

Montana State University - Federal Priorities for FY2013

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AGRICULTURE

Hatch Act, and the Agriculture and Food Research Initiative (AFRI)

Agriculture

Background

The Hatch Act provides capacity funding for State Agricultural Experiment Stations. Hatch Act funding is distributed by USDA's National Institute of Food and Agriculture (NIFA) to eligible institutions under a statutory formula. This program provides funding to support the State Agricultural Experiment Stations enabling them to address critical national, multistate, state, and local problems. Hatch Act funds benefit America by providing research capacity at 1862 land-grant universities and related institutions in order to:

- Develop new biofuels/bioproducts, enhance energy efficiency, and reduce dependence on foreign oil.
- Improve knowledge concerning the complex linkages between food, nutrition, and human health.
- Protect America's food supply and ensure our biosecurity.
- Combat the twin epidemics of obesity and diabetes.
- Preserve the nation's natural resources.
- Build strategies for producers, consumers, and communities to address climate change.
- Maintain competitiveness of U.S. food, fiber, and fuel producers in global marketplace.

The Act requires that states provide a 100% match from non-federal resources (many states provide a greater match). For example, in Montana (FY 2011), each dollar received under the Hatch Act was leveraged by the State of Montana for an additional \$4.08 to fund the Montana Agricultural Experiment Station. Furthermore, Federal and State funds are leveraged with additional gifts and competitive funds, at least 2:1 annually.

Agriculture in Montana has historically adapted to wide swings in environmental conditions through scientific innovations, change in management practices and hard luck. The acceleration of environmental condition dynamics dramatically impacts water quantity and quality, temperature extremes, drought frequency, pest dynamics and other components. Current MAES research is central to comprehensive adaptation science discoveries and application in agriculture and natural resource systems.

Congress has provided small increases in recent years, but this has barely slowed the steady, decades-long erosion of this vital program research and state/community economic development activities.

Impact on Montana

The maintenance or an increase in Hatch Act funding would have significant impacts on Montana and agricultural research across the nation. In Montana, an increase would be used to:

- Retain critical employees and research programs necessary to keep Montana agricultural and natural resource systems sustainable and economically viable throughout all communities.
- Improve new bio-cropping systems, such as with oils seeds and pulse crops, by providing promising alternative cropping rotations with strong biofuel potential, as well as through diversification of rotations creating sustainable energy diversification and improved human health and nutrition properties.
- Deploy personnel and facilities throughout Montana with particular emphasis on improved efficiency through breeding and genetics in cow-calf and seed stock beef cattle systems, and with wheat and barley crops for domestic and international markets.
- Energy development and mineral extraction practices are pervasive throughout Montana. New reclamation and restoration practices have led to improved stewardship for soil quality, plant community establishment and multiple future land uses.
- Insect, weed and disease management practices have been improved with genetic advances, identification of cost-effective alternatives (cultural, mechanical, chemical, biological), and enhanced understanding of biological interactions and their on-going impacts on plant and animal agricultural practices.

Alternatively, a decrease in Hatch Act funding would result in the loss of key research personnel impacting stakeholders throughout the State of Montana. Agricultural research programs that are valued and depended on by Montana producers would be reduced or ended, such as:

- Montana agricultural and natural resource communities would experience decreased efforts towards research and outreach education programs in sustainable cropping systems, plant and animal breeding/genetics, integrated pest management practices, resource stewardship, infectious disease mitigation and global competitiveness opportunities.

- Emerging efforts in energy development and diversification, improved human health and nutrition, biosecurity, mineral extraction and comprehensive adaptation science programs with changes in environmental conditions would be decreased at a point in time when they are needed even more by Montanans and society.
- There would be a reduction in dissemination of research information and development of educational programs in critical areas of farm, home and community energy, environmental protection, agricultural profitability and human health and nutrition.

Issues

Maintain or increase Hatch Act funding through USDA-NIFA at least FY 2011 levels. Increase the AFRI competitive research and education program to its full authorized amount as has been accomplished with other research agencies (e.g. NIH, NSF).

Smith-Lever

Agriculture -- NIFA

Background

Sections 3 (b) and (c) of the Smith-Lever Act provide formula funds to public land grant institutions (1862 institutions) for conducting cooperative extensions activities. Specifically, funds may be used for development of practical applications of research knowledge, instruction and demonstration of existing or improved practices and technologies in agriculture, rural energy and related areas. This is the principal means of taking research and knowledge directly to ranchers and farmers. The FY 2012 appropriation is \$294 million.

Impact on Montana

In FY 2011, MSU received almost \$2.6 million from Smith Lever 3 (b) and (c) and matched that funding with a comparable amount. Funds were used for salaries and benefits of Extension agents, travel to support rural development, operations to support part-time farming program, salaries and benefits to support rural and urban 4-H program, and postage allocations to specialists and county Extension offices.

Issues

Maintain at least the FY 2012 level.

USDA Agricultural Research Service Animal Bioscience Building and Program

Agriculture
Agricultural Research Service

Background

Agriculture is the largest basic industry in the Montana economy and the livestock industry is its largest segment. Montana is a global leader in the production of high quality seed stock, genetics, and resource stewardship, leading to quality exports around the world. Innovations in Montana seed stock are quickly incorporated in herds across the United States. The USDA-ARS facility programmatic efforts will build upon bovine genome sequence to discover new technologies. World competitors in the animal protein foods such as Australia and New Zealand have begun their scientific effort in this arena. To advance our standing and world leadership in quality beef production we will need to move the science to emphasize functional genomics. Enhancing the strong relationships between USDA-ARS at Fort Keogh and MSU scientists will strengthen global research, training and outreach outcomes in beef (and other species, such as sheep) biosciences. The production of high quality livestock and the unique seed stock industry significantly contribute to Montana, regional and national economies. This research mission and team effort will be unique to Montana and the intermountain region.

A \$24 million research building funded, built, and staffed by USDA-ARS on the Montana State University campus will be dedicated to work on functional genomics in partnership and in cooperation with the MSU College of Agriculture, USDA-ARS in Miles City, MT, and USDA-ARS in Clay Center, NE.

The ARS share of the integrated plan includes 7 SY to create a research unit at Bozeman composed of functional genomics scientists (with expertise in mammalian species, including the cattle and sheep and microbial ecology). Reoccurring program support for these scientists would require \$6 million in base budget funding. The USDA-ARS Fort Keogh Livestock and Range Research Laboratory with its wealth of phenotypic data and matching DNA resources would add 2 SY as quantitative/genomic scientists (\$3 million in base budget funding). The goal is to apply the genetic information secured from mapping the bovine genome (e.g. from a Montana Line 1 Hereford) to enhance the efficient production of safe, consistently high-quality meat products and add value to rural communities.

Impact on Montana

The production of high quality livestock and the unique seed stock industry significantly contribute to Montana, regional and national economies. Cutting-edge research, training and outreach programs are essential to ensure the long-term sustainability of livestock production and profitability. A Functional Genomics Research Program and a federal Animal Biosciences Research Facility would bring the combined federal and state genomic expertise together in a location and using unique herds and large-scale rangeland facilities to expand genetic knowledge and promote innovation to increase the quality of Montana seed stock and the commercial livestock industry. At the same time, this will improve northern Great Plains cattle and range production practices, management, and enhance food safety and quality for consumers everywhere, through collaborative research and outreach activities.

Issues

For this project to move forward, full funding for the facility and program are needed.

COMMERCE,
JUSTICE
AND
SCIENCE

NSF EPSCoR

National Science Foundation

Background

Montana NSF EPSCoR is a statewide science infrastructure program funded by the National Science Foundation. EPSCoR, which stands for Experimental Program to Stimulate Competitive Research, builds capacity across the state in science and technology through investments in people, tools, and ideas.

Impact on Montana

This capacity building has successfully catalyzed science and engineering research centers and groups that generate significant scientific discoveries for the nation and economic growth for the region. EPSCoR invests in:

- * Hiring world-class faculty into the Montana university system. Since 2007, 23 new faculty members have been hired who have garnered over \$22M in external funding. Eighty-seven (87) new faculty have been hired since 2001, with over 90% still at their institution.
- * Graduate student training and recruiting. Stipends and investment in recruiting infrastructure to competitively recruit the best students has resulted in 258 graduate students supported by Montana NSF EPSCoR since 2001.
- * Supporting undergraduate research to assist faculty and provide invaluable experience for training the next generation of scientists and engineers. Over 1,340 undergraduate students have received support for their research since 2001. Participation in research projects gives students valuable skills in conducting original and creative scholarship.
- * Montana's Native American community by supporting research projects at the tribal colleges, training graduate students, and strengthening math and science education. Since 2007, 107 Native American students have participated in EPSCoR supported research projects at the tribal colleges.
- * Communicating Science to all Montanans. Education and outreach efforts in 2010 reached over 100,000 people in Montana with travelling exhibits and on-line and print media.

Issues

- 1) Maintaining the 20% state cost-sharing required for the current \$20M program.
- 2) Expanding federal support for state EPSCoR infrastructure building programs.
- 3) Establishing funding mechanisms and the resources (state, federal and private sector) to sustain highly effective state S&T activities piloted by the State EPSCoR Program.
- 4) Establishing the next generation of highly effective federal and state leadership to rapidly advance the NSF EPSCoR program.

NASA EPSCoR

Commerce-Justice-Science
NASA -- Education

Background

The NASA Experimental Program to Stimulate Competitive Research (EPSCoR) is designed to develop a national research capacity in support of NASA by developing research infrastructure and expertise in states that have traditionally had a limited research base in NASA and NASA-related areas, including space, aerospace and earth sciences associated with NASA. The program consists of (a) a small award (\$125,000 per year) to each participating jurisdiction to facilitate interactions with NASA centers and programs and to develop research proposals and (b) competitively awarded three year, \$750,000 grants to pursue a specific research topic. The FY 2012 appropriation is \$18.4 million.

Impact on Montana

Montana EPSCoR has competed successfully for a number of research awards, including the grant instrumental in forming the Montana Gravitational Wave Astronomy Group (MTGWAG), the grant key to forming the Native American Research Laboratory (NARL) at UM, and several others in the fields of Lidar, Solid Oxide Fuel Cells, Climate Change, Radiation Tolerant Computing, and Content-Based Image Recognition.

MTGWAG is now one of the world's leading Gravitational Wave Astronomy groups. Headed by Dr. Neil Cornish, the group specializes in determining how we will decode the data resulting from this revolutionary new field in astronomy. Several doctoral graduates of the group now work for NASA, and the group adds to the MSU Department of Physics' high achieving reputation.

The mission of NARL is to provide American Indian undergraduate students and graduate students with "hands-on" research opportunities in basic sciences in a culturally-relevant cross-disciplinary and cross-cultural environment. The NASA EPSCoR grant enabled NARL to enter into competitive research in the field of extremophiles, offering Native Americans from across the country the opportunity to do NASA-related research at UM.

NASA EPSCoR continues to build infrastructure and technical transfer activity in Montana in scientific areas important to the nation. In electrical engineering, Montana is a leader in developing Lidar systems for analyzing the effects of aerosols on Earth's climate. Researchers in computer engineering are finding ways to mitigate radiation damage to computers in space, an important field as NASA's current 'radiation-hardened' computer components lag in technology by 15 years. In mechanical engineering, a NASA EPSCoR supported group is researching better solid oxide fuel cells, an exciting potential power source for space missions. In earth and computer science, researchers are studying the Greenland ice-bridge for clues on how our global climate is changing. Researchers in physics and computer science are developing significant changes in how scientists search huge astronomical images databases, which will make searching data and recognizing patterns much more efficient.

Issues

Maintain at least the FY 2012 level; Goal is to return to \$25 million authorized level.

NASA Space Grant

Commerce-Justice-Science
NASA -- Education

Background

The NASA Space Grant program, operating through an awardee in each state and connecting more than 850 affiliates around the country, promotes NASA science, research, education and outreach through scholarships and fellowships, public programs, teacher support, research, curriculum enhancement, faculty development and related activities designed to ensure a workforce pipeline for NASA and NASA-related industries, as well as STEM education and professions in general. The FY 2012 appropriation is \$40 million.

Impact on Montana

Space Grant in Montana is a statewide program operated out of MSU. Montana Space Grant Consortium (MTSGC) has been widely recognized for its student flight programs and for its systems approach to projects which enables students to experience research and development processes similar to those used at NASA and in industry. Major programs in Montana include the student satellite program which just launched Montana's first satellite, BOREALIS student scientific high altitude ballooning programs, research funds available to every STEM undergraduate student in Montana, Tribal College tethered ballooning and aurora detector programs, internships in Montana and at NASA Centers, STEM education grants to Montana faculty for new courses or other enhancements, the Space Public Outreach Team (SPOT) where specially trained undergraduates travel around the state teaching K-12 students about current NASA missions, and more.

The MTSGC student satellite, then called Explorer 1 [PRIME], was chosen as the number one qualifier for NASA's first EVER Cubesat launch, positioning Montana's student satellite program as the best in the nation. When the first launch vehicle failed, Montana was ready with a backup and successfully launched in October 2011. Now called the Hiscock Radiation Belt Explorer or HRBE, the satellite is operating in orbit and sending back a wealth of scientific data. Over 150 have students worked on the HRBE project from its infancy in 2006 until the current operations phase. Students graduating from this Montana program have extraordinary success in obtaining jobs in aerospace industry and with NASA. Over 95% of MTSGC graduates go on to a higher STEM degree or STEM employment.

Montana's high altitude ballooning programs are also national leaders, having co-hosted five national workshops to help start ballooning programs in other states. The SPOT program engages 5-10% of ALL K-12 students in Montana in space science each year. As a result of a MTSGC program, Montana has a network of aurora detectors at Tribal Colleges across the state. When aurora takes place, the detectors automatically send text messages alerting students and their communities to 'look up!' All detector data is available on-line for students to analyze. Each year, MTSGC participants gather to share their results at the Student Research Symposium. In 2011, 80 students plus their advisors from 15 Montana campuses gave presentations at the Symposium. Not only does the Symposium offer students a chance to give a public presentation, but it also provides a great avenue for sharing Montana research.

Issues

Maintain at least the FY 2012 level; Goal is to return to \$46 million authorized level.

DEFENSE

MilTech

Defense

Background

MilTech is a Department of Defense (DOD) “partnership intermediary” that helps small US companies to overcome technical hurdles and manufacturing problems in production of new technology for DoD. Its mission is to get innovative technology into the hands of the US military more quickly, reliably, and cost-effectively. MilTech was established at MSU in 2004 and represents a partnership between two nationally recognized university centers, TechLink and the Montana Manufacturing Extension Center (MMEC).

MilTech provides hands-on assistance to help small companies:

- Improve product design to ensure survivability, systems integration, and cost-effectiveness
- Develop sustainable, cost-effective supply chains and manufacturing processes
- Implement manufacturing “best practices” and quality-control systems
- Establish robust financial management systems to ensure sustainability

MilTech draws on outside technical experts as needed and leverages the nationwide network of Manufacturing Extension Partnership (MEP) centers, such as MMEC, which include approximately 1,450 industrial engineers at 370 locations around the United States.

MilTech has been highly effective. Its assistance has resulted in the successful transition of more than 95 new technologies from US small business to DoD operational use. Many of these new technologies have supported US military operations in Iraq and Afghanistan, helping to save lives and improve combat operations.

Impact on Montana

MilTech has helped expand DoD contracting opportunities for Montana companies, increasing the number of high-paying, defense-related jobs in the state. Montana companies assisted include: Cable Technologies (Great Falls); S&K Electronics (Pablo); Summit Aeronautics and Helena Industries (Helena); Nomad Technologies and NorthWest Precision (Kalispell); Arcomac Surface Engineering and GCS Research (Missoula); PFM Manufacturing (Townsend); Precision Lift (Monarch); Mystery Ranch, Scientific Materials, BlackHawk, CrossTac, Lattice Materials, and TexBase (Bozeman); Phillips Environmental/CleanWaste and Bacterin (Belgrade); Dr. Down (Polson); Spika Welding and Manufacturing (Lewistown); and Lilja Barrels (Plains). In addition, MilTech hires multiple Montana-based companies to help it achieve its mission, including AutoPilot, Platform2, Mystery Ranch, Pika Design, Sweet Onion Creations, Big Arm Design, Salient Technologies, Bridger Armory, and Backpacking Light.

Issues

MilTech was started with Congressional-interest funding in 2004, which it received until 2009. It subsequently has received direct funding by DoD program managers. However, this project-based funding does not cover basic operation and overhead costs. An alternative source of core funding is needed to maintain and sustain this important program.

DoD Program Element (PE) and Contact Person:

- DoD PE Number in the Air Force RDT&E Budget: PE 0604317F, *Technology Transfer*
- DoD Program Manager: David Sikora, Air Force Technology Transfer Program Manager, AFRL/XPPD, Wright-Patterson AFB, OH, Tel (937) 656-9868

TechLink

Defense

Background

TechLink was established as a federally funded technology transfer center at Montana State University in 1996. Since 1999, it has served as the US Department of Defense's primary external "partnership intermediary," helping DoD to develop productive technology partnerships with US small business. Based on its success, TechLink "graduated" from Congressional earmark funding to being a line item in the DoD budget in FY 2004.

TechLink helps companies to: (1) license DoD-developed inventions, enabling them to develop new products using these innovations; and (2) secure competitive R&D contracts for new technology development, primarily through the DoD Small Business Innovation Research Program.

Results: TechLink has established more than 800 technology partnerships between DoD and US companies. These partnerships include over 290 license agreements, resulting in the transfer of approximately 785 DoD patented or patent-pending inventions to US companies for conversion into new commercial and military products. TechLink brokers over half of all DoD license agreements with US industry. It also has helped companies in Montana and the region to secure over \$170 million in competitive R&D funding, primarily from DoD, for new technology development. These technology partnerships have resulted in substantial new economic activity and employment.

Economic Impacts: The Bureau of Business and Economic Research (BBER) at the University of Montana conducted a study of TechLink's economic impacts in 2009. That study found that TechLink partnerships between DoD and industry generated \$729 million in economic output and created or retained 4,290 jobs. Based on these results, TechLink received an Excellence in Economic Development Award in 2010 from the International Economic Development Council (IEDC).

Impact on Montana

TechLink has assisted over 150 Montana companies, including most of the state's major technology businesses. Approximately a third of its 800 technology partnerships involve companies in the state. TechLink has helped Montana companies to secure approximately \$80 million in R&D funding, contributing significantly to technology-based economic development in the state. The BBER study in 2009 found that more than \$122 million in economic output in Montana was generated from sales of products created from TechLink-brokered partnerships with DoD. As a consequence, over 1,050 jobs were created or retained in Montana.

Issues

Maintain current annual DoD funding of \$2.5 million for TechLink

DoD Program Element (PE) and Contact Person:

- DoD PE Number in the Air Force RDT&E Budget: PE 0604317F, *Technology Transfer*
- DoD Program Manager: David Sikora, Air Force Technology Transfer Program Manager, AFRL/XPPD, Wright-Patterson AFB, OH, Tel (937) 656-9868

Unmanned Aerial Systems (UAS) -- Augmentation for DOD

DOD, Tri-Services -- Research, Engineering and Development

Background

The US Department of Defense (DOD) operates a number of unmanned aerial systems (UAS) platforms, dedicated to specific missions and needs. All branches of the DOD Armed Forces are fully vested in UAS activities. Montana interests have been pursuing the establishment of a major program in Unmanned Aerial Systems (UAS). The pending DOD reauthorization bill should provide for the establishment of new test sites for UAS testing and development. On a separate track, MSU has been working with Mississippi State University on the creation of a dedicated UAS Center of Excellence. Integration of UAS into the civil airspace is critical for enhanced missions; much like what is already in place for manned aerial systems. Furthermore, Montana State University and Mississippi State University collectively, and through partnerships, have very unique research capabilities that are valuable to the DOD both related to, and independent of, applications to UAS.

The focus of the efforts by Montana State and Mississippi State will be (Scope, Approach, and How):

- 1) Development and operation of several low cost UAS platforms (fixed wing and rotorcraft).
- 2) Montana State will work to leverage its Military Operations Areas (MOAs) to the benefit of UAS development. Companies throughout the US are eager for such opportunities. These sites are unique in that they cover large areas with minimal safety risk during the development of UAS. It could be of vital importance to re-structure missions for Malstrom Air Force base with a unique and sustainable expertise for the US and Montana.
- 3) The combinations of Montana State and Mississippi State have research strengths in the complete hierarchy for UAS activities and these will be combined for a synergistic whole. These include:
 - o Advanced Materials and Structures (especially low cost composites manufacturing)
 - o Propulsion (including high power density fuel cells)
 - o Guidance and Control (redundant and reconfigurable computers)
 - o Remote sensing and sensor development
 - o Large-scale data collection and interpretation
 - o Mission planning (human factors and training)

These topics are consistent with the needs for DOD UAS platforms. However, we will do these at a much lower cost. The costs for DOD UAS can be in the millions of dollars, but the systems we are proposing (with considerable previous experience) are on the order of \$10,000. In particular, using UAS technology as a testbed for the existing DOD technologies, needs and missions offers a low risk opportunity.

Impact on Montana

There are civilian and military applications and this project offers an opportunity to coalesce and bring new research and business opportunities to the state. There are needs for ongoing projects which already utilize or are testing UAS technologies in Montana. Among them, wildfire patrol and mission planning, border patrol, various law enforcement in remote areas, and remote sensing for many other purposes. Numerous outside interests and companies are looking for sites to test their technologies for DOD applications. Our Military Operations Areas (MOAs) and Certificates of Authorization (COAs) offer the DOD direct access for testing its existing UAS platforms, and for dual use missions in the US civil airspace. In particular, this project could help to develop the necessary technology and protocols to remove the current FAA restrictions for UAS in civil airspace. From the FAA UAS Factsheet: "Due to the UASs inability to comply with 'sense and avoid' rules, a ground observer or an accompanying "chase" aircraft must maintain visual contact with the UAS and serve as its 'eyes' when operating outside of airspace that is restricted from other users." This is a huge constraint, and severely limits UAS in civil airspace. Having our MOA as the major site in the US could provide multiple business opportunities over the breadth of the UAS hierarchy described above. Montana universities have had a track record of spinning off its research for the creation of high tech companies within the state. This project will serve to leverage several ongoing and relatively mature research disciplines to that end.

Issues

Support DOD research in UAS technology
Support DOD research utilizing UAS platforms for measurement, etc

ENERGY AND WATER

Energy Efficiency and Renewable Energy (EERE)

Department of Energy

Background

The Department of Energy's Energy Efficiency and Renewable Energy (EERE)'s is of special interest to Montana. The EERE's renewable energy program focuses on biomass and biorefinery systems, geothermal technology, hydrogen and fuel cell technology, water power, solar energy and wind technologies. EERE's energy efficiency activities include reducing the energy consumption of vehicle, building and industrial technologies.

Impact on Montana

MSU has active research programs in biofuels (both algal and crop based), solar, hydrogen energy, fuel cells, energy efficiency and wind energy. Annual total research expenditures in these areas (including private sector match) total \$4.9 million and involve 22 faculty, 30 professionals, 30 graduate students and 33 undergraduates.

Wind Energy Projects This effort has cataloged wind resources within the state that could assist in siting new wind projects. In addition, there is an ongoing collaborative research effort on the development of better quality composite materials for wind turbine blades. Highlight:

- MSU researchers have developed a multi-axial mechanical testing device and used this to create and maintain an internationally accessed database on composite materials.

Biofuels Projects Algal biofuels is a strong effort with a very vertically integrated team that involves microbiologists that identify extremophiles and study their metabolism to engineers that work on increasing lipid production and investigate microbe mortality in industrial environments. There are also crop based biofuels efforts that focus on improving ethanol production from waste straw without detrimental impact on the primary food crop, and oilseed work that investigates higher value products such as bio-lubricants and bio-plastics. Highlights:

- An MSU researcher has developed use of NILE Red stain as a method to rapidly assay oil content in algae. This method is now standard in the field
- Researchers have developed and patented a method to stimulate significantly higher oil production from algae using inexpensive nutrient

Fuel Cell Research Major focuses of the effort are on identifying materials that can operate at high temperatures, are less susceptible to "poisoning" by minute amounts of sulfur, have greater fuel flexibility, and don't require expensive precious metal catalysts and developing intelligent control schemes that protect the fuel cell from conditions that cause degradation or failure. Highlight:

- Researchers are developing an innovative reversible fuel cell – battery hybrid that has potential for energy storage and release on both short (battery) and long (reversible fuel cell) time scales which could address intermittency issues in renewable such as wind

Issues

Continued support for biofuels and other alternative energy development is critical for Montana and the nation and will give MSU an opportunity to compete in an area where it has strong expertise. Alternative energy solutions must look at issues beyond just the technologies for energy generation and must consider issues with integration with existing energy delivery systems, demand response, and implementation in different environments including rural settings.

Fossil Energy (FE)

Department of Energy

Background

The Department of Energy's Fossil Energy (FE) Research and Development program concentrates on improvement of existing technologies and development of next generation systems associated with fossil energy use, such as coal and natural gas which currently provide more than 70 percent of the nation's power.

Impact on Montana

MSU's major activities in fossil energy have involved Carbon Capture and Storage (CCS, also called Carbon Sequestration). Carbon capture and storage efforts are critical to our state and nation. With approximately 25% of the nation's coal supply (6% of the world's) Montana has a huge resource that can contribute to the nation's energy security and the state's economy. CCS provides a means to tap this resource in a more environmentally friendly fashion which can help ensure it remains viable for use. MSU annual total research expenditures in this area (including private sector match) total \$11.8 million and involve 24 faculty, 32 professionals, 31 graduate students and 17 undergraduates. These figures do not include the recent large scale test award mentioned in the second bullet below.

Big Sky Carbon Sequestration Regional Partnership (BSCSP) One of 7 DOE funded regional partnerships focused on mitigating greenhouse gases (particularly carbon dioxide, CO₂, a natural product of burning fossil fuels for energy) via storage in underground geological traps. It also has investigated "terrestrial" storage of CO₂ in soil and plants by change of land use. This program is focused on *demonstration* of carbon sequestration. The partnership includes the private sector, universities, national labs and state government agencies in the region. Highlights:

- BSCSP is gearing up the world's first pilot scale injection of CO₂ into basalts. If basalt storage is proven viable in this test, it significantly adds to world storage potential
- In July 2011 MSU and DOE finalized negotiations on a large scale test of carbon sequestration. This eight year project is \$85 million in total with \$67 million coming from DOE-FE. This project may also help identify a potential source of CO₂ useful for enhanced oil recovery.

Zero Emission Research and Technology Center (ZERT) This center also deals with carbon sequestration, but has a *basic science and engineering* focus. ZERT is improving fluid flow models to predict the underground behavior of stored CO₂, measuring reaction rates of CO₂ with underground minerals under appropriate conditions, developing and testing the detection limits of new and existing CO₂ detection technologies, and investigating mitigation strategies. Highlights:

- ZERT developed a first in the world field facility for testing near-surface detection technologies. Both MSU and Montana private sector technologies have been tested at this site and access to this site has helped a Bozeman company win a Phase II SBIR.
- Research into a novel microbially based method for sealing small aperture leaks around wellbores was initiated under ZERT and has attracted a \$1.8 M grant from DOE

Issues

A significant challenge exists in achieving an appropriate level of regulatory oversight for research in this field. While protection of public and private resources is critical, regulations written for commercial activities that are conducted at very large scale over 25-50 years are onerous to prohibitive for research projects conducted at smaller scale over 1-5 years.

LABOR,
HEALTH & HUMAN
SERVICES,
EDUCATION

Institutional Development Award (IDeA) Program NIH NCRR in FY 2012; transferred to NIGM in FY 2013

Labor-HHS

Background

IDeA - the largest of the EPSCoR-like programs - is designed to broaden the geographic distribution of NIH funding for biomedical research. As authorized by Congress, the program is intended to enhance the competitiveness for research funding of institutions located in states with historically low levels of funding and low aggregate success rates for grant applications to the NIH. Currently, the two core components of IDeA are: 1) Centers of Biomedical Research Excellence (COBRE) program and 2) IDeA Networks of Biomedical Research Excellence (INBRE) program. The COBRE program is designed to increase the pool of well-trained investigators in the IDeA states by expanding research facilities, equipping laboratories with the latest research equipment, providing mentoring for promising candidates, and developing research faculty through support of a targeted multi-disciplinary center, led by an established, senior investigator with expertise in the research focus area of the center. INBRE increases the pipeline of outstanding students and enhances the quality of science faculty in the IDeA states by networking research intensive and undergraduate institutions. The INBRE program prepares students for graduate and professional schools as well as careers in the biomedical sciences, supports research and mentoring of young investigators, and enhances research infrastructure at participating institutions. The FY 2012 appropriation for IDeA is \$276,480,000.

Impact on Montana

Montana has five COBRE awards and one INBRE award, resulting in approximately \$14,000,000 total costs per year. These funds have had a significant impact on the State scientific research enterprise, leading to new jobs, new research equipment, and enhanced research facilities. The majority of the funds are for salaries, and INBRE alone funds fully or partially 150-170 positions annually, with approximately 70% of its budget going toward salaries. Importantly, the majority of these positions are undergraduate and graduate students. Likewise, over 50% of COBRE budgets are used for salaries, supporting a number of new faculty and other research positions. In addition, the COBRE and INBRE programs also generate significant new grant awards. For example, the INBRE program has been responsible for generating over \$50 million in new grants in Montana over the last 11 years. At MSU, the COBRE programs have been responsible for generating close to \$30 million in new grants. Thus, COBRE and INBRE support has increased the research infrastructure, thereby enhancing the competitiveness of Montana researchers for research grant funding. Current COBRE research is leading to new understanding of infectious diseases, cellular metabolism, and protein function, with the ultimate goal of developing novel therapeutics for treating important diseases. Similarly, INBRE support has fostered an enhanced research culture at tribal colleges and undergraduate college partners, resulting in statewide collaborations among network institutions and improved research efforts in the area of rural health.

Issue

The COBRE and INBRE programs have been extremely successful at developing specific research programs within Montana. Many of these programs are now self-sustaining and have become competitive at the National level in acquiring their own competitive grants. However, there remains in Montana numerous scientific areas or programs that still need the developmental boost that COBRE and INBRE are designed to provide. Such programs include for example, rural health disparity, including Native health disparities, as well as numerous aspects of environmental health, but especially those associated with mining and oil production, and biomedical problems related to diet and immune system function.

TRANSPORTATION

University Transportation Center (UTC)

Transportation-HUD and Highway Reauthorization Bill

Background

The Research and Innovative Technology Administration (RITA) currently operates a network of university transportation centers (UTCs). In October 2011, USDOT/RITA conducted a new competition designed to revamp the entire program. RITA plans to select ten Tier 1 centers, two Tier 1 transit focused centers and 10 regional UTCs. WTI has submitted a Tier 1 UTC proposal for a National Center for Rural Transportation and is the lead university partnering with Iowa State University, University of Arkansas, and University of Alabama.

Impact on Montana

The Western Transportation Institute (WTI) is the **nation's largest transportation institute focusing on rural transportation** and has been a designated UTC since 1998. The Institute was established in 1994 by the State Departments of Transportation of Montana and California, in cooperation with Montana State University. WTI has an annual budget exceeding \$10 million and a 50+ person multidisciplinary staff of professionals, students and associated faculty from engineering, computer science, fish and wildlife, ecology, business, and economics. WTI has conducted collaborative research in more than 40 states, at local, state, and federal levels and is often called upon to provide testimony at congressional hearings, to USDOT and industry advisory boards.

UTC funding is subject to a 100% non-federal match requirement which means that every federal dollar coming to WTI must be matched by a non-federal dollar. WTI has developed a diverse research portfolio of research sponsors ranging from small non-profit foundations to large state DOTs meet this match requirement. Over the past 14 years, WTI has successfully used this pooled fund model to deliver nationally recognized research and provide stable, well-paying jobs for professionals as well hands on research experience for students. It also means the UTC funds are leveraged to maximize the value of each research dollar in meeting shared research goals across the transportation stakeholder community.

Issues

UTC funding provides a solid base which WTI can strategically and effectively leverage with other research funding sources to develop research results that can meet the needs of multiple organizations.

Loss of UTC funding will impact Research, Education and Technology Transfer Activities that benefit Montana economy.

Research

- Loss of 30% or \$3.2 M per year from total WTI budget
- Loss of \$1.2 M in salaries or 17 staff
- Loss of non-federal match that can be used to form innovative partnerships
- Loss of ability to purchase and sustain 4 laboratories outside of contract research

Education

- Loss of funding to support 15 undergraduate students conducting research
- Loss of stipend/ tuition support for 10 graduate student

Technology Transfer

- Loss of ability to host nation conferences to showcase WTI experience and attract partners
- Loss of ability to focus on to create and new business models for spin-off research

Unmanned Aerial Systems (UAS) -- FAA Center of Excellence Program

Transportation-HUD
FAA -- Research, Engineering and Development

Background

The FAA operates a number of Centers of Excellence (COE), dedicated to specific topics and operated by universities with numerous academic and industrial partners. The lead for a CoE must be a research university and CoEs tend to have a number of academic partners. In fact, FAA encourages universities in different states to work together. Montana interests have been pursuing the establishment of a major program in Unmanned Aerial Systems (UAS). The pending FAA reauthorization bill should provide for the establishment of new test sites (different from CoEs) for UAS testing and development. On a separate track, MSU has been working with Mississippi State University on the creation of a dedicated and comprehensive UAS Center of Excellence. The FAA had included UAS as a subject under a General Aviation CoE program that is planned for early 2012. Pursuant to language in the Senate report on the FY 2012 Transportation-HUD Appropriations Bill and letters from the Montana and Mississippi Senators, the FAA has decided to separate UAS from the General Aviation solicitation and to pursue UAS as a separate university Center of Excellence. MSU and Mississippi State intend to propose to the UAS program, mostly likely with one or more other university partners.

The focus of the efforts by Montana and Mississippi State will be (Scope, Approach, and How):

- 1) Development and operation of several low cost UAS platforms (fixed wing and rotorcraft)
- 2) Montana State will work to leverage its Military Operations Areas (MOAs) within Montana to the benefit of UAS development. Companies throughout the US are eager for such opportunities. These sites are unique in that they cover large areas with minimal safety risk during the development of UAS.
- 3) The combinations of Montana State and Mississippi State have strengths in the complete hierarchy for UAS activities and these will be combined for a synergistic whole. These include:
 - o Advanced Materials and Structures (particularly low cost composites manufacturing)
 - o Propulsion (including high power density fuel cells and bio-based liquid fuels)
 - o Guidance and Control (redundant and reconfigurable computers)
 - o Remote Sensing and sensor development
 - o Large-scale data collection and interpretation
 - o Mission planning (human factors and training)
 - o Public policy related to UAS operations in civilian airspaces

These topics are consistent with ongoing FAA Centers of Excellence and will augment the existing centers, including but not limited to: Joint Center for Advanced Materials Research, Aircraft Noise and Aviation Emissions Mitigation, General Aviation, Airworthiness Assurance, Operations Research, Airport Technology, Commercial Space Transportation, and Computational Modeling of Aircraft Structures. In particular, using UAS technology as a testbed for the existing FAA Centers of Excellence offers a low risk opportunity. This is in direct support of **The FAA's Role: Safety First [as stated in the FAA Fact Sheet – UAS http://www.faa.gov/news/fact_sheets/news_story.cfm?newsid=6287]**.

Impact on Montana

This project offers an opportunity to coalesce civilian and military utilization of UAS and airspaces to bring new research and business opportunities to the State. There are needs for ongoing projects which already utilize, or are testing UAS technologies in Montana. Among them, wildfire patrol and mission planning, border patrol, various law enforcement in remote areas, remote sensing for various agriculture needs, test platforms for existing Montana companies needing UAS access, surveillance of disaster areas, etc. Furthermore, Montana has had a track record of spinning off its research for the creation of high tech companies within the state. This project will serve to leverage several ongoing and relatively mature research disciplines to that end.

Issues

Support and fund separate FAA Center of Excellence for Unmanned Aerial Systems (UAS)
Support research in UAS technology

MONTANA UNIVERSITY SYSTEM

Research & Technology Transfer Report - 2006, 2007, 2008, 2009, 2010, & 2011

Data Elements for MUS Policy	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
R&D Expenditures	\$103,048,865	\$102,116,323	\$96,150,553	\$98,431,691	\$109,481,694	\$102,767,291
Number of new invention disclosures filed	32	30	22	26	22	17
Number of new start-up companies which have licensed or commercialized university-developed intellectual property	5	1	2	3	1	0
Number of new intellectual property licenses issued	29	35	43	48	50	43
Total intellectual property licenses in effect at the close of the fiscal year	109	130	153	184	191	200
Total gross revenues from intellectual property licenses	\$219,931	\$257,621	\$664,244	\$557,832	\$466,181	\$322,051

Data Elements for Strategic Plan	FY 2006	FY 2007	FY 2008	FY 2009	FY 2010	FY 2011
Patents Issued	3 patents, 1 TM	13 patents	13 patents, 3 TM	20 patents, 1 TM	9 patents, 2 PVP	11 patents
US Patents Filed	52	46	31	27	29	27
Active Licenses (Total)	109	130	153	184	191	200
Active Licenses (MT Companies)	68	81	89	105	109	98
Percent Licenses w/ MT Companies	62%	62%	59%	57%	57%	49%
License/Patent Revenues	\$49,949	\$69,165	\$221,614	\$290,690	\$256,690	\$181,473
Reimbursed Patent Costs from Licenses	\$169,982	\$138,562	\$442,630	\$267,142	\$209,491	\$140,579