

Five Year STRATEGIC RESEARCH PLAN  
FOR IDAHO HIGHER EDUCATION  
(2012-2016)

**Richard Jacobsen**

Executive Director of Research and Technology Transfer  
(Interim Vice President for Research)  
Idaho State University

**John K. McIver**

Vice President for Research and Economic Development  
University of Idaho

**Mark J. Rudin**

Vice President for Research  
Boise State University

**EXECUTIVE SUMMARY**

Research is being increasingly acknowledged by industry, government and education as a key factor in the future economic vitality of Idaho. The universities and colleges of Idaho's system of higher education understand the need for greater collaboration in order to be competitive in today's global environment. The vice presidents of research also recognize the need to focus on and emphasize existing strengths and opportunities in Idaho's research community. They developed the following statewide strategic plan for research to ensure the greatest potential for achieving a vital and sustainable research base for Idaho. The strategic plan identifies the key research areas that will become the focal points for research and economic development through partnering among academia, industry, and government in both science and technology.

Research is fundamental to the mission of a university due to its role in knowledge discovery and in providing new ideas for technology commercialization via patents, copyright, licenses, and startup companies. University faculty who engage in research and creative activity are at the leading edge of their respective fields. Research also enhances the national reputation of the faculty and the universities. These faculty and their vibrant research programs attract the best graduate and undergraduate students by providing unique, cutting-edge learning experiences in their research laboratories, studios, field sites, and classrooms. On the most basic level, research strengthens a university's primary product -- innovative, well-educated students ready to enter a competitive workforce.

Research is the foundation of a university's economic development role. The influx of research dollars from external grants and contracts creates new jobs at the university, along with the attendant purchases of supplies, services, materials and equipment. The results of the research are new knowledge, new ideas, and new processes, which lead to patents, startup companies and more efficient businesses.

Idaho's research universities have strengths and opportunities for economic development in 1) Energy, 2) Natural Resource Utilization and Conservation, 3) Biosciences, 4) Novel Materials and 5) Software Development. By focusing collaborative efforts in these areas, the research universities will expand research success, public-private partnerships and the overall economic development of the State. Specifically, this collaboration:

- will increase the focus among Idaho universities and colleges on areas of strengths and opportunities;
- create research and development opportunities that build the relationship between the universities and the private sector;
- contribute to the economic development of the State of Idaho;
- enhance learning and professional development through research and scholarly activity; and
- build and improve the research infrastructure of the Idaho universities to meet current and future research needs.

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

This Statewide Strategic Research Plan for Idaho Higher Education is a tool for identifying and attaining quantifiable goals for research and economic growth and success in Idaho. The plan will be reviewed and updated annually as needed amid the fast-changing pace of research discovery.

**VISION**

Idaho's public universities will be a catalyst and engine to spur the creation of new knowledge, technologies, products and industries that lead to advances and opportunities for economic growth and enhance the quality of life of citizens of Idaho and the nation.

**MISSION**

The research mission for Idaho's universities is to develop a sustainable resource base by:

- identifying, recruiting and retaining top faculty with expertise in key research areas;
- building research infrastructure including facilities, instrumentation, connectivity and database systems to support an expanding statewide and national research platform;
- attracting top-tier students to Idaho universities at the undergraduate and graduate levels, and providing outstanding education and research opportunities that will prepare them to excel in future careers;
- raising awareness among state, national and international constituencies about the research excellence and capabilities of Idaho's universities by developing and implementing targeted outreach, programs and policies; and
- collaborating with external public, private, state, and national entities to further the shared research agenda for the state, thereby promoting economic and workforce development and addressing the needs and challenges of the state, region and nation.

**GOALS**

1. Goal - Increase research collaboration among Idaho universities and colleges to advance the areas of research strengths and opportunities.
  - a. Objective – Ensure the growth and sustainability of the Center for Advanced Energy Studies (CAES).
    - i. PM – Amount of ongoing state funding received annually at each of the universities to support CAES activities.
    - ii. PM –Number of graduate degrees resulting from CAES-related activities each year.
    - iii. PM – Annual expenditures derived from external funds on CAES activities.

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

- b. Objective – Expand joint research ventures among the state universities, including EPSCoR and Institutional Development Award (IDeA) related programs.
    - i. PM – Number of collaborative, sponsored proposals submitted.
    - ii. PM – Number of collaborative, sponsored projects awarded.
  - c. Objective – Create joint and coordinated hires (faculty, staff, and graduate students) among the state universities.
    - PM – Number of joint hires.
2. Goal – Create research and development opportunities that strengthen the relationship between the state universities and the private sector.
- a. Objective – Leverage facility use between the state universities and private sector.
    - PM – Number of university/private sector facility use agreements (in both directions).
  - b. Objective – Increase the number of sponsored research projects involving the private sector.
    - i. PM – Number of proposed sponsored projects with private sector.
    - ii. PM – Number of awarded sponsored projects with private sector.
  - c. Objective – Encourage the exchange of ideas between the universities and the private sector.
    - i. PM – Number of student internships.
    - ii. PM – Number of faculty conducting research in external facilities.
    - iii. PM – Number of private sector personnel conducting research in residence at university facilities.
    - iv. PM – Number of joint university/industry workshops.
3. Goal – Contribute to the economic development of the State of Idaho.
- a. Objective – Increase the amount of university-generated intellectual property introduced into the marketplace.
    - i. PM – Number of technology transfer agreements.
    - ii. PM – Number of invention disclosures.
    - iii. PM – Number of non-disclosure agreements.
    - iv. PM – Number of patent filings.
    - v. PM – Number of issued patents.
    - vi. PM – Amount of licensing revenues
  - b. Objective – Increase the number of university start-up companies.
    - i. PM – Number of start-up companies
    - ii. PM – Number of jobs created by startup companies
4. Goal – Enhance learning and professional development through research and scholarly activity.
- a. Objective – Increase the number of university and college students and staff involved in sponsored project activities.
    - i. PM – Number of undergraduate students supported by sponsored projects

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

- ii. PM – Number of graduate students supported by sponsored projects
    - iii. PM – Number of faculty and staff involved in sponsored projects
  - b. Objective – Increase the dissemination of research findings.
    - i. PM – Number of peer-reviewed publications (students and faculty).
    - ii. PM – Number of theses and dissertations.
  - c. Objective – Increase the number of K-12 students involved in STEM education.
    - i. PM – Number of STEM events promoting research-related activities.
    - ii. PM – Number of K-12 students involved in research presentations and instruction.
- 5. Goal – Enhance the research infrastructure of the Idaho universities to meet current and future research needs.
  - a. Objective – Increase the infrastructure necessary to enhance research and collaboration.
    - i. PM – Number of proposals targeted for research equipment, facilities, and services.
    - ii. PM – Number of awards for research equipment, facilities, and services.
    - iii. PM – Amount of space dedicated to research
  - b. Objective – Coordinate and create efficiencies in university research administration across the state.
    - i. PM – Number of efficiencies identified.
    - ii. PM – Number of efficiencies implemented.

**RESEARCH OPPORTUNITIES**

Idaho's research universities have developed statewide strengths in strategic research areas that have great potential to drive future economic growth and success. The criteria used to select these areas include: number of faculty and qualifications; peer-reviewed publications and impact; infrastructure (facilities, equipment, information technology, staff); external grant and contract funding; academic programs; student involvement; potential benefit to the State; and technology transfer activity, including patents, licenses, and startup companies. By *focusing* collective research efforts and resources in these areas, the universities will be on the most efficient and effective route to research success and state-wide economic development. These high impact areas include 1) Energy, 2) Natural Resource Utilization and Conservation, 3) Biosciences, 4) Novel Materials, and 5) Information Management and Software Development.

*Energy:* Energy is a critical driver of any economy. The projected increases in the population of the world and increases in the standard of living will produce severe strains on the ability to meet the demands of the next few decades. In addition, finite reserves of fossil fuels and pollution from their combustion requires that alternative sources of energy production be developed. The combination of natural resources in Idaho and presence of the Idaho National Laboratory makes energy a natural area of emphasis. Indeed, the three universities with research capabilities already have extensive research projects in this area. The Center for Advanced Energy Studies is an example of the significant investment the three universities and the Idaho National

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

Laboratory have made to develop expertise in nuclear engineering and safety, biofuel production from dairy waste, geothermal exploration, carbon sequestration, energy policy, and energy efficient structures. Intellectual property has already been generated from these products and is licensed. Further growth in these areas not only takes advantage of the strong base but strongly supports economic development through new markets for new product development

*Natural Resource Utilization and Conservation:* In the broad field of natural resource utilization and conservation, Idaho's universities have expertise in water resources, agriculture, forestry, recreation, and geophysics and geochemical detection and monitoring of groundwater pollutants. For example, university geologists, ecologists, and policy experts are collaborating on broad-ranging research projects that examine and predict the impact of climate change on Idaho's water resources. As water is essential to agriculture, recreation, the ecosystem, and human health, the universities have research strength in an area of tremendous societal and economic impact. Agriculture remains an important part of the economy of Idaho. Development of new plant varieties with improved resistance to disease and climate change remain an area of importance as does the development of new feeds for domestic fish production. The often competing demands for preservation and exploitation put on the environment require understanding of the various ecosystems in the state and region as well as societal and economic impacts of policy decisions. The future economic success of the state will rely on a deep understanding of these processes.

*Biosciences:* Idaho universities have established research programs in several areas of the biosciences. These include selected areas of cell signaling and bioinformatics. While these areas of expertise contribute to the basic understanding of processes in living systems, they are applied to a wide range of living systems—extending from humans through wild and domestic animals and fish to plants. Human health is an important element of these programs, with research occurring in cancer as well as genetic and pathogenic diseases. Research on non-human living systems involves animal disease, improving food production and methods for mitigating climate variability. These studies address many of the challenges facing humanity not just in Idaho but also in the nation and the world. Results can lead to new treatments for human diseases, increased food production and safety, and preservation of the natural environment.

*Novel Materials:* The global materials industry is worth an estimated \$550 billion, conservatively. Materials revolutionize our lives by offering advanced performance and new possibilities for design and usage. For example, the market for biocompatible materials has grown from a few to \$60 billion in the past decade. Market size is growing for materials in emerging areas such photonic materials, electronic and dielectric materials, functional coatings, and green materials. Materials research in Idaho is conducted by a wide range of scientists in diverse fields. Current materials researchers in Idaho cover a broad spectrum of specializations, including semiconductor device reliability, microelectronic packaging, shape memory alloys, DNA machinery, environmental degradation, materials for extreme environments, biomaterials and bio-

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

machinery, materials characterization, and materials modeling. Nanoscale materials and devices, functional materials and their uses and materials for energy applications are a focus of research throughout the state. These areas of research are highly synergistic with local industries and the Idaho National Laboratory (INL). Access to materials characterization equipment and processing laboratories has resulted in collaborations with small businesses and start-up companies.

*Information Management and Software Development:* Device control and information management are an essential part of 21<sup>st</sup> century life and, therefore, are an important part of educational requirements. For instance, large amounts of sensitive data are collected, processed, and stored electronically but must be accessed and moved in order to have any impact. In fact, many systems are computer controlled through networks. These include such things as the electric transmission grid and transportation in major cities. The universities are beginning to develop research expertise in software development and data management lifecycle design and operations and secure and dependable system design and operations. This area provides a significant area of opportunity for economic development in Idaho as well as for improving the global competitiveness of the United States. There are already a significant number of firms in Idaho whose interests are in software development for device control, information management and processing. In addition, many of the major research projects being undertaken in the region by various state and federal agencies as well as the universities require the handling of significant amounts of data in a secure and dependable fashion. Each university has some expertise in this area but not a critical mass. Currently, research funding in the universities from private and governmental sources is limited by the number of qualified personnel. In addition, within Idaho there is a high demand for graduates at all levels in computer science.

## **EXTERNAL FACTORS: IDAHO RESEARCH ADVANTAGES AND CHALLENGES**

### Research Advantages

*The Idaho National Laboratory (INL) and the Center for Advanced Energy Studies (CAES):* Idaho is fortunate to be home to the Idaho National Laboratory, one of only 20 national laboratories in the U.S. The INL's unique history and expertise in nuclear energy, environmental sciences and engineering, alternative forms of energy, and biological and geological sciences and related fields provides an excellent opportunity for research collaboration with Idaho's university faculty in the sciences, engineering, business and other fields.

CAES established at the request of the U.S. Department of Energy, is a public-private partnership that includes Idaho's research universities—Boise State University, Idaho State University, and the University of Idaho—and the Battelle Energy Alliance (BEA), which manages the INL. The CAES partners work together to create unique educational and research opportunities that blend the talents and capabilities of Idaho's universities and the INL. A 55,000 square-foot research facility in Idaho Falls supports

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

the CAES energy mission with laboratory space and equipment for students, faculty, and INL staff in collaborative research projects. The State of Idaho invested \$3.2M in direct support of the three Idaho research universities during FY09 and FY10. During these first two years, the CAES partners won \$24M in external support for CAES research that has contributed to both scientific advances and economic development in the state and region.

*Natural Resources:* Idaho's beautiful natural resources are well known to fishermen, hunters, skiers, and other outdoor enthusiasts. Through its rivers, forests, wildlife, geological formations, and rangelands, Idaho itself is a unique natural laboratory for geological, ecological, and forestry studies. Idaho is home to some of the largest tracts of remote wilderness in the lower 48 states. In addition, the proximity of Yellowstone National Park and the Great Salt Lake provide additional one of a kind opportunities for ecology and geology research.

*Intrastate Networks:* The existing networks within the state, including agricultural extension services and rural health networks, provide a foundation for collecting research data from across the state, and rapidly implementing new policies and practices as a result of research discoveries.

*Coordination Among Universities In Advancing Research and Economic Development (technology transfer):* By and large the research universities continue to coordinate and share their technology transfer and economic development activities. This not only increases each university's competitiveness at the national and state level but also decreases the costs for achieving a particular goal.

### Research Challenges

*Economy:* The current economic recession is the most severe downturn most of us have seen in our lifetimes. The immediate effects of this recession on university research are state-wide budget cuts, with results that include hiring freezes, loss of university faculty and staff, higher teaching loads for faculty (with correspondingly less time for research), and delayed improvements in research infrastructure, including major equipment.

However, it is not only the current recession which threatens Idaho university research. Idaho has relatively few industries, and seems to attract fewer new companies and industries than other states. When one major sector suffers, as agriculture is at the present time, the entire state suffers. As state institutions, the research universities suffer. Over time, a relatively slow state economy leads to at least two problems: 1) recruitment and retention of faculty, who go to institutions offering higher salaries, more startup money, and better infrastructure; and 2) aging infrastructure, keeping Idaho researchers behind their national peers in terms of having the most up-to-date facilities and equipment. Without proper infrastructure, Idaho research faculty is at a distinct disadvantage in competing with peers across the nation for federal grants.



**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

*Competition from Other Universities:* In research, university faculty competes nationally for grant funds from federal agencies such as the National Science Foundation, Department of Energy, and the National Institutes of Health. Many other universities are well ahead of Idaho's universities in terms of state funding per student, patent royalty income, endowments, etc., and are able to move ahead at a faster pace, leaving Idaho universities further behind as time goes on.

*University Culture:* Each of Idaho's research universities aspires to greater levels of achievement in research and creative activity, and to emphasize economic development outcomes along with success in basic and applied sciences, engineering and other scholarly pursuits. It is expected in the future that faculty at each of the universities will be rewarded in annual performance reviews for invention disclosure, entrepreneurial engagement, outreach activities and interdisciplinary research along with the traditional value placed on archival publication and external research funding. There is world-class research in Idaho that is recognized on national and international levels in selected fields of endeavor. This is increasing with new research-active faculty hires at each institution. There are some cultural differences among faculty manifested by discomfort with change aimed at increasing research volume making Idaho's universities more nationally competitive. These concerns often lessen as faculty from the various universities, private sector professionals and national laboratory staff work together in collaborative research and related instruction in state-of-the-art activities.

*Vastness of State and Distances Between Schools:* Although the distances between the research universities is not much different from those in other western states, the topography of Idaho increases the time and cost required for travel well beyond those experienced in other states. This fact discourages collaborations between faculty members and administrators at the different research universities as well as between universities and other entities within Idaho. Although video conferencing can alleviate this problem, there is limited capability at each university. There is also the continuing problem of finding funds to pay for the necessary connectivity between the universities as well as to the world outside of Idaho.

*Data Issues:* There is very little long-term, quality data available on the research enterprise or economic development. The data that exists are scattered among various entities in a variety of formats thus make it hard to centralize and use. Furthermore, there is no one entity responsible for collecting, analyzing and dispersing it. This is also true for many of the sectors that will strongly influence the future economic impact of Idaho. While there are large amounts of data that have been collected on watersheds, forests and agricultural operations and the environment—to name a few—they are distributed across a number of agencies and individuals within those agencies. Worse yet, much of this information is lost every time a researcher retires.

*Private Sector Support:* Idaho has very little high-technology industry within its borders. This reduces the potential for developing an applied research initiative within the universities that, in many states, provides one important arm of economic

**INSTRUCTION, RESEARCH, AND STUDENT AFFAIRS**  
**DECEMBER 8, 2011**

---

development and technology transfer. This also means that it is much harder to develop those private/public partnerships that provide the universities with additional capital to construct research and technology transfer facilities. Idaho's relatively small population of 1.6 million people limits the potential tax revenue for support public institutions, but improves participation in research surveys and hearings for establishing public opinion.

*Fragmented Economic Development Initiatives:* There are seemingly too many economic development initiatives in Idaho and they are not well coordinated. It is imperative that state, university, and community initiatives work together toward common and agreed to goals. As it is, little progress is being made towards developing an economic strategy for the state that includes the research universities and little money has been secured to drive the economic development process. In fact, it is not uncommon to find that different entities in Idaho are competing against each other.

*National and International Recognition:* While each Idaho research university has faculty members that can successfully compete on the national and international scene for research funds, no one university has the necessary reputation, breadth of faculty expertise or facilities to compete for the large projects that are necessary to establish a national or international reputation and substantially grow its research funding.

*Lack of Diversity:* The population of faculty, staff and students at each of the three research universities, like that of the State, is fairly homogeneous. This lack of diversity—be it cultural, socio-economic or ethnic—hurts the universities and surrounding communities in several different ways. First, it makes recruitment of students, faculty and staff from under-represented groups more difficult. Second, it is noted on accreditation reports and, as such, is a negative reflection on the institution. Finally, it limits the competitiveness of the university in several federal agencies where plans for including under-represented groups in the program are a key element of the proposal.