ARKANSAS 2018

STATE SCIENCE & TECHNOLOGY PLAN

STATE OF ARKANSAS
ASA HUTCHINSON
GOVERNOR

Dear Arkansas Science Advisory Members:

I want to thank you for the diligent work in developing the Arkansas State Science and Technology Plan. This forward-thinking plan points the way for more effective coordination between the state's institutions for higher learning, other state agencies, and the private sector partners.

The strategies outlined in the following pages provide a powerful blueprint in leading the state's innovation machine. This plan, with its selected priorities, will increase our economic effectiveness in expanding job-creating research in our state.

I am pleased your efforts incorporated our initiatives on computer coding and STEM development in Arkansas's K-12. These are exciting times in Arkansas as we are being recognized as leaders in the global technology marketplace.

I look forward to your updates, as you implement this bold plan.

Sincerely,

Asa Hutchinson

500 WOODLANE STREET, SUITE 250 • LITTLE ROCK, AR 72201
TELEPHONE (501) 682-2345
www.governor.arkansas.gov

FOREWORD

The Arkansas Science Advisory Committee (SAC) has been tasked by the executive director of the Arkansas Economic Development Commission (AEDC) to update the State's Science and Technology (S&T) Plan.

This update expands upon the last version of the S&T plan released in September 2013, which was written by the SAC and accepted by the former Board of the Arkansas Science and Technology Authority (ASTA). All ASTA duties and functions were transferred to AEDC in 2015.

The 2013 Plan created an inventory of Arkansas science and technology capabilities including both the strengths and the weaknesses in our state.

A baseline for S&T development in Arkansas was established as the following inventory:

1. Where are we

2. What we have

3. Where we want to be

This 2018 update builds upon the foundation of the former plan by concentrating on the priorities to move the State to "Where we want to be."

This document and the recommendations herein are presented by the FY2018 members of the Arkansas Science Advisory Committee.

SAC Voting Members

Dr. Andy Sustich, Chair
Arkansas State University
(Representative from A-State)

Dr. Ralph Davis
University of Arkansas
(Representative from UARK)

Dr. Larry Cornett
University of Arkansas for Medical Sciences
(Representative from UAMS)

Dr. Abhijit Bhattacharyya
University of Arkansas at Little Rock
(Representative from UA Little Rock)

Dr. Mansour Mortazavi
University of Arkansas at Pine Bluff
(Representative from UAPB)

Dr. Stephen R. Addison
University of Central Arkansas
(Representative from 4-year colleges)

Dr. Rick Massengale
Arkansas Tech University
(Representative from 4-year colleges)

Tom Chilton, J.D.
Arkansas Economic Development Commission
(Representative from AEDC)

Jerry Adams
Arkansas Research Alliance
(Non-public representative)

Ex-Officio / Non-voting members

Dr. Larry Cornett, Arkansas NIH IDeA
Dr. Keith Hudson, Arkansas NASA EPSCoR
Dr. Steve Stanley, Arkansas NSF EPSCoR

In a modern economy, science and technology coupled with innovation are critical components to a vibrant business environment. The Arkansas Science & Technology Authority was merged into the AEDC specifically to accelerate innovation by fostering job-creating research.

The objectives of this update to the S&T plan are to maximize the economic development impact of Arkansas' higher education institutions by:

- Identifying opportunities for universities and industry to collaborate
- Aligning future investments in university research competencies with industry areas of technology focus
- Stimulating improvement in technology skills and talent development in Arkansas

These objectives were guided by the efforts of the 2005 Accelerate Arkansas initiative. Accelerate Arkansas was a state-wide catalyst with more than 70 members from the private and public sectors committed to moving the State forward to compete in the knowledge-based, innovation-centric economy.

The core strategies established by Accelerate Arkansas and set forth by the Arkansas Legislature continue to drive the science and technology priorities up to the date of this S&T Plan.

Building on the success of the Accelerate Arkansas initiative, this S&T Plan has set forth three goals designed to create additional momentum to the state's innovation efforts. These three goals, outlined on the following page, are supported with action items which will be individually measured for accomplishment.

The SAC is confident that the implementation of this S&T Plan will enable Arkansas to compete in the explosive growth environment of scientific discovery and the worldwide global business markets while also producing statewide opportunities in entrepreneurial innovation.

This plan supports the development of greater numbers of higher paying jobs for Arkansans. The increase in the standard of living will stimulate better recruitment of skilled workers and. more importantly, aid in the retention of our best and brightest.

SAC Vision

Job creation and economic opportunities for all Arkansans will be expanded and enhanced through fostering and implementing World-Class infrastructure and professional personnel education and training in Science and Technology. Targeted priorities leading to advancement of statewide Science and Technology capabilities will be accomplished by facilitating competitive expansion in Research and Innovation.

STATE S&T GOALS

Goal 1: Advance and Elevate R&D to Stimulate Innovation

- Innovate Arkansas
- Arkansas Research Alliance
- Arkansas Biosciences Institute
- Arkansas Bioinformatics Consortium
- AEDC R&D Tax Credits
- Arkansas Business & Technology Accelerator Grant Program

Goal 2: Facilitate Competitive Expansion for Innovative Research & Development

- Small Business Innovation Research (SBIR) Matching Grant
- National Science Foundation EPSCoR Matching Grant
- Arkansas High-Performance Computing Center (AHPCC)
- Basic Research Grants
- Applied Research Grants
- Technology Transfer Assistance Grants (TTAG)
- Centers for Applied Technology Program

Goal 3: Establish Targeted Priorities

- Data Science and Analytics
- Power Electronics
- Biological & Agricultural Technology

> *"The role of innovation has been critical to economic development as the U.S. has evolved over the decades. There is a clear statistical link between innovation and gains in the standard of living."*
>
> Abby Joseph Cohen, Senior Investments Strategist and President of the Global Markets Institute of Goldman Sachs, 2011

INTRODUCTION

In 2005 the Arkansas Department of Economic Development (now AEDC) commissioned a task force to report on the State's competitiveness on the creation of knowledge-based Jobs.

The task force outlined a number of improvements as part of this initiative culminating in the formation of Accelerate Arkansas (AA).

AA is a non-profit working group comprised of a mix of private and public individuals with a goal to develop a strategy to enhanced the state's economic future.

In 2005, the Accelerate Arkansas organization created a blueprint which was provided to the Governor and the Legislature, establishing "Arkansas' Position in the Knowledge-based Economy." The blueprint outlined these goals:

- Support research and development that creates jobs
- Provide incentives that make risk capital available to fill a funding gap
- Encourage entrepreneurship and new enterprise development
- Increase achievement in science, technology, engineering, and mathematics (STEM) education

This strategy was embraced by the Arkansas Legislature during the 2007 General Session which included:

- Establishing the Arkansas Research Alliance
- Replacing the funds previously removed in Basic Research Grants and Research Matching funds
- Establishing a risk capital matching fund
- Expanding the funding in the Seed Capital Investment Program
- Creating Innovate Arkansas
- Enhancing the Consolidated Incentive Act 2001 to stimulate R&D investments by existing industry in the state
- Developing a Public Sector led taskforce "Building a 21st Century Economy in Arkansas"

The success of the aforementioned programs motivated the Governor and the Legislature to pass into statue, in 2017, two additional innovation economic stimuli:

- The Arkansas Small Business Innovation Research Matching Grant
- The Arkansas Business and Technology Accelerator Grant

Computer Science Education

Governor Asa Hutchinson has expanded the state's focus on STEM to include his Computer Coding Initiative passed into law in 2015.

Governor Hutchinson was one of the first governors to announce that computer science education would be a major focus of his administration and has maintained that commitment throughout his administration.
https://www.wired.com/2015/03/arkansas-computer-science/

"Of all the big-ticket items we've dealt with this legislative session, this relatively small-ticket item may have the greatest long-term impact."

Gov. Asa Hutchinson (speaking to the legislature on the Computer Coding Initiative)

- Act 187 of the 2015 Arkansas General Assembly established the requirement that each public high school and each public and charter school in Arkansas offer a computer science course. http://bit.ly/2sjaq47

- The Arkansas Computer Science and Technology in Public School Task Force: Report of Activities, Findings, and Recommendations. http://bit.ly/2r9Srs3

Overview

The actions identified within this plan include the SAC's recommended level of continued investment unless no allocation of funds are necessary to complete the program's task(s). Some increases have been requested, but there are only a few with incremental investments to meet the growing demands of the programs. The larger increases outlined in the request are to restore the Basic and Applied Research Grants.

Arkansas has, through diligent stewardship, demonstrated remarkable improvement in developing knowledge-based opportunities. Despite this, our State continues to lag in key indicators of economic development:

- Arkansas ranks low among states in overall health of its citizens and has great disparity in the availability of healthcare.

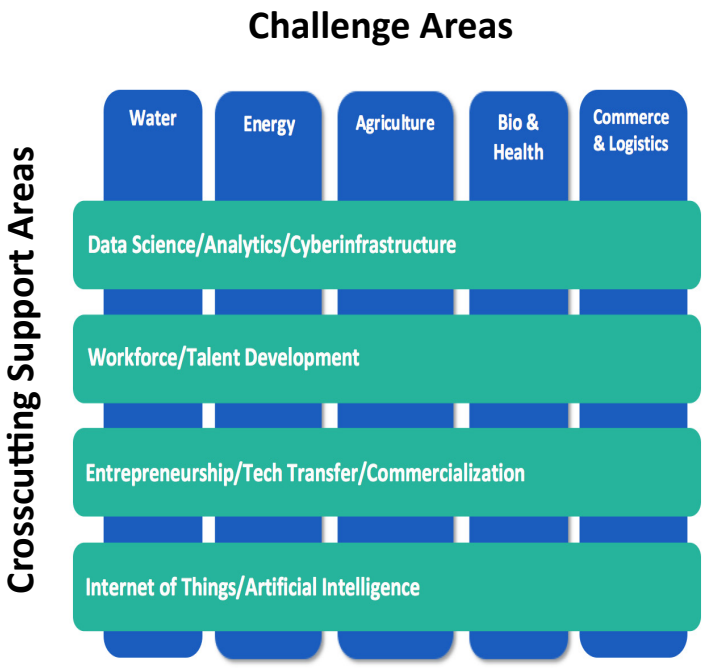
- Arkansas continues to be an agricultural state with dependence on costly energy consumption. As a result, our crop and animal products must be subject to continuous technological innovation and improvement in growing and harvesting food for the marketplace.

- Arkansas has an abundance of water resources needing to be protected with new technologies for conservation, storage and delivery.

These deficiencies can be, and will be, turned into opportunities to strengthen the Arkansas economy.

The Science and Technology strategy has identified research challenge areas of energy and power technologies, agriculture, commerce, logistics, bio-ag, and water.

This bold plan utilizes the development of the science of data analytics to cut across the areas of opportunity for economic improvement in Arkansas (see figure on next page).



Important improvement has been made by Arkansas to replace the single-minded focus on manufacturing recruitment, with an innovation driven policy to develop stronger knowledge-based job creation.

AEDC has developed, with the assistance of the consultants at TECONOMY Partners, a breakout strategy calculated to aggressively enhance the most promising innovation opportunities arising from the Accelerate Arkansas launch.

The SAC strategy builds upon the successful innovation programs operating in the State since inception by the legislature in 2007. Additionally, within the following pages is a review of the two new programs added by the Arkansas Legislature in 2017.

The three targeted priorities of the new Science and Technology Plan will bring the appropriate focus on fast-tracking Arkansas towards building a strong knowledge-based, innovation driven economy.

Review of Arkansas Current Science and Technology Programs to: Advance and Elevate Research and Development to Stimulate Innovation

Innovate Arkansas (IA)

IA was created with the assistance of the State of Oklahoma and modeled after their successful i2E program. IA is a state-funded effort, subcontracted by AEDC to Winrock International, functioning as a mentor of developing high-tech, fast-growing, high-skills and high-paying companies in Arkansas. The client base is generally innovative entrepreneurs taking research and commercializing it into job-creating companies in Arkansas.

Recommendation: The SAC recommends continuation of the funding of IA at the current level of $1.5 million annually.

Innovate Arkansas Investment Capital/Grant Development Data

Survey Data Response Rates

Calendar Year	Number of Survey Responses and Rates
2014	61 Responses
	59% response rate
2015	55 responses
	54% response rate
2016	67 responses
	60% response rate

Calendar Year	Total Gross Payroll	Average Annual Salary	Gross Revenue Sales	Current Employees
2014	$26,895,126	$ 52,529	$22,530,347	581
2015	$16,913,944	$ 50,564	$32,842,538	335
2016	$30,555,418	$ 64,942	$48,412,140	471

Innovate Arkansas Investment Capital/Grant Development Data

Calendar Year	Public Investment
2014	$ 1,475,000
2015	$ 837,293
2016	$ 992,000
Total	$ 3,304,293

Calendar Year	Private Investment
2014	$ 24,829,000
2015	$ 13,864,000
2016	$ 26,415,750
Total	$ 65,108,750

Calendar Year	Federal Grants
2014	$ 3,726,750
2015	$ 15,080,000
2016	$ 2,255,000
Total	$ 21,061,750

2014 Total	$ 30,030,750
2015 Total	$ 29,781,293
2016 Total	$ 29,662,750
Cumulative	$ 89,474,793

Arkansas Research Alliance (ARA)

The ARA was modeled after the Georgia Research Alliance. The program is tasked with elevating the profile of research at the five designated Arkansas research universities. The organization is financially supported by the universities, the private sector, and AEDC.

Its primary function is to assist in recruiting top-flight researchers from outside the State. The program has been expanded to include support of targeted in-state researchers. The ARA has led the development of the Bioinformatics Council and has become the interface to the National Center for Toxicological Research (NCTR), the only federal research lab in Arkansas.

Recommendation: The SAC recommends the continued support of the ARA with the State and private support to increase to $2 million dollars annually over the next five years.

Historical ROI of Arkansas Research Alliance Efforts, 2010-2018

Campus	Scholars	Fellows	Academy Total
UARK	$ 1,686,667	$ 225,000	$ 1,911,667
UAMS	$ 2,833,334	$ 225,000	$ 3,058,334
UALR	$ 500,000	$ 225,000	$ 725,000
UAPB	$ -	$ 100,000	$ 100,000
A-State	$ -	$ 150,000	$ 150,000
Total	$ 5,020,001	$ 925,000	$ 5,945,001

Campus	FDA Contracts	State/Nano	Grand Total
UARK	$ 503,742	$ 154,000	$ 2,569,409
UAMS	$ 1,950,981	$ 610,000	$ 5,619,315
UALR	$ 547,985	$ 167,000	$ 1,439,985
UAPB	$ 139,608	$ 40,000	$ 279,608
A-State	$ 74,217	$ 20,000	$ 244,217
Total	$ 3,216,533	$ 991,000	$ 10,152,534

Arkansas Biosciences Institute (ABI)

The ABI was created by the legislature from funds received as a result of the tobacco law suit settlement. The establishment of ABI was to promote:

- Agricultural research with medical implications
- Bioengineering research expanding genetic knowledge
- Tobacco related research as it related to illness in Arkansas
- Nutritional aimed at preventing and treating disease caused by tobacco
- Other areas of developing research that are related to primary supported programs

Participating members include the Arkansas Children's Research Institute, Arkansas State University, the University of Arkansas System Division of Agriculture, the University of Arkansas at Fayetteville, and University of Arkansas for Medical Science.

Recommendation: The SAC recommends the current level of $10 million annually for funding.

Economic Impact of ABI Funding & Leveraged Support, FY2016

Impact Type	Employment (Job Years)	Labor Income ($M)	Output ($M)
Direct Effect	309	14.5	50.8
Indirect Effect	198	8.1	24.4
Induced Effect	128	4.6	15.7
Total Impacts	634	27.3	90.7
Multiplier	*2.05*	*1.88*	*1.79*

Impact Type	State & Local Tax Revenue ($M)	Federal Tax Revenue ($M)
Direct Effect	0.4	2.7
Indirect Effect	0.8	1.8
Induced Effect	0.9	1.2
Total Impacts	2.1	5.7

Economic Impact of ABI Funding & Leveraged Support, Cumulative 2002-2016

Impact Type	Employment (Job Years)	Labor Income ($M)	Output ($M)
Direct Effect	4,375	204	711
Indirect Effect	2,769	113	339
Induced Effect	1,787	65	220
Total Impacts	8,931	382	1,270
Multiplier		*1.88*	*1.79*

Impact Type	State & Local Tax Revenue ($M)	Federal Tax Revenue ($M)
Direct Effect	5.6	37.8
Indirect Effect	10.7	25.7
Induced Effect	12.7	16.4
Total Impacts	29	79.9

Arkansas Bioinformatics Consortium (AR-BIC)

The AR-BIC is a virtual statewide science community aimed at developing, leveraging, and enhancing statewide collaboration in the analytical and computing research area to increase knowledge in the life sciences. The goals of the AR-BIC are to:

- Strengthen Arkansas' ability to compete at national and international levels for research funding
- Enable and facilitate collaboration in research where synergy is identified,
- Enhance education, training and university curricula, and
- Expand Arkansas economic growth and job opportunities.

Recommendation: Currently the State has not invested in this program. The SAC recommends that the State investigate and consider providing supplemental funding for this program.

AEDC Research and Development Tax Credits

Two types of R&D Tax Credits designed to promote research to job creation are offered by AEDC.

- In-house Research by a Targeted business: Discretionary incentive requiring targeted qualifications. Once approved a business receives an income tax credit equal to 33 percent of the R&D expenditures incurred each year for five years. This credit can be sold.

- In-house Research:An eligible business that conducts in-house research within a research facility that is operated by the eligible business can make application for this non-discretionary tax credit. The credit is equal to 20 percent of the annual R&D expenditures for five years and one renewal period of five years.

Recommendation: The SAC recommends no changes to the R&D programs for Targeted businesses. The SAC supports a review of all other R&D tax incentives for improvement or elimination

Arkansas Business and Technology Accelerator Grant Program

This program is a new statute passed into law in 2017. This program was created to stimulate innovation and growth among the state's technology businesses and to create high-skilled, high-wage jobs.

Business and Technology accelerator is defined as a full time immersive program administered by an eligible applicant to potentially invest in, mentor, and accelerate commercial development of start-up businesses. The focus of this program is to foster economic growth by linking new ideas, products, and services by entrepreneurs and startup companies to corporate sponsors seeking commercialization of new products or services.

Recommendation: This program is very new and as a result, the SAC recommends keeping the funding at $1 million annually.

Review of Arkansas Current Science and Technology Programs to: Facilitate Competitive Expansion for Innovative Research and Development

Arkansas Small Business Innovation Research Matching Grant Program

This program may provide, to eligible businesses, discretionary matching grants of up to 50 percent of the amount of a federal Phase I and Phase II SBIR grants, not to exceed $50,000 for a Phase I and $100,000 for Phase II awards. This program's objectives include:

- Creating and retaining high-tech jobs, especially high-wage jobs in middle skill and high skill occupation
- Encouraging innovative small businesses to engage in federally funded research that has the potential for technological innovation and commercialization
- Increasing the amount of SBIR funds invested in Arkansas businesses
- Inducing the retention, growth, and location of companies in Arkansas.

This is a new program implemented in October of 2017.

Recommendation: The SAC recommends monitoring the progress and maintain the funding at $2 million annually for now.

Arkansas Established Program to Stimulate Competitive Research (AR NSF EPSCoR)

The mission of the Arkansas NSF ESPCoR Program is to build up an infrastructure of both equipment and researchers to enable the State's post-secondary institutions to compete more effectively for federal funding. EPSCoR is hosted at multiple federal agencies and Arkansas has successfully participated in the National Science Foundation's program for more than ten years.

Arkansas NSF EPSCoR has contributed more than $53 million in statewide research funds.

Recommendation: The SAC strongly recommends continuing the pursuit of this National Science Foundation grant. The State is required to provide a $4 million dollar match to obtain the grant. This match is $800,000 per year for five years.

Arkansas High-Performance Computing Center (AHPCC)

The AHPCC is a core research facility at the University of Arkansas at Fayetteville that provides high-performance computing hardware, storage, and support services, including training and education, to enable computationally intensive research at the university and within the state as well as collaborators elsewhere.

The AHPCC, through its association with the National Science Foundation's Extreme Science and Engineering Digital Environment (XSEDE) and XSEDE Campus Champions programs, also assists researchers in acquiring and using resources at national supercomputer centers.

Recommendation: The SAC recommends the State take a more active role in funding this important Arkansas asset. We suggest a task force be empaneled to study the possibility of expanding this program as a larger state resource.

Basic Research Grants

The Basic Research Grant Program provides matching grant funds to help promote and support the growth and development of scientists working in Arkansas and to enhance the status of science and technology in Arkansas-based colleges and universities by funding basic research.

AEDC may fund up to 60 percent of the total cost of the basic research project being funded. Remaining project costs shall be funded with cash or in-kind services provided by the college or university proposing the research project.

Recommendation: The SAC supports the restoration of the funds for Basic Research. The proposed annual funding should be $800,000.

Applied Research Grants

The Applied Research Grant Program provides matching grant funds to help create applied research partnerships between private industry and Arkansas-based colleges and universities to stimulate the transfer of science and technology. Private industry match may be in the form of cash or new machinery and equipment.

AEDC may fund up to 50 percent of the total cost of the applied research project being funded. Remaining project costs shall be funded with cash or new machinery and equipment provided by a business or industry cosponsoring the project; however, AEDC may fund up to 66 and 2/3 percent of the applied research project if the participating private industry is principally located in Arkansas and employs 50 or fewer persons.

Recommendation: The SAC recommends that Applied Research funding should be used to support the three priorities set forth in this plan. As a result, no line item funding is to be provided by the legislature.

Technology Transfer Assistance Grants (TTAG)

The purpose of the Technology Transfer Assistance Grant (TTAG) Program is to increase Arkansas' competitiveness through technical and operational advancements by providing funds for the transfer or deployment, or both, of innovative technology to Arkansas-based enterprises to resolve identified technology-based, industry-driven problems, issues, or concerns.

TTAG is intended to provide financing that allows a business' specific technology to better compete for funding from other division programs.

TTAG funds may be used to pay for costs associated with engineering or technical support fees, database searches, travel, responses/cash matches to the Small Business Innovation Research (SBIR) Program or the Small Business Technology Transfer (STTR) Program; and other costs decided on a case-by-case basis. TTAG funds are generally not approved to purchase fixed assets or training.

Maximum AEDC funding per project shall not exceed $3,750 based on the following:

- First $2,500 of project costs, and
- Additional amount up to $1,250 based upon a 50:50 match with the enterprise assisted with TTAG funds for next $2,500 of project costs.

Recommendation: This is an important incentive for gaining innovation traction for fledgling Arkansas entrepreneurs, The SAC supports continuation of this program and increasing the funding.

Centers for Applied Technology Program

The purpose of the Centers for Applied Technology (CAT) Program is to encourage greater collaboration between private enterprises and Arkansas-based colleges and universities in the development and application of new technologies. This is effectuated through identifying, designating, and funding centers in technological areas with significant potential for economic growth and development in Arkansas, or in or within which the application of new technologies could significantly enhance the productivity and stability of Arkansas enterprises.

A FOCUSED APPROACH

As previously indicated, Arkansas has many targeted programmatic efforts to promote Research and Innovation. The Innovation community in Arkansas understands rising competition from national and international participants means the state must focus its efforts to succeed in the competitive marketplace.

In 2016 the AEDC commissioned TECONOMY partners, a well-established consulting firm, to assist in identifying Arkansas strengths in determining Innovation focus areas. The concern was that a best-in-class Innovation infrastructure was in place, but despite the many programs the State lacked a narrow focus on its economic strengths.

Using sophisticated modeling techniques, TECONOMY identified six innovation clusters for review:

- Electronic Connectors- Power Electronics
- Data Science and Analytics
- New sealants and nano-viscous materials (material science)
- Medical Devices
- Biopharmaceuticals
- Genetically engineered plant lines and characteristic traits

After careful review, the list was narrowed to three clusters by combining biopharmaceuticals and plant genetic engineering, and eliminating medical devices and materials science due to market saturation. The remaining three focus clusters were established as targeted developmental areas by the SAC:

- Data Science and Analytics
- Power Electronics
- Bio-Ag Technology (genetically engineered plants for food and medical applications)

PRIORITY 1: DATA SCIENCE & ANALYTICS

Utilizing legislative empowerment to create Centers for Applied Technology (CAT), a committee was established by the executive director of AEDC to study and assess the viability of the three targeted focus clusters. The power electronics and bio-ag clusters have previously been studied within an NSF EPSCoR program, where each project was provided with substantial research funds. The creation of a CAT, although promising, has not yet fully developed as a sustainable project for either cluster. The SAC recommends keeping an emphasis on both of these clusters but foresees a faster traction for marketplace expansion by focusing on data science and analytics.

In 2017, Governor Hutchinson convened a Blue Ribbon Commission to study and make "Recommendations on Advancing the Economic Competitiveness of Data Analytics and Computing in Arkansas." The commission was comprised of state staffers, the two major university system chancellors, and included a majority membership from the private sector.

The near-term strategic priorities and actions recommended by the Commission involve four broad initiatives:

- Advancing increased networking and executive education for Arkansas companies to better integrate data analytics into their businesses

- Reinforcing data analytics skills development across Arkansas' universities and connecting students with businesses

- Target data analytics and computing talent retention, attraction and retraining to ensure Arkansas can meet existing and new company demand for data analytics talent

- Raising Arkansas technical capabilities through a data analytics strategic implementation fund

Governance

The Arkansas Partnership for Data Analytics and Computing will be governed as an independent non-profit organization comprised of an industry-led Board with representation from state government and higher education. The governing board will be limited to between nine and eleven members to be an effective working board that can best guide and oversee the action plan of the initiative. Broader planning committees may be organized around specific objectives to ensure stakeholder engagement in all parts of the State while engaging with state and public sectors that might not ordinarily think about data analytics as being key to solving industry-wide problems, i.e. agriculture/timber and K-12 education. An external advisory board also may be considered to engage experts from outside of Arkansas to help provide insights on future directions and help assess ongoing efforts to the governing board.

Operating Model

The Arkansas Partnership for Data Analytics and Computing will require dedicated resources for developing a "lean" staff able to facilitate engagement and keep actions moving forward. The key value is in having staff dedicated to sustaining and building relationships, supporting the board of directors and advisory groups and learning from experiences. The staff will also support the ongoing committees that may be formed by the governing board in areas such as educational support, industry support, economic development and outreach/awareness.

Resource Plan

A base level of funding of up to $25.5 million over a five-year period from state government will be required to staff the initiative and launch its near-term program efforts as a key technology-based economic development initiative of the state. A mix of public and private resources will be required to support each action, tailored to that specific action. Overall, public funding is expected to leverage significantly greater private investment through program activities and incentivized actions.

Actions

- **Establish the Arkansas Center for Data Science**
- **Expand the state's participation in the Blockchain for Arkansas (BC4AR) Initiative with industry partners**
- **Create a plan to increase retention of top talent**
- **Establish a statewide professional network for CIOs and CTOs**
- **Establish an Arkansas Data Analytics Internship program**
- **Develop a summer institute for advanced analytics for college juniors**
- **Create a data analytics re-training initiative for incumbent workers**
- **Work with legislature to create financial incentives for students with CS and analytics degrees to make careers in Arkansas**
- **Work with Arkansas universities ro revamp CS curriculum, establish capstone projects, make Data Science a communication requirement**

PRIORITY 2: POWER ELECTRONICS

The University of Arkansas at Fayetteville (UAF) is developing a strong reputation in the power electronics research community.

This growing capability has led to spin-outs like WolfSpeed, a Cree Company, a leading innovator and manufacturer of wide band gap semiconductors, which have been proven far superior to incumbent technologies in conserving, converting and utilizing energy.

WolfSpeed is located in the UAF Technology & Research Park. Additionally, UAF has partnered with Ozark Integrated Circuits, Inc. to license university research to this small but fast growing business.

New developments are emerging from the National Center for Reliable Electric Power Transmission (NCREPT). NCREPT was established for the purpose of investigating solid-state solutions for the electric power grid including protection devices and FACTS as well as energy storage and distributed generation applications.

NCREPT is involved in five areas of research that impact the realization of power electronics solutions:

- Power Electronic Design and Modeling
- Power Electronic Packaging
- Power Electronic Testing
- Mixed-Signal Integrated Circuit Design.
- Sensors and Controls.

A team of UAF researchers currently has a $4 million proposal before the National Science Foundation to create an expansion of the 3E effort (Energy, Environment, and Economy).

The SAC supports the 3E project as an expansion of important economic development in precision agriculture, water and energy conservation.

Actions

- **Study the possibility of creating an applied research facility in power/ microelectronics**
- **Support the expansion of the 3E effort**

PRIORITY 3: BIO-AG TECHNOLOGY

Arkansas is an agricultural leader in both animal and crop production. The University of Arkansas at Fayetteville, a land grant institution, has a globally recognized poultry science program. In addition the University of Arkansas at Monticello has a world-class program in forestry.

The University of Arkansas Division of Agriculture collaborates with producers and farmers throughout the state regarding the adaptation of new plant and animal varieties and developing best practices for increasing sustainable production.

Previous NSF EPSCoR grants supported the development of a plant biotechnology collaboration throughout the state. This support continues in the efforts through the Arkansas Biosciences Institute (ABI) assisted by the:

- Arkansas State University
- Arkansas Children's Research Institute
- University of Arkansas Division of Agriculture
- University of Arkansas at Fayetteville
- University of Arkansas for Medical Sciences

Ongoing research continues to strengthen plant-based production proteins and enzymes that have important pharmaceutical, nutraceutical, and industrial use.

The continuation of research is developing in the identification, through genetic trait analysis or through genetic modification, of crop varieties that are able to maintain plant health and produce a high yield in the changing climate conditions.

The SAC recommends expanding funding under the direction of ABI for the ongoing support of this research activity. The focus on developing a major support organization through the Arkansas Center for Data Science will be increasingly important to the success of this globally significant research.

CONCLUSION

The State of Arkansas' Science and Technology plan, through the work of the Science Advisory Committee, establishes herein a strategic path to integrate the statewide efforts into a single set of priorities. The infrastructure of the state to promote innovation and entrpreneurship, already well-established, will be tasked to focus on the initiatives outlined within this strategy.

The State's alliance partners, which include the universities, Arkansas Biosciences Institute, Arkansas Research Alliance, and Innovate Arkansas will be directed to spend state funds to synchronize their plans with the science and technology focus areas.

This science and technology strategy will not usurp any individual efforts at targeted research or other commercialization activities, but will concentrate state investment dollars to the priorities established within this plan.

Thank you to the Science Advisory Committee for all of the hard work in preparation of this science and technology plan for the great state of Arkansas.