around-the-world tours, see E1.3.1) and collaborating (e.g., state-of-the-art distance communication, file platforms, non-disclosure agreements and IP protections, research on collaboration itself); create dynamic and attractive physical space at CAES hub and spoke locations (e.g., collaborative space, living lab, cafe or food trucks at CAES headquarters).	R2.1.2. [See R1.2.1–R1.2.3]	R3.1.2. Pilot common facility operations and administrative processes, safety standards, training protocols, costs, branding, and efficient best practices in facility operations (e.g., rad transfer across multiple Nuclear Regulatory Commission licenses, capabilities matching, access controls); pilot agreements to reduce barriers
	R1.1.3. Pilot joint resource/funding pools to create and enhance collaborations (e.g., Summer Visiting Faculty program, INL collaboration fund, CAES Associate designation). [See R1.3.2]	R2.1.3. [See R1.3.1–R1.3.3]	R3.1.3. Pilot a common administrative interface (single point of entry) for CAES Associates and member institutions; establish tools and platforms for matching people to equipment/facilities (e.g., menu including capability, cost, location, contacts)

Tactical Actions (0–2 Years)	R1.2.1. Create and sustain tools to identify potential funding opportunities (e.g., crowdsourced diversified funding-opportunity announcement (FOA) target database, calendar) and successfully matchmake across interested CAES parties (e.g., process to allow for safe sharing, email list for upcoming FOAs, collaboration funds, workshops to prepare for annual calls, process to partner with INL via Laboratory Directed Research and Development [LDRD/seed funding, ability to apply to new funding sources])	R2.2.1. Jointly identify and designate Focus Area working group institutional leads (>1 per Focus Area) and individual leads; establish rolling, voluntary inclusive/diverse working group membership	R3.2.1. Begin planning CAES information management greenfield
	R1.2.2. Provide proposal-writing resources to all interested CAES parties (e.g., proposal writers, training/speakers on how to target specific FOAs, proposal review committee, boilerplate CAES language on CAES support/laboratory capabilities)	R2.2.2. Identify and implement best-practice framework, tools, resources, and expectations for working group deliverables (e.g., effective/structured collaboration-creating meetings, joint seed funding pools, matchmaking tools, internal FOAs to tease out capabilities, reporting for aggregated opportunities, inputs, and analysis of funding opportunity database(s), tracking of active projects, identification of unique capabilities and opportunity spaces, paths to funding growth, and teaming agreements)	R3.2.2. Use member research needs and expansion plans to inform future interconnectivity, capacity needs (e.g., remote utilization of transmission electron microscopy (TEM) via Idaho Regional Optical Network [IRON])
	R1.2.3. Create, track, and report on potential funding sources, their potential in CAES context, CAES targets, and revenue attracted; track and report on proposal creation and effectiveness (source, effort, costs, wins, revenues) to optimize collaborative tools and resources. [See I2.2]	R2.2.3. In a select subset of Focus Areas, pilot working groups to refine sub-areas for focus, define research goals, capabilities, revenue targets, and show success in building out a research Focus Area via incoming funding	R3.2.3. Leverage IRON platform for interconnectivity across CAES member institutions, Cybercore Integration Center, Collaborative Computing Center (C3), and other CAES centers of excellence
	R1.3.1. At each CAES entity, promote internal valuation of collaboration (e.g., tenure support; INL career advancement; external/internal awards and recognition; CAES Associate designation; progress toward state higher education goals)	R2.3.1. Communicate and promote Focus Area progress and successes externally via CAES headquarters and CAES entity ambassadors (e.g., at campus, community, and regional events, targeted conferences, and through select media outreach, briefings for legislators, meetings with program managers)	R3.3.1. Perform a gap analysis on facilities and capabilities to support future research needs and emerging Focus Areas
	R1.3.2. Develop and pilot recruiting approach and priority audiences, both internal and external, to CAES (e.g., formalize "packages" to include office space, LDRD/seed funding, joint appointments, students; expanded faculty engagement leading to increased student engagement; support for university and department recruiting with information on CAES opportunities for students and faculty, including tenure; CAES and university success stories and alumni engagement). [See R1.1.3]	R2.3.2. Pilot on building out external constituencies and partnerships (e.g., non-CAES entities including universities, the National University Consortium, industry, national labs, think tanks, and regional organizations). [See I2.2]	R3.3.2. Work with the Nuclear Science User Facility (NSUF) to determine potential for streamlined access to NSUF capabilities and facilities through CAES
	R1.3.3. Develop communications and outreach infrastructure built around CAES value, entry and exit points, successes both internal and external to CAES (e.g., Annual Report, select media, campus events, provost/president reports, legislator briefings)	R2.3.3. Pilot regular communications and pitches to a funding agency or organization (e.g., well-coordinated and prepared Washington, DC, trip to advocate for program funding and prime the pump on future funding opportunities identified as CAES, leverage INL-government and university-industry connections)	R3.3.3. Evaluate the potential for a coordinated funding and capital-improvements program to support Focus Areas

## Collaborative Education—CAES Academy

CAES Academy supports and leverages university offerings, interactions, and activities through collaboration. CAES Academy can serve as a vehicle for student development and success in advanced energy while CAES universities remain the accredited institutions empowered to confer degrees, certifications, and formal recognition of academic achievement. The academy concept seeks to expand the advanced-energy talent pipeline, engage and attract new talent, and equip students and the existing workforce with the knowledge, skills, and experiences needed for innovative solutions to the most pressing regional, national, and planetary energy, security, and environmental challenges. Through CAES Academy, efforts in the Education Pillar include:

- Providing undergraduate and graduate students, researchers, and laboratory and industry workforce professionals with new and optimized course offerings, certificates, degrees, development, and training opportunities
- Creating optimal touchpoints between the universities and the national laboratory through all stages of education and career advancement by way of internships, fellowships, postdoctoral positions, joint appointments, visiting positions, teaching and mentoring, and other opportunities for engagement
- Leveraging and expanding training and personalized learning experiences beyond those that individual universities can offer

## COLLABORATIVE EDUCATION

### Leveraging experiences and joint university offerings

CAES Academy connects education and exploration with implementation and progress, as well as hosting professional development opportunities within a powerful, collaborative culture.

Efforts to achieve this goal are focused on three critical outcomes in the Education Pillar:

- **Academic-Research-Industry Pipeline.** This effort focuses on building awareness of the unique academic opportunities created through university-laboratory collaboration. The rich array of clearly defined opportunities serves to attract more students to member universities and the region and acquaints them with future employment opportunities with INL. These efforts, backed by workforce and skills development through targeted training, serve to build and retain valuable relationships and interactions. These efforts can also create teaching and mentoring opportunities for INL researchers.



- **Integrated Joint Curricula.** Member universities can leverage course offerings across CAES through the pursuit of joint certificates, joint degrees, and other collaborative education experiences for students. When combined with INL short courses, distinctive and personalized learning is enhanced. This creates a further draw for student enrollments in addition to internships and apprenticeships in the Research Pillar.
- **Mission-Aligned Professional Development & Training Center.** Specialized training offerings and targeted colloquia enhance professional-and workforce-development opportunities to build skills, inspire collaboration and innovation, and diversify revenue sources.

CAES Academy connects education and exploration with implementation and progress, as well as hosts professional development opportunities within a powerful, collaborative culture. These connections expand personalized learning for students at all levels and engage researchers in education. The curricula and course content are the responsibility of faculty at the participating institutions. The curricula for the training center have similar connections to organizations authorized to grant recognition of certificates and other credentials. CAES leverages the network to attract and retain next-generation students and faculty and produce future employees fully armed with the experiences and relationships needed for success.

Strategic Objectives (10–20 Years)	<b>Collaborative Research: CAES Academy</b> Augmented educational experiences   Joint certificates and degrees Targeted professional and workforce development and training		
Critical Outcomes (5–10 Years)	<b>E1. Academic-Research-Industry Pipeline</b> Integrated education and research   Robust, hands-on research experiences   Higher enrollment   Faculty retention   Enhanced employability   CAESers as ambassadors	<b>E2. Integrated Joint Curricula</b> Distributed teaching duties   Increased specialization   Needs-driven education   New adjunct professors   Optimized offerings	<b>E3. Mission-Aligned Professional Development &amp; Training Center</b> Sustained world-class skill sets   Virtual options   Bolstered industry, workforce engagement   Training of the trainer   Inspired regional communities
Strategic Initiatives (2–5 Years)	E1.1. Create and optimize targeted research opportunities across the educational timeline to enhance/accelerate the education experience and build a pipeline to workforce opportunities	E2.1. Identify and support creation of suite of relevant joint certificate and degree programs for use across the five CAES entities	E3.1. Build range of periodic and one-off user-requested joint-training opportunities to support INL, industry, and third-party needs (in conjunction with community colleges, ISU Polytechnic Institute, ID/WY Commerce/Labor)
	E1.2. Build strong pipeline of incoming CAESers and successful transitions from student to employee status	E2.2. Support universities in optimizing existing coursework/degrees, based on joint interest, for both higher impact and strengthened INL talent pipeline	E3.2. Support CAES Research/Education/Innovation Pillars and impact with targeted internal-facing offerings (unilateral or joint)
	E1.3. Create wide range of CAESer speaking opportunities to enhance research and education experiences, increase opportunities for PI-to-PI matchmaking, grow CAES branding/outreach, and enhance the regional community understanding of energy	E2.3. Support creation of joint degree/certificate offerings based on needs of third parties (e.g., regional industry partners, national defense agencies, ISU Polytechnic Institute)	E3.3. Establish CAES as a thought leader and go-to organization for enhanced public education and professional development by sustaining dynamic external-facing opportunities to support needs of key stakeholders, industry, and the region
Tactical Actions (0–2 Years)	E1.1.1. Build consensus around priority audience segments (undergraduate and graduate students, postdocs, pre-tenured faculty, beginning to mid-career researchers), and touchpoints for other audiences (e.g., K–12)	E2.1.1. Support development and implementation of first cycle of the Nuclear Safeguards and Security Joint Certificate pilot	E3.1.1. Pilot initial joint-training offerings (e.g., short courses) for Cybersecurity Focus Area (in conjunction with Cybercore Integration Center and INL National and Homeland Security); create links between training and research
	E1.1.2. Begin to optimize CAES engagement opportunities (e.g., process, contracting, onboarding, cost, experience, future employment) via feedback loops; publicize CAES opportunities at different life stage. Opportunities for university cohort could include INL internships, co-ops, fellowships, postdocs, joint appointments, visiting researchers, and visiting faculty. For INL cohort: university mentoring, committees, teaching, joint appointments, and visiting faculty. For industry cohort: visiting faculty or visiting researcher. [See I2.3.2]	E2.1.2. Identify potential opportunity spaces for optimized or new joint offerings across the Focus Areas	E3.1.2. Survey interests, existing offerings, resources, and unique capabilities across the CAES entities (including space, equipment, staffing); consider potential audience, instructors, learning objectives, and content; establish criteria for one-off vs. recurring schedule
	E1.1.3. Pilot new engagement opportunities (e.g., industry apprenticeships and co-ops, federal or state government internships/fellowships under Policy Focus Area, CAES associate status). [See I2.3.1]	E2.1.3. Evaluate past attempts at joint offerings across CAES member organizations for lessons learned, obstacles, processes, and approaches; pilot and then standardize Memorandum of Understanding agreements to create a path for appropriate accreditation and other processes through CAES entities themselves, administration and faculty, curriculum-review committees	E3.1.3. Target win strategy for state/federal/industry training opportunities (e.g., stakeholder visits, review calls, competitive analysis, proposal development, highlight strengths of CAES: leverage the five institutions, both university academic prowess and INL best-in-class hands-on experience). [See I2.3.2]

Tactical Actions (0–2 Years)	E1.2.1. In collaboration with INL Partnerships, Human Resources, and Associate Directors, improve joint efforts in campus outreach and engagement to increase CAES visibility and build a strong diverse incoming pool of candidates; integrate CAES offerings in university and INL promotional material to enhance individual recruiting efforts	E2.2.1. Support universities in exploring and piloting opportunities to boost enrollments, optimize teaching load, and specialize in existing course offerings across university campuses (e.g., diversified offerings, joint offerings, visiting semester student programs; shared, adjunct, and guest professors)	E3.2.1. Research: Pilot optional safety training or offering (e.g., special note on transcript) based around experienced CAES radiological staff as a joint resource, for CAESers wanting to augment required safety protocols; pilot Nuclear 101 offering for incoming INL employees; pilot crosscut education opportunities in policy, energy economics, social sciences, data, coding, etc.
	E1.2.2. Pilot buildup of strong and lasting faculty-researcher connections (e.g., via joint appointments, CAES Associates, long-term funding via mini-centers) such that faculty labs serve as feeders for CAES student population; increase touchpoints between researchers and students to maximize hire rate (e.g., interns, fellows, postdocs; LDRD/SEED connections; serve as research advisors, thesis committee members, or instructors; advise student design courses)	E2.2.2. Pilot opportunities to leverage INL national energy and security ties and bring current, relevant perspectives into the classroom (e.g., reverse joint appointments, curriculum support, guest lectures, adjunct teaching roles) to better integrate Research, Education, and Innovation Pillar initiatives	E3.2.2. Education: Pilot an instructor training and development program for researchers and subject-matter experts who want to join the faculty teaching pool (e.g., BSU offering on how to develop curricula on virtual platforms)
	E1.2.3. Identify and pilot opportunities to streamline hiring of CAES students to INL and industry positions (e.g., tie E1.1.2. to organizations with high workforce need; integrate university offerings into position descriptions; pilot innovative mechanisms related to security clearances or PhD funding, such as BS-to-PhD; assist outgoing CAESers in finding opportunities to position them well for re-entry, track and stay in touch with CAES alums that depart)	E2.2.3. Working with INL mission orgs and INL Partnerships, identify continuing education-enhancement opportunities for current INL workforce; promote course offering to INL employees and managers for visibility; explore means to add courses/university presence to University Place campus. [See I1.1.3]	E3.2.3. Innovation: Pilot offering based on I1.1.2
	E1.3.1. Pilot internal research matchmaking opportunities (CAES seminar series, research speed-dating, lightning talk events, leverage virtual platforms and tools to support). [See R1.1.2]	E2.3.1. Identify, prioritize, and report on future opportunities for joint certificates and degrees for non-CAES entities (e.g., to support student or current workforce development in relevant industries; industry professional development and tech transfer; state and federal agency professional development). [See I2.3.2]	E3.3.1. [See E1.3.2]
	E1.3.2. Pilot external-facing education opportunities provided by CAESers and alumni (e.g., CAES speakers bureau for requested K–12 or regional engagement, blog, CAES 'TED' Talks for community, CAES colloquia or workshops centered around Focus Areas for industry) with theme of collaboration. [See E3.3.1]	(intentionally blank)	E3.3.2. Determine need and CAES potential to deliver professional development offerings on topics such as collaboration, energy policy, economics, big data, non-technical skills, other specialized learning topics
	E1.3.3. Pilot targeted university outreach program, (e.g., INL researchers who are alumni of a university return to speak about their experience at INL and highlight CAES opportunities for collaboration)	(intentionally blank)	E3.3.3. Pilot CAES Director's Colloquium (world-class speakers in a community setting); pilot Nuclear 101 for regional policy makers (internal and external subject-matter experts, in conjunction with LINE Commission 2.0)

## Collaborative Innovation—Energy Innovation District

To enhance energy science, technology, and engineering innovation, CAES seeks to develop and expand entrepreneurial opportunities, industry partnerships, and ideas-to-market efforts of INL and CAES member universities via an energy-innovation district. The CAES Energy Innovation District bolsters CAES and regional goals by increasing the available resources and collaboration points needed to enhance the value and utility of research and development and, ultimately, to achieve market impact. Activities in this pillar are designed to spur job creation, economic diversification and development, and technological impact while maintaining relevance to regional industry needs. CAES has an important role to play as an anchor for a regional work-live-learn-play energy-innovation district that would seek to:

- Provide a more streamlined single point-of-entry for industry to access CAES expertise and facilities
- Provide educational resources and tools to spark and accelerate an entrepreneurial, collaborative, innovation-based mindset for CAES students, faculty, and researchers
- Provide well-resourced, innovation-building activities that generate excitement, energy, and ideas by bringing together diverse thinking and expertise
- Provide physical spaces conducive to collaborative innovation, start-up venture development and to attract industry and venture-capital sponsors at CAES headquarters, INL, CAES university campuses, the Idaho Falls Research and Education Campus, and other key national locations

## COLLABORATIVE INNOVATION

Single-point-of-entry access & entrepreneurial ecosystem

CAES will develop and expand industrial partnerships and create new businesses to accelerate ideas-to-market.

- Provide intellectual mentorship and guidance for both the technical and business aspects of starting an energy-technology venture
- Provide a forum to develop and make progress on industry-focused R&D needs
- Provide opportunities for continuous engagement between universities and the private sector to strengthen current workforce and develop the future employment pipeline, including in-residence exchanges between CAES and industry

As a new and rapidly evolving CAES strategic pillar, the anticipated efforts to achieve these innovation goals include two main critical outcomes:

- **Spin In/Up/Out Start-up Ventures.** CAES will build an energy-innovation district by creating a dynamic physical and intellectual space to ignite, build, and sustain a thriving entrepreneurial environment

and culture. Efforts include providing education, curricula, resources, and teaming to prepare future and existing entrepreneurs with a cutting-edge advantage of both technical expertise and business acumen. The energy innovation district will enable easier access to a full suite of technical and business resources that are needed to turn ideas into businesses. For example, this could include mentorship programs, technical guidance and peer review, facility access, legal counsel, and opportunities to leverage regional entrepreneurship opportunities, networks, and initiatives. CAES will identify existing and suitable IP related to the Focus Areas and the potential for funding support from relevant sources, including government-, industry-, non-profit-, and philanthropic-sponsored work. We will emphasize the tie-ins between INL and the member universities' regional-development plans in creating a larger entrepreneurial ecosystem. These areas of collaboration provide a solid foundation where the right ideas could mature into successful business ventures, organizations can be provided appropriate resources, and innovators can network for new opportunities.

- **Industry Point-of-Entry.** CAES will facilitate and enhance a more streamlined point-of-entry process for industry to access INL and member universities' capabilities, expertise, and facilities with the goal of meeting industry needs, ranging from idea capture to market-impact technologies. CAES, together

with industry groups and partners, will compile a "menu" of CAES facilities, expertise, equipment, and services that may contribute to strengthening existing business areas and developing entirely new business areas given ever-changing customer needs. Meetings, workshops, and charrettes will identify collaborative industry research opportunities and evaluate potential funding opportunities that could result in jointly funded efforts that would not otherwise be possible. In addition, CAES will better enable directly funded industry work to address difficult challenges that could benefit from CAES resources. At the professional-development and institutional-knowledge levels, CAES Associate-industry touchpoints through research and education activities, training, and potential for embedding industry professionals directly into CAES entities serve to build the collaborative relationships that are the hallmark of CAES success.

Strategic Objectives (10–20 Years)	<b>Collaborative Innovation: Energy Innovation District</b> Anchor regional “work-live-learn-play” R&D district   Accelerate start-up ventures   Build industry partnerships   Foster regional economic development, global impact   Leverage regional IP strengths   Support research to-tech-to-market	
Critical Outcomes (5–10 Years)	<b>11. Spin In/Up/Out Start-Up Ventures</b> Research/commercialization space   Access to tech/business/legal expertise   Team mentorship   Entrepreneurship pipeline education   Access to venture capital and funding sources   Full-suite innovation ecosystem	<b>12. Industry Point-of-Entry</b> Industry-driven research   Streamlined industry access to R&D   Tech-to-market emphasis   Established connection point between industry and relevant start-ups   Industry-facility touchpoints   Workforce needs-based educational training with pipeline synergies
Strategic Initiatives (2–5 Years)	I1.1. Develop, hone, and promote educational resources and tools to spark and accelerate an innovation-, collaboration-based mindset, and successes among CAES students, faculty, and researchers	I2.1. Provide single point of entry for private sector to engage CAES member organizations on priority research
	I1.2. Develop a successful, regular cycle of well-resourced innovation-building activities that continue to generate CAES and regional excitement, energy, and ideas for further educational and professional development	I2.2. Further understand, expand, and institutionalize industry-focused research needs, areas, and programs (ex. via IUCRCs and other federal funding opportunities). [See R1.1.-1.2]
	I1.3. Build the physical presence conducive to collaborative innovation, supporting startup development, and creating touchpoints with industry sponsors at CAES headquarters, the broader Idaho Falls Research and Education Campus, CAES spoke locations, and other key national locations. [See I2.3.1]	I2.3. Host opportunities for the private sector to strengthen its current workforce and future pipeline
Tactical Actions (0–2 Years)	I1.1.1. Perform deep-dive analysis on successful and failed innovation and accelerator efforts in the region and nation for best practices and lessons learned	I2.1.1. Create and build a menu of CAES organization facilities, equipment, and services available to industry
	I1.1.2. Benchmark CAES institution and regional entrepreneurship/innovation-thinking curricula offerings, perform gap analysis, and evaluate CAES potential for collaborative offerings (e.g., training, certificates, and seminars; leveraging and coupling business and law schools, etc.). [See E3.2.3]	I2.1.2. Develop and jointly approve a common structure and review process for template legal agreements (e.g., non-disclosure (NDA) and cooperative research and development (CRADA) agreements, IP disclosures)
	I1.1.3. Develop concept of tech-to-market mentorship program (evaluate and leverage third-party platforms for connections) in conjunction with regional stakeholders	I2.1.3. Create list of IP held by CAES institutions, with target list of potential industry licensing opportunities; develop a communication plan; assess the level of interest in more actively marketing intellectual properties
	I1.2.1. Connect with and benchmark regional efforts in this activity space (including CAES entities, NEIA, ITC, REDI, ITAC, IGEM, SBDC, and Wyoming Tech Business Center); assess the readiness to connect with similar institutions nationally; meet with key industry stakeholders and perform a needs assessment as related to core strengths	I2.2.1. Convene collaborative research workshops involving industry; host charrettes with industry, philanthropies, and investors in key industries; evaluate SBIR/STTR Phase I/II grant potential (e.g., Department of Defense, Department of Energy, Health and Human Services, the National Aeronautics and Space Agency, the National Science Foundation); develop pilot proposals and assess potential business models for membership. [See R1.2.3, R2.3.2]

Tactical Actions (0–2 Years)	<p>I1.2.2. Design or optimize a range of activities to build the ecosystem before choosing pilots (e.g., shark tanks, other competitions, ideation events, i-Corps cycles/hubs); identify existing IP, motivated faculty and researchers, accelerator pilot program candidate ideas, projects</p>	<p>I2.2.2. Select a pilot concept (e.g., the Northwest Food Processing Education and Innovation Center); apply for Industry-University Cooperative Research Centers Program (IUCRC) status. [See R2]</p>
	<p>I1.2.3. Benchmark and develop menu of existing and new seed-funding tools to accelerate CAESer energy ventures (i.e. IGEM grants); conduct exploratory meetings with potential financial sources (e.g., foundations, venture capitalist, banks, industry, states, legislators) to identify their needs, opportunities aligned with Focus Areas; propose potential new business models, including joint funds</p>	<p>I2.2.3. Explore opportunities to optimize and grow the CAES Technical Assistance Program (CTAP); leverage CTAP to support uptake of technologies and measures by regional companies</p>
	<p>I1.3.1. Survey CAES/regional needs and best practices within other successful innovation districts</p>	<p>I2.3.1. Pilot industry-student touchpoints to augment hire rate (e.g., sponsored research with industry mentorships, sponsored apprenticeships, or co-ops [See E1.1.3], seminars, student design courses, sponsorship of innovation activities, turnaround offices in CAES headquarters [See I1.3])</p>
	<p>I1.3.2. Create refreshed plan and design for CAES headquarters collaborative, office, and laboratory spaces to help drive innovation success and attract people to the space</p>	<p>I2.3.2. Enhance current industry workforce skills and education with pointed degrees, certificates, and training to increase industry interest in being involved with CAES [See E2.3.1 and E3.1.3]; pilot program where industry members are embedded at INL or university. [See E1.1.2]</p>
	<p>I1.3.3. Sync with INL and regional planning of Idaho Falls Research and Education Campus; explore opportunities for spoke locations and unique capabilities at CAES university sites [See E2.2.3]</p>	<p>I2.3.3. Sync with INL and regional/national private-sector partners to identify CAES mechanisms to support growth of nuclear testing region</p>

# VALUE PROPOSITIONS

CAES brings unparalleled value to energy R&D by focusing on Research, Education, and Innovation. This emphasis on collaboration and excellence spreads the benefits across the board, supports individuals and institutions, and allows universities, state governments, INL, and the DOE to prosper—providing an overarching value for all.

The value of CAES extends to many stakeholders. Researchers, educators, students, and innovators work

with CAES to define effective collaboration and seek out its benefits. The Strategic Plan sets the foundation for the CAES value proposition: value to universities, value to INL, value to industry, and value to state and federal leadership. We look forward to continuing to work together to refine and expand what CAES offers and to build a strong ecosystem for research, education, and innovation that supports advanced energy solutions, workforce development, and economic growth in the region and beyond.

THE CASE FOR CAES: HOW WE SERVE DIVERSE STAKEHOLDERS	STUDENTS	INL RESEARCHERS	UNIVERSITY FACULTY	INDUSTRY PARTNERS	GOVERNMENT OFFICIALS
<b>RESEARCH</b>					
Expanded access to research facilities and capabilities	✓	✓	✓	✓	
Enhanced reputation as research institutions		✓	✓		✓
Accelerated R&D through teaming		✓	✓	✓	
Capture of more and diversified funding opportunities		✓	✓		
Unparalleled research mentorship and hands-on experiences	✓				
Recruitment of nation's next-generation energy workforce	✓	✓		✓	✓
Student availability at reduced costs	✓	✓		✓	
Rapid turnaround time on some experiments		✓		✓	
Relationship building among multidisciplinary experts		✓	✓	✓	
Contract opportunities for commercial R&D		✓		✓	
Increased volume of publications	✓	✓	✓		



	STUDENTS	INL RESEARCHERS	UNIVERSITY FACULTY	INDUSTRY PARTNERS	GOVERNMENT OFFICIALS
<b>EDUCATION</b>					
Quality talent pipeline for regional workforce	✓	✓		✓	✓
Access to job opportunities through internships and fellowships	✓				
Personalized learning for professional development		✓	✓	✓	
Optimized and new joint offerings	✓	✓	✓	✓	✓
Transfer of INL research into the classroom	✓	✓	✓		
Expanded potential for diversity in the workplace	✓	✓		✓	✓
Enhancement of coursework and training tailored for INL employees		✓	✓		✓
INL researchers as teachers and mentors	✓	✓	✓	✓	✓
Improved recruitment and retention in high-value jobs	✓	✓	✓		✓
Increased public dialogue through energy policy institute		✓			✓
<b>INNOVATION</b>					
Increase in and access to intellectual property and licensing options		✓	✓	✓	
Regional economic growth supported by entrepreneurship	✓			✓	✓
Ecosystem conducive to new idea generation	✓	✓	✓	✓	
Startup development and spin-outs	✓	✓	✓	✓	
Attract new industry and venture capital to the region		✓		✓	✓
Relationship building among CAES innovators and external investors		✓	✓	✓	✓
Solutions for regional businesses by CAES technical assistance program				✓	✓

## Acronym Key

BSU	Boise State University
C3	Collaborative Computing Center
CAES	Center for Advanced Energy Studies
CAVE	Computer Assisted Virtual Environment
COE	Centers of Excellence
CRADA	Cooperative Research and Development Agreements
CTAP	CAES Technical Assistance Program
DOE	Department of Energy
EFRC	Energy Frontier Research Centers
EPI	Energy Policy Institute
FOA	Funding Opportunity Announcement
HQ	Headquarters
IGEM	Idaho Global Entrepreneurial Mission
INL	Idaho National Laboratory
IP	Intellectual Property
IRON	Idaho Regional Optical Network
ISU	Idaho State University
ITAC	Idaho Technology Advancement Community
ITC	Idaho Technology Council
IUCRC	Industry–University Cooperative Research Centers
LDRD	Laboratory Directed Research and Development
LINE	Leadership in Nuclear Energy
MRSEC	Materials Research Science and Engineering Centers
NDA	Non-Disclosure Agreement
NEIA	Northwest Energy Innovation Alliance
NSUF	Nuclear Science User Facility
PI	Principal Investigator
R&D	Research and Development
REDI	Regional Economic Development for Eastern Idaho
SBDC	Small Business Development Center
SBIR	Small Business Innovation Research
STC	Science and Technology Campus
STTR	Small Business Technology Transfer
TEM	Transmission Electron Microscope
UI	University of Idaho
UW	University of Wyoming

## CONTACT US

**Noël Bakhtian, Ph.D.**  
CAES Director  
(Idaho National Laboratory)  
noel@inl.gov

**Amy Moll, Ph.D.**  
CAES Associate Director  
(Boise State University)  
amoll@boisestate.edu

**Richard Jacobsen, Ph.D.**  
CAES Associate Director  
(Idaho State University)  
jacorich@isu.edu

**Richard Christensen, Ph.D.**  
CAES Associate Director  
(University of Idaho)  
rchristensen@uidaho.edu

**Don Roth, Ph.D.**  
CAES Associate Director  
(University of Wyoming)  
rothdon@uwyo.edu

Center for Advanced Energy Studies  
995 MK Simpson Blvd, Idaho Falls, ID 83401  
Main Number: (208) 526-1784



CAES is a research, education, and innovation consortium bringing together Idaho National Laboratory, Boise State University, Idaho State University, the University of Idaho, and the University of Wyoming.

[www.caesenergy.org](http://www.caesenergy.org)