

Prosperity through Innovation Science and Technology In Delaware 2008 – 2012



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Delaware Science & Technology Council

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Background, Strategies and Goals

Leadership in Science and Technology (S&T) has become both a State and national priority. This is necessitated by the development of a global knowledge-based economy and a shift of manufacturing operations to lower cost countries. These changes are manifested in Delaware by the decline of the chemical and auto industries, a maturing of the financial services sector and an increase of S&T-based entrepreneurialism.

To prosper in the 21st Century, Delaware must become more competitive in S&T business segments such as life sciences, energy, environment and nanotechnology. Economic growth will be driven by large, small and start-up businesses that are on the cutting edge of science and technology. This will require a business environment that stimulates innovation, entrepreneurship, knowledge-based partnerships and an education system that encourages the State's youth to pursue careers in science, education, engineering and mathematics.

In June 2006 Governor Minner established the Delaware Science and Technology Council to help develop and manage the State's science and technology assets. In executing this responsibility the Council, which is composed of leaders from the academic, public and private sectors, has worked to: (1) Establish strategic direction; (2) Select and prioritize opportunities; (3) Implement partnerships and secure resources; (4) Lead dialogs with stakeholders; (5) Respond to legislative needs; and (6) Measure progress against commitment.

As the basis for a Strategic Plan the following strategies have been set:

- Select and nurture emerging S&T intensive business segments. These segments will include life sciences, energy and a sustainable environment, where the focus will be on developing an R&D base and in creating innovative new businesses.
- Attract top scientific talent to the State by becoming a recognized R&D center, capitalizing on our geographic compactness to build internationally recognized, multi-institutional centers of excellence in targeted fields.
- Better integrate S&T into the State's education systems to produce graduates, who are fully prepared to contribute in an S&T intensive economy.
- Foster innovation, entrepreneurialism and knowledge-based partnerships among private, public and academic institutions state-wide, regionally, nationally, and globally.

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To execute against these strategies, the following goals have been established:

1. **Develop strong biomedical research capability in Delaware.**
2. **Develop and promote the adoption of technologies that enhance agricultural systems and improve the profitability and sustainable development of Delaware agriculture.**
3. **Position Delaware as a leader in sustainable energy and a cleaner environment through development and adoption of new technologies.**
4. **Progress toward a sustainable environment while ensuring a prosperous economy by developing a statewide, comprehensive and coordinated research, education, work force, training and economic development capability.**
5. **Build a knowledge-based community in Delaware by establishing a public-private-academic partnership to link over 99% of Delaware's businesses, educational and medical institutions and households into a broadband, cyberinfrastructure by 2012 with focus on state of the art hardware, software and professional support.**
6. **Foster innovation, creativity and entrepreneurialism leading to science and technology-based economic development.**
7. **Determine if a competitive position can be established in nanotechnology and then define a program in selected sectors.**

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2008 Initiatives

Human Health

Submit a proposal to renew the Delaware NIH-NCRR-INBRE grant and request \$1M/yr of State cost sharing funds. The grant will be aimed at taking the next step in building a biomedical research capability in the State.

Continue the cancer program begun in the current INBRE, make investments to expand neuroscience research coordinated by the Delaware Neuroscience Consortium, and initiate a new program emphasizing cardiovascular research.

Support research and interventions to reduce health disparities and assist the Delaware Office of Minority Health.

Agriculture

Monitor the Solar Energy Research pilot project to determine economic viability. Issue the information guide titled "Solar Energy – an Investment and Cost Guide for Poultry Growers".

Evaluate the potential of Fraunhofer's technology to enhance the profitability of Delaware agriculture. Initiate a pilot demonstration if warranted.

Determine if Carbon Sequestration has economic potential in Delaware. Launch a demonstration project if appropriate.

Create a joint avian surveillance and diagnostic capability on the Delmarva Peninsula.

Plan and initiate a pilot program in corn to determine the effect of irrigation on nutrient uptake and runoff.

Pursue initiatives to develop bio-based energy sources in Delaware e.g. participants in the cellulose to bio fuels approach.

Sustainable Energy

Support the Sustainable Energy Utility (SEU) Task Force. Select the best technologies for a pilot demonstration.

Use the established statewide work group to develop recommendations to the Delaware Energy Council's next generation Energy Plan.

Environment

Secure a second NSF-EPSCoR grant (\$15M) for Delaware and secure State cost share funds. The grant will be used to develop the science, education and stakeholders' alignment to move towards a sustainable environment.

Education

Launch pilot programs with Delaware Technical and Community College and Delaware State University to demonstrate the 'Class room of the Future'.

Economic Development

Support the University of Delaware's Office of Economic Innovation and Partnerships to spur innovation, entrepreneurship and knowledge-based partnerships.

Assemble a public-private-academic partnership to explore the feasibility and potential routes to establish a widely accessible broadband cyberinfrastructure in the State.

Determine how the Council can advance Delaware's interests in the Base Realignment and Closing (BRAC) program involving the move from Fort Monmouth, NJ to Aberdeen, Md.

Support the Information Assurance Task Force's program to adopt electronic notarization in Delaware.

Consider expanding the capacity of Delaware Technology Park to meet growing academic and entrepreneurial needs in Delaware.

Continue to support the MANA initiative through a second grant proposal titled Rapid Nano Net to EDA. The purpose is to identify and connect strengths of the region using the web to stimulate academic and commercial partnerships.

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Goals

Goal 1: Biomedical Research

Develop strong biomedical research capability in Delaware

Current State

Health sciences are already a major element in the economy of Delaware and the goal is to increase their contribution by building a biomedical research capability in Delaware. The Delaware Economic Development Office estimates that in 2006 the Health Sciences Cluster employed 45,000 workers and added about \$3.0 billion to the state's GDP (about 5%). Key participants in this cluster include Christiana Care Health Systems (CCHS), the Helen F. Graham Cancer Center (HFGCC), Nemours A. I. Dupont Children's Hospital (Nemours), the University of Delaware (UD), Delaware State University (DSU) and the Delaware Biotechnology Institute (DBI). In 2002 the leadership of these organizations agreed to establish a biomedical research capability in the state, and significant progress has been made in cancer research capability and neuroscience. A number of world-leading private-sector companies engaged in life science R&D – e.g. DuPont, AstraZeneca, Incyte, Agilent, W.L. Gore, Strategic Diagnostics, etc– add considerable strength to Delaware's position.

Accomplishments

With support from the NIH-NCRR BRIN and INBRE grants, Delaware has built a statewide biomedical research infrastructure of people, facilities and programs involving the State's academic and medical institutions. Cancer was selected as the key focus area. Significant progress has been made by establishing and growing the Center for Translational Cancer Research.

Separately, the DSU-led Delaware Neuroscience Consortium was formed, involving nearly 60 scientists at Nemours, CCHS, UD, and DSU. It has created a distributed statewide 'center of excellence' focused on increasing the neuroscience portfolio, already encompassing over \$18 million in NIH grants alone. Additional neuroscience funding comes from NSF, DOD, and the VA. The role of the consortium is to maximize the effectiveness of Delaware's neuroscience research, build new capabilities in basic and translational neuroscience, support neuroscience education throughout the state, and reduce the human tragedy and financial cost of psychiatric and neurological disease to individuals, their families, and communities.

Based on an in-depth analysis of statewide strengths, needs and opportunities, research programs in the areas of cardiovascular and neuroscience have been selected as the next major steps in building Delaware's biomedical research capability. A new Center for Heart and Vascular Health located at the Christiana Care Hospital opened in November 2006. The Center contains 140 new in-patient rooms, an 87,000 sq ft state-of-the-art science education center and a 7,000 sq ft medical library.

A unique, multi-institutional research effort in biomedical imaging was established at DBI. DSU's NSF-funded Center for Research and Education in Optical Sciences and Applications (CREOSA) has advanced bioimaging capability, including confocal microscopy and LIBS.

In 2007 DSU created and continues to host the downstate People of Color Mental Health conference in conjunction with the Mental Health Association in Delaware.

Objectives

- Continue to build the statewide biomedical research infrastructure in order to develop the capability for high quality research and compete successfully for federal grants.
- Continue to support the development of the Center for Translational Cancer Research and the Biomedical Imaging Center.
- Begin the development of a new research area in Cardiovascular,.
- Increase the research component of the State's nursing programs.
- To support the above objectives, submit a second NIH-NCRR-INBRE proposal (\$3M/year for five years) in July '08 expecting award in 1Q'09. Request \$5M in cost share funds from the State in June '08.
- Continue to integrate biomechanical programs into the overall goal – for example, biomechanical research at DSU and UD's NIH funded program in biomechanical research.
- Support the development of a Center for Health Disparities Research at DSU.
- Strengthen and expand biomedical research and educational collaborations with out-of-state institutions, for example Thomas Jefferson University, the University of Pennsylvania, Drexel University, and the University of Medicine and Dentistry of New Jersey.

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Goal 2 Agriculture and Natural Resources

Develop and promote the adoption of technologies that enhance agricultural systems and improve the profitability and sustainable development of Delaware agriculture

Current State

Agriculture is one of the most important industries in the State. Animal-based agriculture is driven by poultry production, which is a half-billion dollar per year industry that accounts for about 70% of the total economic value of agriculture in the State. Delaware's livestock industries are also significant, with dairy valued at \$20 million, beef cattle at \$6 million, and swine at \$2.6 million.

Net farm income has increased steadily in the past decade, averaging \$122 million in 1997-1999, \$191 million in 2000-2002, and \$378 million in 2003-2005.

The state boasts an impressive basic biotechnology research capability and is now focusing on integrating biotechnology into agribusiness. Areas of existing strength are avian virology, physiology, genomics, basic plant biology and plant breeding.

The equine industry is growing rapidly and has become a major contributor to the state's economy. Irrigated agriculture is growing, providing stability to crop yields and offering opportunities to increase productivity. Expanded opportunities to use agricultural crops and by-products as bio-energy sources are stimulating interest in preserving farmland for new energy-based cropping systems. Solar cells are being evaluated as a low cost energy source in a poultry house pilot project. Future growth in Delaware's vegetable industry seems likely, given the proximity of Delaware to large urban populations with a growing interest in consuming locally grown vegetables. The "Green Industry" (greenhouses and nurseries), second only to corn in terms of commodity crop cash receipts, provides ever-increasing opportunities for small businesses engaged in the landscape industry and for innovative uses of greenhouses to produce new crops year-round.

Accomplishments

The State of Delaware Plan of Work (2007-2011) developed by the University of Delaware's College of Agriculture and Natural Resources and Delaware State University's College of Agriculture and Related Sciences includes 7 planned programs directly relevant to the State's Science and Technology Plan:

- Animal Biology, Health, and Production Systems
- Biotechnology and Biotechnology-Based Agribusiness
- Ecosystems and Biodiversity
- Food Science, Safety, and Technology
- Plant Biology and Crop Production Systems

Soils and Environmental Quality
Aquaculture

In addition, there are 20 multi-state research projects in place and this number will increase in the near future.

Objectives

- Monitor the Solar Energy Research pilot project to determine economic viability. Issue the information guide titled “Solar Energy – an Investment and Cost Guide for Poultry Growers”.
- Pursue an effort between Maryland, Delaware, and Virginia to create a joint avian surveillance and diagnostic capability on the Delmarva Peninsula.
- Determine the potential of Fraunhofer’s science and technology to enhance the profitability of Delaware agriculture and decide to run a pilot demonstration.
- Determine if Carbon Sequestration has economic potential in Delaware and decide whether to develop and initiate a demonstration project.
- Plan and initiate a pilot program to determine the effect of irrigation on nutrient uptake and runoff. Funding of \$250M has been allocated for 2008 study in the Chesapeake Bay watershed.
- Pursue initiatives to develop bio-based energy sources in Delaware.
- Areas for future exploration include:
 - Create a revolving loan program within DEDO or DEA to finance agriculture investments.
 - Develop a plan including necessary legislation to extract value from the State’s forestry assets in an environmentally acceptable manner.
 - Explore a promising fit for stationary fuel cells in Agriculture with potential uses in hatcheries, feed mills and soybean crush facilities.

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Goal 3: Sustainable Energy

Position Delaware as a leader in sustainable energy and a cleaner environment through development and adoption of new technologies

Current State

Two of Delaware's highest priorities are to assure reliable and affordable energy and to transition in the way energy is supplied and used. Air pollutants that impact climate change in Delaware largely come from energy consumed for transportation, electric power generation and industry. About eighty-four percent of electrical energy in Delaware is generated from fossil fuels (about forty-five percent is imported).

Electrical rates have soared nearly sixty percent since 2006 as has the price of transportation fuel. Significant new legislation was passed and later signed by the Governor in July, 2007 that offers encouragement to Delaware residents and businesses to adopt conservation practices, energy efficient devices and consumer-sited renewables. Large Delaware companies such as DuPont, W.L. Gore, General Electric and Air Liquide along with many smaller companies and academic institutions have committed substantial research and development effort to the pursuit of alternative energy solutions. Some participate in federal grant programs and have global research partnerships.

The economic potential for Delaware and the opportunity to be a national player in alternative energy are high. The State can implement policies that regulate and offer incentive to practice energy conservation, purchase improved efficiency devices and transition to alternative choices to fossil fuels. It is in a position to encourage private and academic research and development projects and pilots for alternative energy technologies.

Accomplishments

A 42kW solar cell demonstration project was initiated by the S&T Council to assess the economics of solar energy. The facility was designed and built by WorldWater and Power with input and components from GE. It was installed in April 2007 at an Allen Family Foods poultry house in Laurel Delaware and has met expectations. The \$650,000 project was funded through multiple grant sources to cover both installation and extensive data monitoring conducted by UD – College of Agriculture.

New technology to dramatically increase the efficiency of solar cells has been demonstrated by a UD led consortium funded by a grant from the Defense Advanced Research Project Agency. The project has transitioned to a \$100million grant to DuPont for commercialization. The University of Delaware is a participant in this program.

A well-balanced Alternative Energy Subcommittee of the Council has been formed and is functioning. Relevant studies by the State have been circulated for mutual grounding.

Delaware State University established the Center for Hydrogen Storage Research, funded by DOE, DOT, BP, and Ion Power. Researchers work to improve fuel cell technology and have

already shown that several types of borohydride compounds have the potential to achieve DOE's 2010 goal of 6 weight percent hydrogen.

The University of Delaware Energy Initiative was established and has hosted several conferences.

Objectives

- Determine the economic viability of solar energy in the poultry industry. Distribute “Solar Energy - an Investment and Cost Guide for Poultry Growers”.
- Establish a statewide Work Group to develop recommendations to the Delaware Energy Council’s next generation Energy Plan with meetings and workshops to be conducted throughout 2008.
- Communicate the mission of the Sustainable Energy Utility (SEU) and discuss opportunities, goals and initiatives in order to stimulate the evaluation and commercialization of new sustainable energy technologies.
- Leverage inter-institutional research programs and identify opportunities for funding basic research and advancement of technologies of commercial promise, particularly in solar, wind and fuel cell applications.

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Goal 4: Sustainable Environment

Progress toward a sustainable environment while ensuring a prosperous economy by developing a statewide, comprehensive and coordinated research, education, work force, training and economic development capability

Current State

The State of Delaware represents a unique space to address the issues and opportunities involved in reaching a sustainable environment. Most of the State is coastal plain. It has an extensive and fragile coastal ecosystem. A growing population is placing enormous pressure on the development of farmland and redevelopment of urban brown fields. Tourism as an economic sector is placing demands and stresses on the coastal ecosystem. The Delaware estuary is a large brackish body of water and there are extensive marshlands that are critical fish and crab habitats. Also part of the coastal zone has been designated a wild life sanctuary which is part of a major bird migratory flight path.

The State has environmental issues that are locally important and nationally relevant. For example, agriculture, particularly poultry, is a major industry in the State with issues that include pesticide runoff, arsenic contamination and particulate release from poultry houses. Algae blooms in the coastal waters and particle release from marshland are recurring environmental issues. Also a long history of industrial production, particularly chemicals, has left the state with brown fields and superfund sites.

Delaware has a track record of effectively identifying, prioritizing and acting on difficult issues and valuable opportunities - due in part to its small size and constancy of purpose. However, interaction among academic scientists and environmental practitioners (both government and the private sector) is often sporadic and lacks a process to maximize effectiveness. Similarly, the Delaware institutions of higher education (UD, DSU, DTCC) and Wesley College) have significant capability in disciplines critical to environmental sustainability, but the efforts are dispersed across various Departments and lack the interdisciplinary nature required for full impact.

Accomplishments

Delaware's first NSF- EPSCoR RII award (RII-1, March 2005 – February 2008, \$6 million over three years from NSF with \$3 Million in State cost sharing, entitled "Complex Environmental Systems and Ecosystem Health") took steps to address the above issues by building a statewide academic infrastructure of people, programs, and facilities, with an emphasis on environmental science. This infrastructure was designed to interconnect the State's institutions of higher education. The Delaware Biotechnology Institute (an academic unit of UD with a statewide mission to coordinate the development of Delaware's life science capabilities) served as the managing partner. Other outcomes from this EPSCoR award included seed

grants to build partnerships among scientists across the network and establishing The Center for Critical Zone Research.

Funded by the NOAA Education Partnership Program, DSU has participated in the Environmental Cooperative Science Center and the Living Marine Resources Cooperative Center, which together are providing \$1.85 million. With these funds DSU conducted an integrated assessment of the Delaware National Estuarine Research Reserve (DE-NERR) to help the state determine research issues critical to the conservation of its coastline. Currently NOAA-funded research projects are focused on the state priority to optimize management strategies for conservation and germplasm preservation of Blackbird Creek.

A proposal for a second Delaware NSF-EPSCoR RII (RII-2) grant for \$15 million over five years has been submitted. Cost share funds of \$5 million have been requested from the State. The RII-2 goals are: (1) continue to develop the interdisciplinary research and education infrastructure begun under the previous grant with a more focused effort on environmental science, (2) develop future scientists and technologists in increasing numbers and diversity and strengthen scientific literacy throughout the State and (3) capture the educational, social and economic benefits of the Discovery-based research by developing the “EPSCoR Integrative Process”. This Process will build a stakeholders network among academic institutions, government and the private sector to match needs with research capabilities. It will create teams with expertise in the science, economics, ethics, policy and social dynamics to develop and implement more comprehensive solutions to environmental problems.

Objectives

- Receive NSF approval of the EPSCoR RII-2 proposal and begin program implementation – July 2008
- Receive the first installment (\$1M) of the State cost share funds for RII-2 grant (\$1 million/year for five years).
- Build the Statewide Environmental Stakeholders network
 - Sensing workshop- July 2008
 - DNREC Needs assessment – timing TBD
 - Environmental Summit – Target February 2009
- Develop the team of experts for the “EPSCoR Integrative Process” – January 2009
 - Develop three pilots as proof of concept
- Develop an “Environmental Needs” Strategic plan – first draft by June-2009

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Goal 5: Cyberinfrastructure

Build a knowledge-based community in Delaware by establishing a public-private-academic partnership to link over 99% of Delaware's business, educational and medical institutions and households into a broadband cyberinfrastructure by 2012 with focus on state of the art hardware, software and professional support.

Current State

A Blue Ribbon NSF Advisory Panel has stated in 2003 “that a new age has dawned in scientific and engineering research, pushed by continuing progress in computing, information, and communication technology, and pulled by the expanding complexity, scope, and scale of today's challenges. The capacity of this technology has crossed thresholds that now make possible a comprehensive “cyberinfrastructure” on which to build new types of scientific and engineering knowledge environments and organizations and to pursue research in new ways and with increased efficacy.” To implement this vision, the NSF has launched the Advanced Cyberinfrastructure Program (ACP).

Delaware must be at the leading edge of the ACP. Providing wide access to a statewide, broadband cyberinfrastructure will significantly improve the State's competitiveness for scientific research, education and economic development. Due to its central location in the mid-Atlantic region, Delaware is well positioned to develop a leadership role as a knowledge-based community. Due to its central location on the mid-Atlantic coast, Delaware's academic institutions are already well connected to the nation's scientific broadband networks (Abilene and the National LambdaRail). Delaware is a member of the NIH-INBRE and NSF-EPSCoR communities, and, through the leadership of the Delaware Biotechnology Institute, has established a lead position in developing an academic-based cyberinfrastructure among the Northeast INBRE States (New Hampshire, Maine, Rhode Island, Vermont and Delaware). The intent of this initiative is to build on the scientific North East Network Initiative (NENI) and expand its impact across Delaware with a broadband collaboration to include the private and public sectors. A public-private-academic partnership has the potential to put Delaware into a leadership position with regard to broadening access to this vital emerging and evolving technology.

Accomplishments

Delaware is connected to Internet 2. A regional collaboration has been initiated among the member states of the INBRE North East Region to improve access to significantly upgraded state-of-the-art cyberinfrastructure. The design is based on the LARIAT Network Initiative that connected Alaska, Hawaii, Montana, Nevada and Wyoming to the National Grid and follows the NSF Cyberinfrastructure Vision for 21st Century Discovery. With support by the NIH-INBRE and the NSF-RII-1, all of the Delaware's academic and clinical partner institutions have put in place dedicated laboratories or classrooms to support bioinformatics research and

cyber-learning activities. Initial funding (\$500K) for this initiative was secured in fall 2007 from NIH under an INBRE supplement. Additional funding opportunities will become available this summer, when the NENI states compete for the 5-year NIH-INBRE renewal, and through a new cyber-initiative led by the NSF EPSCoR Office in collaboration with the NSF Office of Cyberinfrastructure (OCI).

Objectives

- Establish a statewide cyberinfrastructure task force to define the current state of broadband capability and accountability in the State.
- Assemble a public-private-academic partnership program to explore the feasibility and potential routes to establishing a widely accessible broadband cyberinfrastructure in the State.
- Strengthen the capacity and capability of the State's cyber-knowledgeable professional faculty and staff.
- Collaborate with the North East Network Initiative to develop a regional cyberinfrastructure program and incorporate appropriate elements into the Delaware initiative.
- Include a cyberinfrastructure component in the INBRE grant renewal proposal (~July-2008 submission for possible May 2009 funding)
- Prepare and submit a cyberinfrastructure improvement proposal as a part of the NENI consortium to NSF EPSCoR and OCI (Fall 2008).
- Support and implement innovative and effective cyber-assisted learning modules and distance learning strategies to bring up-to-date educational opportunities to more Delawareans, despite classroom shortages and high gas prices. DTCC and DSU plan to develop "Classrooms of the Future" concepts by integrating cyber-enabled education tools to facilitate teaching of courses to a broader number of students.

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Goal 6: Innovation, Creativity, and Entrepreneurialism

Foster innovation, creativity and entrepreneurialism leading to science and technology-based economic development.

Current State

In 2003, the Council on Competitiveness held a summit to educate and motivate leaders in the State to the realities, the threats and the opportunities from the development of the global economy. The outcome of that conference led to two conclusions: the academic institutions and the private and public sectors need to partner for future growth and the State and regional leadership need to foster a more dynamic entrepreneurial environment. The 2007 report *Rising Above The Gathering Storm* has served as a driver for the American Competitiveness Initiative and other national-level programs to address two key challenges that are tightly coupled to scientific and engineering prowess: creating high-quality jobs for Americans, and responding to the nation's need for clean, affordable, and reliable energy. To address those challenges, the report outlines ideas according to four basic recommendations that focus on the human, financial, and knowledge capital necessary for US prosperity. The four recommendations focus on actions in K–12 education, research, higher education and economic policy

The protection, development and commercialization of Intellectual Property (IP) are an important component of the State's competitiveness and prosperity. An important source of such intellectual property comes from the inventiveness and entrepreneurialism at the State's academic institutions. In this context, both the University of Delaware and Delaware State University have committed to improve the effectiveness of their IP processes.

Accomplishments

First State Innovation (FSI), a privately led initiative, has been created to accelerate the prosperity of Delaware's people by attracting and retaining entrepreneurial and innovative businesses and supporting infrastructure in Delaware and the surrounding region by connecting them with a strong supporting infrastructure. The end of 2007 has achieved a funding base of \$1million.

Delaware State University has initiated bimonthly Innovative Technologies talks and networking forums to bring together government, business, and academic participants.

The University of Delaware has created the Office of Economic Innovation and Partnerships (OEIP with the following mission:

Function as a portal that connects the University's knowledge-based assets and its leadership capabilities with the needs and opportunities of potential collaborators resulting in partnerships that produce economic and social benefit and provide students with career mentoring, internships and employment opportunities.

Promote innovation and entrepreneurship among students, faculty and staff through a program that provides education, mentoring, 'laboratory' experience and private sector internships and which contributes to the growth of the University's knowledge-based assets.

Develop an Intellectual Property Center that catalyzes invention and develops and markets the University's portfolio of intellectual property. A re-engineered IP process has been developed; five pilot projects are underway to test the process.

Lead the development of science and technology-based economic development in the State.

A State, academic and private sector Economic Development Summit was held in November 2007 and regarded as highly successful in making entrepreneurial culture a State priority.

The Presidents Forum on Entrepreneurship sponsored by UD was held on April 25, 2008.

Objectives

- Support First State Innovation in building relationships at large and small technology-based companies, securing funding for operations and a process to evaluate and assist emerging businesses secure seed capital.
- Support the mission of the University of Delaware's Office of Economic Innovation and Partnerships.
- Accelerate economic development in central and southern Delaware by establishing and developing significant new research and technology infrastructure at Delaware State University to foster innovation, catalyze knowledge-based partnerships in Central and Southern Delaware, and support the knowledge and technology needs of government agencies.
- Develop plans to expand incubation capacity proximate to both Universities to meet growing academic, start-up and anchor tenant needs.
- Support UD's efforts to establish an effective IP process and consider adoption at other institutions of higher education in the State. Establish a "Gap Fund" to pay for "proof of principle" development for selected inventions.
- Support Greater Newark Network to create a science and technology-based community of private, academic, retail and residential participants.
- Engage in the process of Base Realignment and Closure (BRAC) impacting the relocation from Fort Monmouth, New Jersey to the Aberdeen Proving Grounds in Maryland. This will result in 30,000 new technology jobs by 2015. This is an important opportunity for the State.
- Implement Information Assurance Task Force recommendations.

Goal 7: Nanotechnology

Determine if a competitive position can be established in nanotechnology and then define a program in selected sectors.

Current State

MANA was launched in the Fall of 2004 as a collaborative effort between Ben Franklin Technology Partners of Southeastern Pennsylvania, The New Jersey Commission on Science and Technology and the Delaware Technology Park. As nanotechnology is bridging multiple industry sectors and academic disciplines, new efforts are emerging in the Mid-Atlantic Region of the United States to develop robust nanotechnology opportunities across state borders. MANA's mission is to position the tri-state area as a global hub for expanded research, development, application and commercialization of nanotechnology by:

- Highlighting emerging opportunities, sharing knowledge, and facilitating best practices.
- Attracting and securing investments to accelerate commercialization.
- Marketing the region's strengths and capabilities.

Over 100 companies are engaged in nanotechnology research and product development, including DE companies such as DuPont, AstraZeneca, W.L. Gore, Air Liquide and many smaller ones such as NanoSelect, ANP Technologies, Ultrafine Technology and EM Photonics. Over 80 universities, many with nanotechnology research grants and expert faculty, are located in our region. Examples include Penn State, Lehigh, U of Penn, Drexel, Rutgers, Princeton and U of Delaware.

The Mid-Atlantic region is well positioned to be one of the world's leading "go-to" regions for prototyping and commercializing nanotechnology. Delaware can be a significant part of the regional DE/PA/NJ Mid-Atlantic Nanotechnology Alliance (MANA).

Accomplishments

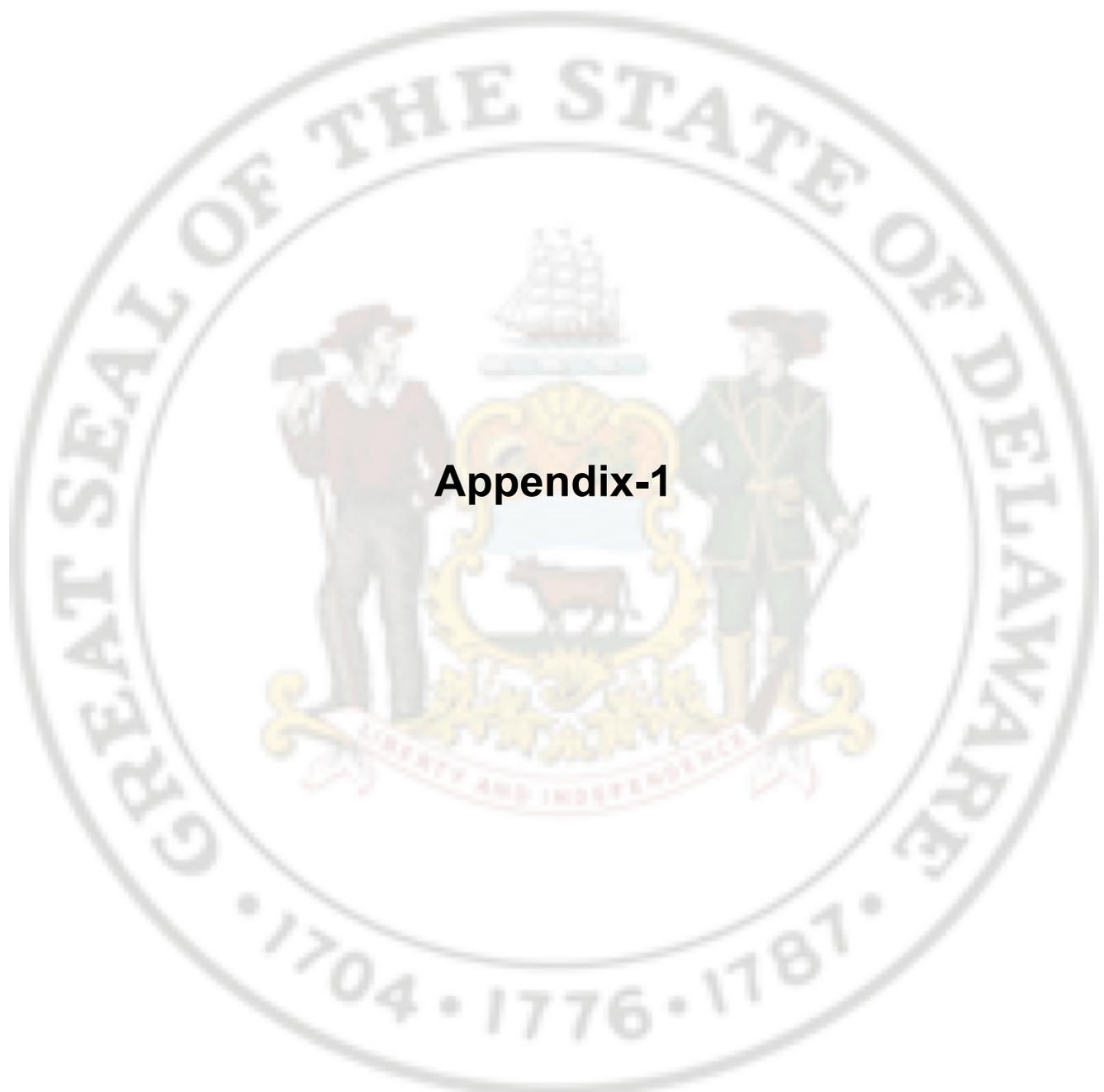
MANA commissioned Battelle Technology Partnership Practice to produce a study with recommendations entitled "*Getting to the Future First*". The report issued in October, 2006 with a full press event. It identified the region's nanotechnology assets, academic research grants, patents, commercial product developments and leading science and business leaders. A Nanotechnology Council has been formed at UD to identify assets and expert faculty for leveraged research grant and possible center proposals.

A major \$5 million NSF grant to DSU for the Center for Research in Optical Sciences and Applications (CREOSA) builds on Delaware's substantial investment in the Center for Applied Optics and is enabling significant new capability in nanoscience and nanotechnology research and applications.

Objectives

- Continue the progress of MANA through a second grant proposal titled Rapid Nano Net to EDA .The purpose is to identify and connect strengths of the region using the web to stimulate academic and commercial partnerships.
- Explore the benefits of creating a Delaware Nanoscience Consortium modeled on the successful and growing Delaware Neuroscience Consortium led by DSU.
- Identify areas of strength across Delaware and initiate interdisciplinary and inter-institutional grant proposals to expand capability. Focus is on bio-nanotechnology, alternative energy, electronics/optics and catalysis. A major academic and private sector conference is planned at UD.
- Support DuPont-proposed national criteria for rules on the evaluation of safety risks and environmental impact of nanotechnology products.

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Appendix-1

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Executive Order #88
June 20, 2006

WHEREAS, science and technology-based research, education, business and economic development has been, and continues to be, critical to the growth and prosperity of Delaware; and

WHEREAS, the emergence of a knowledge-based economy will require participation in new areas of endeavor such as the life sciences, biotechnology, nanotechnology and alternative energy; and

WHEREAS, effective collaboration among the public, private and academic communities is a unique Delaware strength; and

WHEREAS, it is critical that Delaware use these collaborations and partnerships to create new economic opportunities for Delawareans now and in the future; and

WHEREAS, these actions will help make Delaware a leader in emerging areas such as life sciences, biotechnology, nanotechnology, and alternative energy,

NOW THEREFORE, I RUTH ANN MINNER, by the power vested in me as Governor of the State of Delaware, hereby declare and order that:

1. The Delaware Science and Technology Council (the “Council”) shall be established as a statewide organization responsible to:

- (a) Improve the competitive position of Delaware so that it is recognized broadly as a center of excellence in science and technology;
- (b) Provide advice, guidance and advocacy on issues and opportunities in research, education, business, economic development and public policy;
- (c) Develop and implement a statewide science and technology strategic plan;
- (d) Foster Delaware’s uniqueness as a dynamic place for scientific and business talent by developing an innovative, entrepreneurial and business friendly environment, facilitating incubation and commercialization and encouraging collaborations within the State and the region;
- (e) Identify and secure resources to support Council initiatives in cooperation with the Council on Competitiveness and other appropriate state and regional initiatives;
- (f) Coordinate and foster communication between different areas of science & technology to discover unique opportunities at the interfaces of different business sectors;
- (g) Identify sources of seed and venture capital;

- (h) Become recognized as a reputable resource to help understand science and technology issues and opportunities and as a source of relevant information; and
- (i) Provide oversight to the State's NSF-EPSCoR office (National Science Foundation – Experimental Program to Stimulate Competitive Research) and execution of the EPSCoR RII (Research Infrastructure Initiative) grant, with the purpose of building research and development capacity,

2. Council Membership

The Council shall have between 20 and 25 members representing leadership from the academic, public and private sectors. The Chair and Vice Chair must come from different sectors, i.e., one from the public sector and the other from the private sector of academia. The Chair, Vice Chair and Council members will be appointed by the Governor. Designated position on the Council will include:

- (a) The Provosts of the three public institutions of higher education;
- (b) The Secretary of Agriculture;
- (c) A representative from the Governor's Office;
- (d) The Director of the Delaware Economic Development Office;
- (e) Four members of the General Assembly, one appointed by the President Pro Tempore of the Delaware State Senate, one appointed by the Minority Leader of the Delaware State Senate, one appointed by the Speaker of the Delaware House of Representatives and one appointed by the Minority Leader of the Delaware House of Representatives; and
- (f) The remaining members will be public members appointed by the Governor, the majority coming from the private sector, representing (1) the critical business segments and (2) business life cycle from incubation to maturity.

All appointed members shall serve at the pleasure of the person appointing them.

3. Council subcommittees

The Council will be served by Science and Technology Subcommittees responsible for specific science and technology segments. The Chair and membership of each subcommittee will be drawn from the academic, public and private sectors as appropriate. Each subcommittee will be responsible to develop a strategic plan for review with the Council and each will be supported by a member of an administrative group chaired by the Director of the Delaware Biotechnology Institute. The segments to be addressed initially include human health, agriculture and natural resources, alternative energy, nanotechnology, education/work force development and oversight of the State's NSF-EPSCoR initiative.

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Membership of the Council is:

John Carney – Chair	Lt. Governor
John O’Brien – Vice Chair	AstraZeneca
Mark Barteau	UD
Michael Bowman	Delaware Technology Park
Uma Chowdry	DuPont
Charles Copeland	DE Senate
Joe DiPinto	City of Wilmington
Bill Hartman	Fraunhofer
Ben Hsu	Quest Pharmaceutical Services
Will Johnson	Gore
Matt Knight	Consultant
Brian Little	Christiana Care
Judy McKinney-Cherry	DEDO
Fred Melchior	Intervet
Jim Rand	GE
Dan Rich	UD
John Riley	Hercules Inc.
Hazell Reed	DSU
Michael Scuse	DE Secretary of Agriculture
Shekar Shetty	Air Liquide
Byron Short	DE House of Representatives
Ileana Smith	DTCC
David Sokola	DE House of Representatives
Tom Sturgis	Wesley
David Weir	OEIP
Robert Woods	AthenaBio
TBD	Governor’s Office

Membership of the Council’s Executive Committee is:

David Weir - Chair	OEIP
Mark Barteau	UD
Mike Bowman	Delaware Technology Park
John Carney	Lt. Governor
Matt Knight	Consultant
Judy McKinney-Cherry	DEDO
John O’Brien	AstraZeneca
Dan Rich	UD
John Riley	Hercules Inc.
Hazell Reed	DSU

The role of the Committee is to prepare agenda content for Council consideration and action.

Recommendations from the action plans will be brought to the Council for consideration.

Subcommittees, with the requisite skills, have been or are being established for each segment to prepare recommendations.

Human Health/ Biomedical Research	Nicholas Petrelli - Chair	HFGCC
	Bill Ferguson	OEIP
	Paul Friedman	Incyte
	Vicky Funange	Nemours
	Melissa Harrington	DSU
	Brian Little	CCHS
	Bill Mezzanotte	AstraZeneca
	Karl Steiner	DBI
	William Weintraub	Christiana Care – CCOR

Agriculture and Natural Resources	Robin Morgan - Chair	UD
	Konrad Kmetz	OEIP
	Dyremple Marsh	DSU
	Marty Ross	DE Agriculture
	Mike Scuse	Dept. of Agriculture
	David Weir	OEIP

Alternative Energy	Mike Bowman - Chair	DTP
	Mark Barteau	UD
	John Byrne	UD
	Phil Cherry	DNREC
	Andrew Goudy	DSU
	Wil Johnson	W.L. Gore
	Andrea Kreiner	Andrea Kreiner Company
	John Pierce	DuPont
	Jim Rand	GE
	Chris Sherring	WorldWater and Power
	Shekar Shetty	Air Liquide
	Carolyn Thoroughgood	UD
	David Weir	OEIP
Larry Windley	Senator Carper's Staff	

Environment	Steve Borleske - Chair	DBI
	Bob Scarborough	DNREC
	Don Sparks	Critical Zone Research

Cyber infrastructure	Karl Steiner - Chair	DBI
	Ann Altoe	Nemours
	Daniel Grim	UD Network and System Services
	Steve Hess	CCHS
	Thomas Jarrett	Dept. Technology and Innovation
	Russell Merrill	DSU
	Robert Messner	DTCC
	Benjamin Wells	Wesley
Nanotechnology	Mike Bowman - Chair	Delaware Technology Park
	Dennis Cramer	UD
	Beverly Hartline	DSU

A subgroup of the Council functions as an Executive Committee, preparing agenda items for Council consideration and action.

A specific set of criteria have been developed to evaluate and prioritize opportunities and propose action.

These are:

- Alignment with the Council’s strategic plan - Strong fit with at least one of the Council’s strategies. Meets a clear strategic need/opportunity; improves quality of life; helps achieve a sustainable environment; strengthens an existing segment; initiates a new segment; improves infrastructure.
- Economic development/wealth generation - Creates high quality jobs; develops new business start-ups; attracts new businesses to the state; infuses new scientific talent; supports established business.
- Partnerships and Collaborations - Promotes partnerships/collaborations; is interdisciplinary/inter-institutional; is aligned with the strategic priorities of two or more of the major stakeholders; is a route to resources.
- Competitive Position - Develops a new segment; has unique science and technology; has commanding Intellectual Property (IP); builds on existing strength; has potential business growth beyond Delaware.
- Compelling Demonstration - Demonstrates the science/technology underlying the initiative; can be reduced to practice; designed into a pilot demonstration.
- Emerging Opportunities - Seize The Day – Respond quickly to unforeseen, ‘out of left field’ opportunities that appear to have economic development potential.
- Emerging Public Interests – Consider special priority in view of public demand.