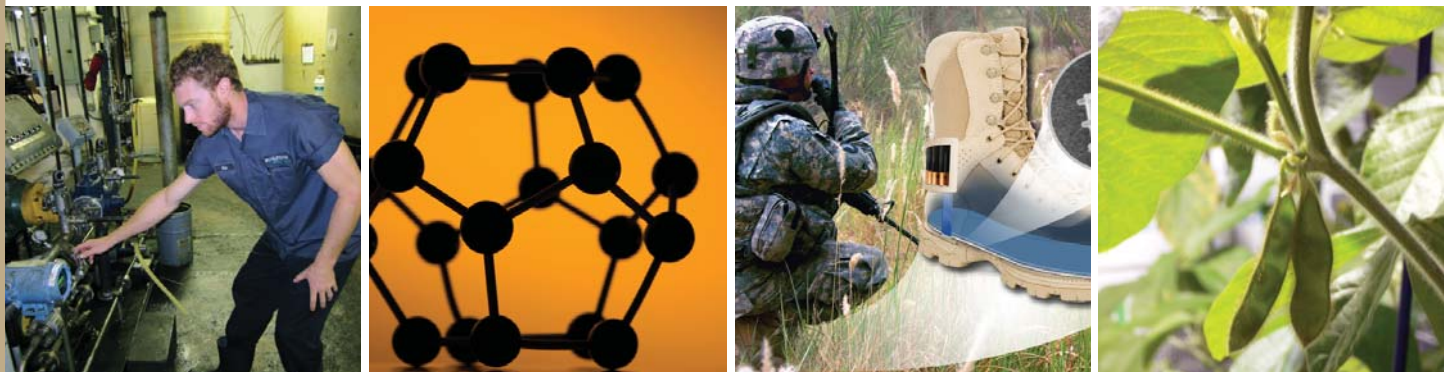


Office of Science & Technology

Continuation Review Final Report

As Required by S.L. 2011-145



To be submitted to the Fiscal Research Division
of the NC General Assembly on or before March 1, 2012

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North Carolina Office of
Science & Technology

**NORTH
CAROLINA**

DEPARTMENT OF COMMERCE

CONTENTS

1) EXECUTIVE SUMMARY	3
2) CURRENT ENVIRONMENT	5
2.a. Description of Office, Mission, Goals & Objectives	8
2.b. Categorization of Mission, Goals & Objectives	11
2.c. Current Program Activities (2001-Present).....	21
2.d. Resource Allocation	26
3) PROGRAM PERFORMANCE	28
3.a. Discussion & Analysis of Performance Measures & Data	28
3.b. Discussion of Whether Objectives Have Been Achieved	51
4) LINK BETWEEN FUNDING RESOURCES & STATEWIDE SOCIETAL IMPACT.....	53
5) PROGRAM JUSTIFICATION	54
5.a. Rationale for Recommended Funding Level.....	54
5.b. Consequences of Discontinuing or Reducing Program Funding	58
6) RECOMMENDATIONS TO IMPROVE EFFICIENCY & EFFECTIVENESS	60
6.a. Improving Services	60
6.b. Reducing Costs or Duplication	61
6.c. Statutory, Budgetary or Administrative Changes	61
7) EXTERNAL FACTORS.....	64
7.a. Policy Issues for Consideration by the General Assembly	64
7.b. Other Relevant Information	64
EXHIBIT A: CURENT MEMBERS OF THE NC BOARD OF SCIENCE & TECHNOLOGY	66
EXHIBIT B: PROFILES OF GRANTEES	67
EXHIBIT C: LETTERS OF SUPPORT	76

1) EXECUTIVE SUMMARY

CURRENT ENVIRONMENT

North Carolina's transition from an agricultural and traditional manufacturing economy to a knowledge- and innovation-based economy fueled by science & technology continues to evolve at a rapid pace. While the state has made tremendous progress during the past several decades, the per-capita income of its citizens has never risen to a level equal to or above the U.S. average and as a share of U.S. per capita income has been declining for more than a decade. Moreover, the levels of economic development and income vary considerably across the state, with the vast majority of counties ranking well below average and a small minority of counties ranking above average. North Carolina can and must do more to increase and broaden the participation of its citizens in the New Economy. Only through such steps will the state's overall standard of living increase meaningfully.

OST MISSION, GOALS, OBJECTIVES, ACTIVITIES, AND RESOURCES

The North Carolina Department of Commerce's Office of Science & Technology (OST) has played a leading role in positioning North Carolina to compete in the New Economy. Yet throughout this last decade, coincident with the dramatic and emerging new economic changes occurring globally, OST's resources and functions have shrunk, diminishing the state's focus on New Economy issues. This pattern does not serve North Carolina well.

OST's mission is to improve the economic well-being and quality of life of all North Carolinians through advancing science, technology, and innovation. It does so by executing the statutorily defined powers and duties of the North Carolina Board of Science & Technology and the NC Department of Commerce's economic development efforts, particularly those focused on small, high-tech, entrepreneurial, and innovative businesses. It is the only office that does so.

Operationally, these powers and duties fall into two broad categories—**strategic and tactical**—that enable OST to fulfill the following roles critical for enabling North Carolina to compete in the innovation-driven New Economy:

ROLE	EXAMPLE
STRATEGIC	
• Champion & Communicator	Leading/distributing NC technology roadmaps to chart NC's economic future
• Evaluator & Advisor	Creating/using NC innovation indexes to evaluate and inform policy and programs
TACTICAL	
• Convener & Facilitator	Organizing/leading NC technology conferences & workshops to catalyze businesses
• Funder & Implementer	Developing/administering NC technology commercialization grant programs
• Recruiter & Retainer	Attracting/keeping high-tech, high-growth, entrepreneurial businesses to/in NC

OST's two full-time staff execute these powers and duties with a lean operating budget that has shrunk from \$295,000 in FY 2003 to its current level of \$215,000 in FY 2012. Similarly, the budget for the technology commercialization grant programs OST administers has shrunk from \$5 million in FY 2007 to \$0 in FY 2012. OST cannot serve the science, technology, and innovation-based New Economy needs of its citizens if it lacks resources to execute its strategic and tactical work.

OST PROGRAM PERFORMANCE

OST's accomplishments are significant and numerous. In the 1980s, through its support of the Board of Science & Technology, OST fulfilled largely a strategic role and was directly responsible for proposing and advocating for the **North Carolina School of Science and Mathematics, MCNC**, and the **North Carolina Biotechnology Center**. These organizations, at the core of the state's technology infrastructure, are the envy of, and are being emulated by, other states and nations.

In the 1990's, OST fulfilled both strategic and tactical roles, recommending and implementing several well-known strategic initiatives and benchmarking efforts, such as the **North Carolina Information Highway, Universal Service**, the **NC Science and Mathematics Alliance**, and **Vision 2030**. These efforts supported and reinforced the infrastructure established during the previous decade.

Since 2003, OST has continued its strategic and tactical roles, including researching, analyzing, and preparing **North Carolina Innovation Indexes**, leading and executing **North Carolina's Nanotechnology Roadmap**, and **developing and administering grant programs that help small, entrepreneurial businesses develop and commercialize technologies**. These programs have:

- enabled the creation and retention of hundreds of high-skills, high-paying jobs throughout NC,
- enabled technology/business-development partnerships among NC universities & businesses,
- enabled the development of hundreds of new forms of intellectual property,
- enabled small businesses and to garner and leverage significantly larger amounts of funding from external sources (*More than \$170 million. On average, for every \$1 the state provides to the businesses, they receive an additional \$8 dollars from other sources*),
- enabled the small businesses to project more than \$60 million in 2012 sales directly related to the products and services developed and commercialized with state support.

OST PROGRAM JUSTIFICATION

Options for OST moving forward range from (1) moderate expansion, to (2) low-cost expansion, to (3) continuation as is. Each of these options, discussed in more detail in section 5 below, offers the General Assembly a choice that entails balancing critical goals (e.g., economic development, job creation/preservation, improved quality of life) and budget constraints. Recognizing the current intensity of the budget constraints and the desire not to increase the size of government, the options are modest in their request. OST's preferred option is #1, which would entail 1 new FTE to help implement **new strategic initiatives** and **new and existing tactical programs**, as directed by General Assembly. This option would most improve North Carolina's competitive position in the New Economy.

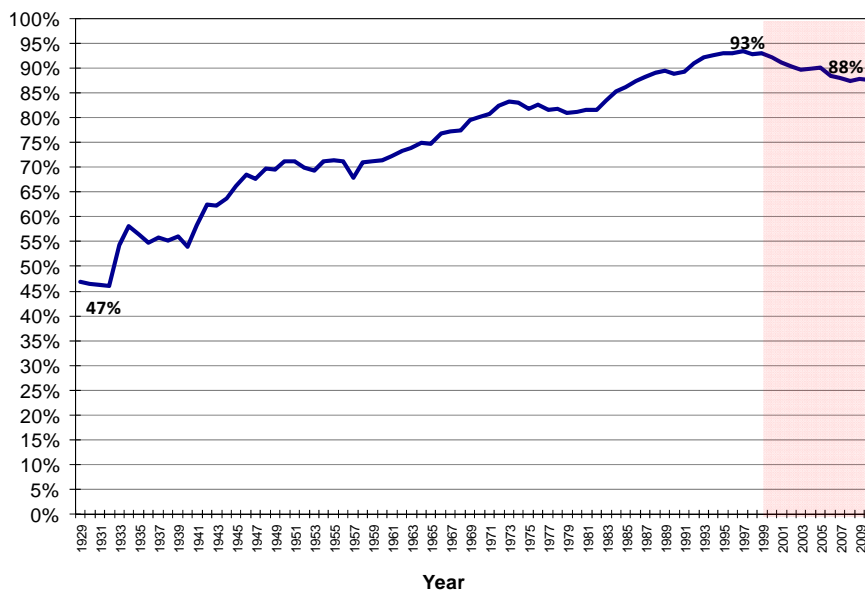
RECOMMENDATIONS TO IMPROVE OST EFFICIENCY AND EFFECTIVENESS

A primary recommendation of this report is for OST to continue to refine and enhance its self-evaluation process with closer assistance and oversight from the General Assembly and its staff. Other recommendations, as detailed in section 6 below, include statutory changes to increase the number of legislative appointees to the Board of Science & Technology, increase the geographic representation of the Board, and increase the industry/sector representation of the Board.

2) CURRENT ENVIRONMENT

North Carolina's transition from an agricultural and traditional manufacturing economy to a knowledge- and innovation-based economy fueled by science and technology continues to evolve at a rapid pace. For nearly a century, the state has responded to this transition by making strategic investments in infrastructure, institutions, and human capital. Because of these investments, North Carolina has achieved a leading role in the "basic" and early-stage "applied" research that forms the foundation for breakthrough innovations. These innovations have helped North Carolina's per-capita income as a share of U.S. per-capita income more than double during the last century, increasing steadily from a low of 47 percent in 1929 to a high of 93 percent in 1999 (see figure below).

NC's Per-Capita Income as Share of U.S. Per-Capita Income, 1929-2010
(Increased between 1929-1999; decreased since then)



Yet these investments, while significant and impactful, have never managed to propel North Carolina's per-capita income to a level above the median per-capita income for the nation as a whole. Moreover, the economic transformations of the last decade present an especially challenging new chapter in our history. Now more than ever, global competition and the rapid pace of innovation—hallmarks of the New Economy—are outstripping the benefits of our investments and policies, causing the gains of previous decades to slip away as quickly as they arose. **North Carolina's per-capita income as a share of U.S. per-capita income now stands at only 88 percent of the U.S. value, a steady and**

Key Fact

*New Economies are knowledge-based, globalized, entrepreneurial, IT-driven, and innovation-based. **Science and technology—which fuel innovation—are critical to enabling the New Economy and its traits.***

Key Fact:

***Innovation**—the creation and adoption of new products, services, and business models—is an ongoing process that creates new industries, makes existing ones globally competitive, and drives future economic growth and well-being.*

Key Fact:

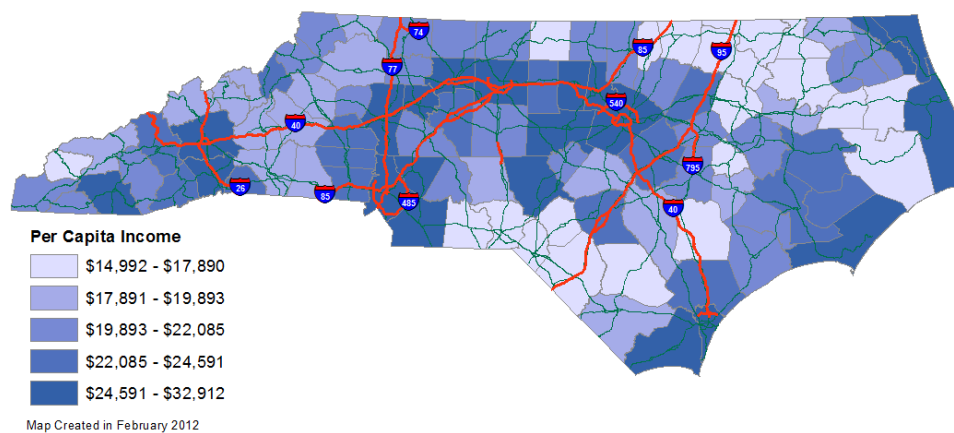
Innovation:

- Provides a **first-mover advantage in new products and services**, expanding exports and creating expansionary employment effects;
- Leads to a **virtuous cycle of expanding employment**;
- Leads to **increased wages and lower prices**, both of which expand domestic economic activity and create jobs.

significant decrease of more than 5 percent from where it had risen in 1999 at the peak of its ascendance.

Underlying these patterns is a more troubling fact: the levels of economic development and income vary considerably across the state, with the vast majority of counties ranking well below average and a small minority of counties ranking above average. **Notably, of the state's 100 counties, only 24 have an average per capita income of \$24,000 or higher** (see map below).

NC's Per-Capita Income by County, 2010



Even more striking, the Raleigh-Durham Combined Statistical Area (MSA), at the heart of the Research Triangle region and the state, has 18.6 percent of the state's population but has:

- 31.9 percent of the state's engineers and architects
- 45.2 percent of the state's workers in computing and math
- 48 percent of the state's technology intensive jobs 51.7 percent of the state's life, physical and social scientists
- 50 percent of all the state's patents awarded
- 80 percent of the state's Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants
- 85 percent of the state's academic R&D
- The lowest unemployment rate in the state

As a result of this highly concentrated prosperity and distribution of resources, North Carolina overall continues to rank in the middle of U.S. states, and well behind many nations, in terms of its performance on a

Key Quote:

"No amount of savings and investment, no policy of macroeconomic fine-tuning, no set of tax and spending can generate sustained economic growth unless it is accompanied by the countless large and small discoveries that are required to create more value from a fixed set of natural resources."

~ **Paul Romer, Economist**
1993

Key Fact:

According to economic estimates, more than 50 percent of the growth in the U.S. economy since World War II, and as much as two-thirds of the U.S. economic growth since the 1990s, resulted from the introduction of new technologies.

wide variety of factors critical for competing in the New Economy.¹

Clearly, North Carolina can and must continue to do more to increase and broaden the participation of its citizens in the New Economy. Only through such steps will the state's overall standard of living increase meaningfully.

Fortunately, more than most states and nations, North Carolina has in place the people, institutions, and programs necessary for responding to the challenges of the New Economy. And while North Carolina's New Economy assets and activities are geographically concentrated in metropolitan areas, as is the case for most of our competitor regions, those areas are, advantageously, distributed broadly throughout the state and linked well by the I-40/I-85 corridor that serves as a strong, supportive "backbone" and distribution network, or nervous system, for the state's economy.

This backbone and the distribution network of "economic organs" it supports are not universally strong, but they can and should draw strength from the Research Triangle region, the "heart" of innovation in the center of the state. With well-designed and well-coordinated public-private partnerships, the state's economic development network can be optimized, realigned, and better connected to foster and accelerate the spread of science, technology, and innovation, both within government and externally throughout the state's economy to the broader society.

North Carolina should strengthen and optimize its "inside-out" strategy (i.e., starting and growing technologies and companies from within the state) in addition to its existing "outside-in" strategies (i.e., recruiting companies into the state). Keeping existing organs strong and productive is much more effective and sustainable than is transplanting organs from outside. While recruiting is and should remain an important component of North Carolina's economic development portfolio, the state cannot recruit its way into a competitive position in the New Economy. **The only**

Key Fact:

Science and technology are evolving globally at an unprecedented pace—generating increased innovation and radical changes in economies and governments worldwide—which ultimately fuels the further development and urgency in the evolution of science, technology, and innovation. This is the new reality we face.

Key Fact:

Faced with a dynamic and uncertain future, the best approach is to shape it rather than be shaped by it. In other words, we must continue to innovate: to create and adopt new products, services, and business models.

¹ For example, the 2010 edition of the *State of the New Economy Index*, produced every few years by the Information Technology & Innovation Foundation in collaboration with the Kauffman Foundation, ranks North Carolina 24th in the nation in terms of the degree to which the structure of its economy matches the ideal structure of the New Economy. In previous years' *New Economy Indexes*, specifically 2007, 2002, and 1999, North Carolina ranks 26th, 24th, and 30th, respectively. Similarly, the Milken Institute's *State Technology and Science index*, which focuses a similar yet larger set of New Economy factors and is also produced every few years, ranks North Carolina in the same ballpark. In its 2010, 2008, 2004, and 2002 *Indexes*, it ranks North Carolina 13th, 18th, 20th, and 17th, respectively. Other sets of rankings produced by other organizations, both public and private, show similar findings regarding North Carolina's science, technology, and innovation-focused assets and activities.

way it can gain a competitive position in the New Economy is to ensure that it *grows* new innovative companies and works to ensure that its *existing* companies are as innovative as they can be.

As discussed below, during the last decade, the Department of Commerce's Office of Science & Technology (OST), overseen by the state's long-standing, accomplished, and highly regarded Board of Science & Technology, has played a leading role in positioning North Carolina to compete in the New Economy. Yet throughout this last decade, coincident with the dramatic and ever-emerging new economic changes occurring globally, the Office's resources and functions have shrunk, diminishing the state's focus on New Economy issues.

This report reviews the role, activities, and performance of OST, offering three options for the legislature to consider to help strengthen OST in ways that enable it to optimize North Carolina's science, technology, innovation and economic development networks, thus improving the economic wellbeing and quality of life of *all* North Carolinians in the New Economy. The case here is for limited government, one that works in partnership with the private and non-profit sectors to make the whole state greater than the sum of its parts.

2.a. Description of Office, Mission, Goals & Objectives

The Office of Science & Technology (OST) was created in 2001, when the staff of the Board of Science & Technology (*see section 2.b. below*) transferred from the Department of Administration to the Department of Commerce to more closely align the Board's long-standing work on science, technology, and innovation with the state's overall economic development efforts. This transfer was intended to mitigate the impact of recession-induced budget cuts at the time and to enhance the OST staff capabilities by leveraging the support of the Department of Commerce's other functions, such as policy and research, public affairs, marketing, legal, and fiscal management.

As described in more detail in sections 2.c. and 3. below, OST:

- Serves as the sole staff to the North Carolina Board of Science & Technology;
- Directly supports and executes the Department of Commerce's economic development efforts, particularly those focused on small, high-tech, entrepreneurial, and innovative businesses;
- Administers the following three legislatively authorized grant programs that provide early-stage funding to catalyze small businesses innovation, technology development, and technology

OST Mission:

To improve the economic well-being and quality of life of all North Carolinians through advancing science, technology, and innovation.

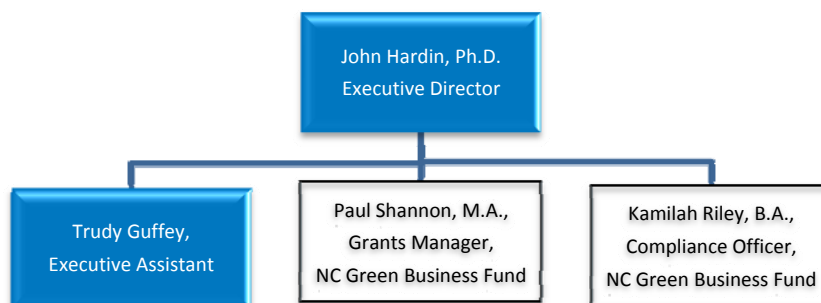
Key Fact:

Created in 2001, OST staffs the Board of Science & Technology and directly supports the Department of Commerce's innovation-driven, New Economy efforts. It is the only organization that does so.

commercialization:

- The One North Carolina Small Business Program;
- The North Carolina Green Business Fund; and
- The North Carolina Energy R&D Cost-Sharing Program.
- Directs and oversees innovation-focused strategic initiatives, such as coordinating the development of *North Carolina's Nanotechnology Roadmap*, planning and organizing an annual statewide *Nanotechnology Commercialization Conference*, leading efforts to revitalize and build North Carolina's advanced manufacturing sector, building and championing the case for North Carolina to be selected as a home for a regional office of the U.S. Patent & Trademark Office, and staffing the North Carolina Innovation Council;
- Works directly with the Department's Legislative Liaison to advocate for programs focused on science, technology, and innovation to keep North Carolina on the cutting edge of innovation and technology development, commercialization, and utilization.
- Researches, analyses, reviews, and provides advice and guidance on substantive policy issues and proposals focused on science, technology, and innovation;
- Prepares and presents high-level state policy briefings, assessments, reports, and presentations to policy makers and external constituencies;

OST's current organization chart is as follows:²



Shaded = state-funded, recurring FTEs.

Not-shaded = federally funded, time-limited FTEs (ending 4/1/2012).

In addition to serving as lead staff to the Board of Science & Technology and overseeing the OST's staff and programs, the OST Executive Director

Key Fact:

The OST Executive Director serves as the state's scientific and technological liaison to the university, business, and non-profit sectors, both within and outside North Carolina. As such, the position serves as the vital "connective tissue" between key segments of North Carolina's innovation-driven New Economy.

Key Quote:

"In fact, there is no such thing as a low-tech industry. There are only low-tech companies—that is, companies that fail to use world-class technology and practices to enhance productivity."

~Michael Porter, Economist, 1998.

² From July 2008-November 2011, OST also employed an Assistant Director, Dr. Sharlini Sankaran. For the first half of that period, this position was state-funded and recurring via state appropriations to OST. In fall 2010, a senior-level OST position was transferred to the Department of Commerce's newly formed Energy division and Dr. Sankaran was subsequently funded with federal Department of Energy funds via the 2009 American Recovery and Reinvestment Act (ARRA). During this latter period, in addition to serving as OST's Assistant Director, Dr. Sankaran served as the Program Manager for the NC Green Business Fund (discussed further below).

serves as the science advisor to the Governor and as the state's scientific and technological liaison to the university, business, and non-profit sectors, both within and outside North Carolina.

Currently, at least 11 states (Arkansas, California, Idaho, Iowa, Maine, Ohio, Oregon, New Mexico, South Carolina, Utah, and Virginia) have individuals who serve state policy makers as science and technology advisors. In today's global innovation-based economy, having a science and technology advisor provides a competitive advantage by giving state policy makers:

- Immediate access to scientific and technical advice;
- Connections with networks in other states and globally;
- A "go to" person for identified impediments to the innovation and economic growth imperative;
- The background, perspective, and focus to see strengths, weaknesses, and opportunities across the state; and
- A champion to unite science and technology agendas across agencies and throughout the state.

Prior to 2000, North Carolina had a Science Advisor who reported to the Governor and also served as the Executive Director of the Board of Science & Technology. Yet in 2001, as part of the Board's move to Commerce and the reconstitution of OST, the title "Science Advisor to the Governor" was statutorily removed from the Executive Director's position. The subsequent Executive Directors have continued to serve as the de-facto State Science Advisor, but in a less potent capacity than in previous years due to the staff and budget reductions discussed below.

The OST Executive Director position requires highly specialized training and expertise not typically resident in state government. In particular, the Executive Director must work closely with, and have the respect of, representatives from a wide range of economic and social sectors, particularly industry, academia, government, and non-profits. Familiarity with the norms, cultures, rules, information, terminology, and key actors in these sectors is imperative.

For example, the current Executive Director holds a Ph.D. in political science and public policy and a B.A. in economics, has worked in OST for more than eight years, had previously worked in university research and sponsored programs oversight and administration for seven years, and has taught public policy at the university level for more than 15 years. Similarly, the previous Executive Director held a Ph.D. in Physics, had

Key Fact:

The OST has a small, highly qualified staff that executes numerous important duties, including innovation-focused policy & programmatic research, evaluation, promotion, and implementation. While plugged in at a high level, it also works at the ground level to help North Carolina's technology businesses—particularly small, early-stage, entrepreneurial businesses—succeed in an ever more challenging economy.

Key Quote:

"We won't experience 100 years of technological advance in the 21st century; we will witness on the order of 20,000 years of progress, or about 1,000 times greater than what was achieved in the 20th century."

~Ray Kurzweil, Inventor and Futurist, 2001

previously served as the Senior Technology Strategist for In-Q-Tel (the private venture capital arm of the CIA), had started, managed, and sold (profitably) a high-tech R&D firm, and had taught at the university level for more than 20 years. Previous Executive Directors, as well Assistant Directors, have had similar backgrounds and experience.

These credentials are what have enabled the OST staff to develop and manage—effectively and efficiently—science-, technology-, and innovation-focused initiatives in North Carolina. Additionally, OST’s Executive Assistant has served in her position for nearly 20 years, providing core administrative support and vital institutional memory across the different Executive Directors. Finally, OST’s Grants Manager and Compliance Office, while time-limited, are positions requiring a specialized knowledge of numerous federal, state, and local rules and regulations regarding grants and financial management that other organizations currently lack.

In sum, without its dedicated budget and highly skilled staff the Board and of Science & Technology could not have conducted the work necessary to create the institutions and manage the initiatives and programs outlined in more detail below, nor could OST implement the activities necessary for North Carolina to remain a leader in the innovation-based global New Economy. Additional information regarding OST’s staff and budget is presented below (*see section 2.d. below*).

2.b. Categorization of Mission, Goals & Objectives

OST’s mission, goals, and objectives derive directly from and fulfill the following North Carolina statute authorizing the powers and duties of the North Carolina Board of Science & Technology:

§ 143B 472.80. “North Carolina Board of Science and Technology; creation; powers and duties.

The North Carolina Board of Science and Technology of the Department of Commerce is created. The Board has the following powers and duties:

- (1) To identify, and to support and foster the identification of, important research needs of both public and private agencies, institutions and organizations in North Carolina that relate to the State's economic growth and development;
- (2) To make recommendations concerning policies, procedures, organizational structures and financial requirements that will promote effective use of scientific and technological resources in fulfilling the research needs identified and that will promote the economic growth and development of North Carolina;

Client Testimonial:

“Our interactions with the Program staff have always been of the highest caliber and we have always been treated with professionalism and with support for our work. Our phone calls and emails were answered promptly, and even when questions were asked at odd times, such as evenings and weekends, we frequently received replies within the hour.”

*~Mycosynthetix Inc.,
Hillsborough. NC.*

Key Fact:

OST’s mission, goals, and objectives derive directly from the North Carolina Statute authorizing the Board of Science & Technology.

- (3) To allocate funds available to the Board to support research projects, to purchase research equipment and supplies, to construct or modify research facilities, to employ consultants, and for other purposes necessary or appropriate in discharging the duties of the Board;
- (4) To advise and make recommendations to the Governor, the General Assembly, the Secretary of Commerce, and the Economic Development Board on the role of science and technology in the economic growth and development of North Carolina.

Operationally, these powers and duties fall into two broad categories—**strategic and tactical**—that enable the Board, as supported directly and solely by OST, to fulfill the following roles critical for enabling North Carolina to compete in the innovation-driven New Economy:

ROLE	EXAMPLE (see section 2.c for details)
STRATEGIC	
• Champion & Communicator	Leading/distributing NC technology roadmaps to chart the course for NC's economic future
• Evaluator & Advisor	Creating/using NC innovation indexes to evaluate and inform policy and programs
TACTICAL	
• Convener & Facilitator	Organizing/leading NC technology conferences & workshops to catalyze businesses
• Funder & Implementer	Developing/administering NC technology commercialization grant programs
• Recruiter & Retainer	Attracting/keeping high-tech, high-growth, entrepreneurial businesses to/in NC

Each of the objectives and activities outlined in section 2.a. above and described in more detail below in this section as well as section 3.a., fall into one or more of these roles and often fulfill both a strategic and tactical purpose.

In terms of membership, as specified in § 143B 472.81, of the Board's 19 members, 15 are appointed by the Governor, and two are appointed by the General Assembly; the remaining two positions are ex-officio (**See Exhibit A for a list of current Board members**). The members broadly represent the business, academic, and public sectors from across the state, as follows:

§ 143B 472.81. "North Carolina Board of Science and Technology; membership; organization; compensation; staff services.

- (a) The North Carolina Board of Science and Technology consists of the Governor, the Secretary of Commerce, and 17 members appointed, as follows:

Key Quote:

"Public sector institutions have the ability to articulate a public agenda and then act as a catalyst. Government's role as a convener of different interests helps to build bridges across disciplines and between upstream and downstream activities."

~New Foundations for Growth: The U.S. Innovation System Today and Tomorrow, RAND Corporation, 2002

Key Quote:

"Today, approximately two-thirds of the award-winning U.S. innovations involve some kind of inter-organizational collaboration—a situation that reflects the more collaborative nature of the innovation process and the greater role in private sector innovation by government agencies, federal laboratories, and research universities."

~Where Do Innovations Come From? Information Technology and Innovation Foundation, 2008

The Governor shall appoint:

- one member from the University of North Carolina at Chapel Hill, one member from North Carolina State University at Raleigh, and two members from other components of the University of North Carolina, all nominated by the President of the University of North Carolina;
- one member from Duke University, nominated by the President of Duke University;
- one member from a private college or university, other than Duke University, in North Carolina, nominated by the President of the Association of Private Colleges and Universities;
- one member from the Research Triangle Institute, nominated by the executive committee of the board of that institute;
- one member from the Microelectronics Center of North Carolina, nominated by the executive committee of the board of that center;
- one member from the North Carolina Biotechnology Center, nominated by the executive committee of the board of that center;
- four members from private industry in North Carolina, at least one of whom shall be a professional engineer registered pursuant to Chapter 89C of the General Statutes or a person who holds at least a bachelors degree in engineering from an accredited college or university; and
- two members from public agencies in North Carolina.

Two members shall be appointed by the General Assembly:

- one shall be appointed upon the recommendation of the President Pro Tempore of the Senate, and
- one shall be appointed upon the recommendation of the Speaker of the House of Representatives in accordance with G.S. 120 121.
- The nominating authority for any vacancy on the Board among members appointed by the Governor shall submit to the Governor two nominations for each position to be filled, and the persons so nominated shall represent different disciplines.

- (b) Members appointed to the Board by the General Assembly shall serve for two-year terms beginning 1 July of odd numbered years. Vacancies in appointments made by the General Assembly shall be filled in accordance with G.S. 120 122. The two members from public agencies shall serve for terms expiring at the end of the term of the Governor appointing them. The other 13 members appointed to the Board by the Governor shall serve for four year terms, and until their successors are appointed and qualified. Of those 13 members, six shall serve for terms that expire on 30 June of years that follow by one year those years that are evenly divisible by four, and seven shall serve for terms that expire on 30 June of years that follow by three years those years that are evenly divisible by four. Any appointment to fill a vacancy on the Board created by the resignation, dismissal, death, or disability of a member shall be for the balance of the unexpired term.

- (c) The Governor or the Governor's designee shall serve as chair of the

Key Fact:

The Governor, President Pro Tempore of the Senate, and the Speaker of the House of Representatives appoint the members of the Board of Science & Technology

Key Fact:

Board of Science & Technology members broadly represent the business, academic, nonprofit, and public sectors from across the state.

Key Quote:

“Government has a vital role to play as a catalyst for large-scale innovation. Government should not seek to dictate, micromanaging every aspect of an agenda, but rather to serve as a steward by convening and facilitating.”

~John Kao, Harvard Business School, 2008

Board. The vice chair and the secretary of the Board shall be designated by the Governor or the Governor's designee from among the members of the Board.

- (d) The Governor may remove any member of the Board from office in accordance with the provisions of G.S. 143B 16.
- (e) Members of the Board who are employees of State agencies or institutions shall receive subsistence and travel allowances authorized by G.S. 138 6. Legislative members of the Board shall receive subsistence and travel allowances authorized by G.S. 120 3.1.
- (f) A majority of the Board constitutes a quorum for the transaction of business.
- (g) The Secretary of Commerce shall provide all clerical and other services required by the Board."

Early History of the Board of Science & Technology (1963-1977)

Nearly 50 years ago, in 1963, the North Carolina General Assembly established the Board of Science & Technology. The idea for such a board—the first of its kind in the nation—originated at a December 1961 meeting to which Governor Terry Sanford invited 39 scientists from the three universities that form the points of the "Research Triangle:" Duke, UNC-Chapel Hill, and North Carolina State University. The charge was for the scientists to help the state meet "the rapid pace of scientific and technological change" and to enjoin the universities to help solve industry problems and help reposition the state as a scientific powerhouse. A two-page centerfold picture in *Time Magazine* immortalized the meeting with the following caption: "*Indicative of the State's pool of more than 2,000 leading scientists and engineers whose services are available to any industry within North Carolina.*"

The group of 39 prominent scientists was designated as the Governor's Science Advisory Committee, making North Carolina the first state to establish the primacy of its science and the relationship to economic prosperity. This step followed on the heels of similar actions at the national and state level. For example, the National Science Foundation, formed in 1950, had begun dispensing grants in 1952. The Research Triangle Institute, created in 1958 by Governor Luther Hodges, was charged with creating applied research facilities that would translate university research to applications useful to industry. In 1959, a visionary group of the state's leaders from business, academia, and industry formed the Research Triangle Park, one of the world's largest public-private planned research parks. And in 1961, President Kennedy convened the Office of Science and Technology in recognition of the increased role of science in the economy manifested by the space race with the Soviets.

Key Quote:

"Highly educated people, great universities and networks for interaction can't be found in the earth, nor do they appear through spontaneous generation. They come into being as the result of well thought out and strategic public policy."
~**Investing in Innovation.**

**National Governors
Association 2007**

Key Fact:

Established by the NC General Assembly in 1963, the Board of Science & Technology was the nation's first state-level advisory board focused on science, technology, innovation, and the economy.

Under the guidance of the Governor's Science Advisory Committee, several highly regarded scientists—including Buckminster Fuller, Edward Teller, Edward Higbee, Jerome Weisner, and William O. Baker—were brought to North Carolina to consult and advise Governor Sanford and the Committee on the possibilities for scientific and economic development. From these meetings, the idea of science-based economic development emerged as a strategy to move the state forward toward higher wages. The principal identified need was for additional financial support for scientific research.

Inaugural Members of the Board of Science & Technology, 1963



In response to this need, the Board was initially established as a grant-dispensing agency patterned after the National Science Foundation. It operated the first competitive state-level grants program in the nation and the only explicit research grant program North Carolina would have until 1984. The Governor chaired the non-partisan Board, and its Executive Director reported directly to the Governor.

The Board was designated as a state agency and funding was appropriated by the General Assembly, which recognized its synergies with the private, non-profit Research Triangle Institute (RTI). The Board advanced RTI's mission by awarding funding, on a competitive basis, to the best university ideas. In this way, North Carolina established a pipeline and pathway for the commercialization of academic discoveries.

From 1963-1969, the Board reviewed 339 proposals and funded 110 (33.4%) which, in turn, resulted in funding for 116 follow-on grants from other sources. The Board's initial investment of \$2.24million, therefore,

Key Fact:

The Board of Science & Technology operated the first competitive state-level grants program in the nation and the only explicit research grant program North Carolina would have until 1984.

Key Fact:

After a strong start in the early 1960s, the Board played a more limited role in the early 1970s due to fiscal constraints. In the late 1970s, it was re-elevated to a cabinet-level function to help lead North Carolina's economy out of the recession.

yielded \$9.42million in additional research funding. Despite this strong track record, in 1969 the General Assembly, under general fiscal pressure, cut funding for the Board. Additionally, in 1973 Governor Holshouser transferred the Board to the Department of Commerce and consolidated all of the state's public universities into a single system under a Board of Governors, which could then provide a focal point for science advice. For the next several years, the Board played a more limited role, providing policy advice and supporting operations at Commerce.

In the late 1970s, in the midst of a major recession, the need for additional investment in science and technology was again perceived as critical, particularly as a means for the state to grow the economy out of the recession and provide better jobs for its workforce. Thus, in 1977, Governor Hunt re-elevated the Board to a cabinet-level function, with the purpose of connecting research institutions and organizations with the private sector. Hunt appointed his former professor and trusted advisor Quentin Lindsey to direct the Board and design new science-based economic development policies.

Recent History of the Board of Science & Technology (1977-2000)

The 1980 "Lindsey" report of the Board provided a blueprint to grow the economy, proposing and advocating for many of the state's now-core institutional infrastructure organizations, including:

- The **North Carolina School of Science and Mathematics (1980)**, the country's first residential high school at which students study a specialized curriculum emphasizing science and mathematics;
- **MCNC (1980)**, which provides technical infrastructure to educate, innovate and enhance economic development throughout North Carolina;
- The **North Carolina Biotechnology Center (1984)**, the first such center in the United States to advance the biotechnology sector statewide;
- The **North Carolina Technological Development Center (1983)**, now called First Flight Venture Center, a technology incubator designed to increase the number of technology companies originating or relocating to North Carolina.

These innovative initiatives—all developed during the early 1980s—

1980 Lindsey Report



Overview and Impacts of Key Organizations Initiated by the NC Board of Science & Technology



NC School of Science & Math (NCSSM): A constituent institution of the UNC system, the NCSSM is a public, residential high school in Durham, where 11th and 12th grade students study a specialized curriculum in math and science. The NCSSM is fully funded by the state; no student is required to pay any tuition, room, board or other student fees.

The NCSSM is the most diverse school in the state. Enrolling more than 600 students, about 50% are Caucasian, 35% are Asian American, 10% are African American, 3% are Hispanic and 1% are Native American. The student population is a demographic reflection of the population the state as a whole; slots are reserved for each congressional district. Each year, NCSSM students place exceptionally well in national and international competitions, such as the Siemens Competition and the Singapore International Mathematics Challenge. In 2010, NCSSM won first place at the 2010 National DOE Science Bowl competition.

The NCSSM is **the** model for at least 18 similar schools around the globe. **Among NCSSM alumni, all 100 N.C. counties are represented, 63 percent pursue science or math fields, 80 percent attend UNC schools, and 60 percent remain N.C. residents, generating an estimated annual economic impact of nearly \$500 million.**



MCNC: Founded in 1980, the private non-profit Microelectronics Center of NC (MCNC) originally had two areas of focus. The first was to accelerate, through research, the growth of the information technology and advanced computer networking industry in NC. From 1980 to 2000, MCNC developed a portfolio of patents and intellectual property that led to the direct launch of seven companies and served to attract General Electric, Northern Telecom, Cisco and other major tenants to RTP.

MCNC's research focus ended with the research assets being distributed to the Research Triangle Institute and to institutions of UNC between 2000-2003. One of the private companies spun off from MCNC, Cronos, was sold to optical chip manufacturer JDS Uniphase for \$750M. MCNC used its \$200M share of the proceeds from this sale to help the State:

- **Promote rural broadband distribution** - \$30M to private providers through the Rural Internet Access Authority (RIAA);
- **Promote entrepreneurial growth** through a \$40M investment and the forming of NC IDEA, an early-stage capital firm;
- **Provide a \$60M down payment on a fiber optic network** that would serve the broadband needs of NC's K20 public education institutions and other public community anchor institutions (non-profit hospitals, public safety, public health, libraries).

The second focus of MCNC is the operation of NCREN, the NC Research Education Network. Approximately 40 states have research and education networks, but North Carolina's NCREN is the only one that did not require substantial direct investment by State government to assist in its formation. Recently, MCNC has parlayed its own \$8 million investment to attract an additional \$136 million in private and federal funding to make NCREN an asset that will serve the broadband needs of the education and community institutions for the next 25 years. This investment, if partnerships with private for profit telecommunications and cable companies are formed, will increase broadband availability in rural areas of the state that lack competitive broadband offerings.



The NC Biotechnology Center (NCBC): a private, non-profit organization funded by the NC General Assembly to support the development of biotechnology research, education, business and strategic policy statewide. **The result of that 30-year commitment is a community that places among the top five in all rankings, and third for number of companies.**

North Carolina's 530 companies and 58,000-plus employees are a result of the state's consistent investment in life sciences - \$100 million per year on average for the last 12 to 15 years. The NCBC serves as the hub for that community, making connections among academic, business and civic leaders. The Center delivers a spectrum of technology-based economic development programs to spur innovation, education, commercialization and job creation. According to a 2010 report from the Battelle Institute, the **North Carolina biotechnology industry's total impact is 226,823 jobs, \$12.7 billion in employment compensation, \$64.6 billion in North Carolina business volume, \$1.92 billion in taxes generated for state and local government.**

were aimed at building capacity in the state and helped position North Carolina as a serious location for technology-based economic development. They are the envy of, and have been emulated by, other states and nations. The box above presents more detail regarding the purpose, structure, and impacts of the first three of these organizations.

In the mid 1990s, the Board, staff also recommended and implemented several well-known strategic initiatives and benchmarking efforts, such as:

- **Intellectual Property and Knowledge Management (1998-1999):** The Board and its staff were directly involved with the National Task Force for Knowledge Management and Intellectual Property <http://www.km-iptask.org>. This task force worked with universities, industry and government to develop the policies necessary to make the U.S. a leader in turning knowledge to net worth. Projects involved benchmarking corporate practices; a survey of systems and tools used in KM and IP; assisting the financial community to develop reliable metrics to evaluate a company's intangible asset value; building a business case for recognition of intangible assets and IP strategies; defining the "best practice" for IP mining; developing a model for electronic patent prosecution and litigation; and advancing academe's role in defining KM.
- **Universal Service (1997-1999):** The Board and its staff organized public hearings and interactive video presentations around the state on the changes to Universal Service Policy affected by the Telecom Act of 1996. The Board presented findings from these hearings to the North Carolina Utilities Commission and proposed ways to reduce the Digital Divide in North Carolina. The Board played a leadership role in publicizing the E-rate and assisting in applications for E-rate funds, leading to the receipt of more than \$85 million for North Carolina schools and public libraries over three years. The Board also worked with the Attorney General's office to publicize the federal Lifeline and LinkUp programs so that the less wealthy in North Carolina could have access to telephony. This led to North Carolina being listed among the top states in its program to extend telephone service to all its citizens.
- **North Carolina Information Highway (NCIH, 1993):** The Board's staff played a major role in support of deployment of broadband infrastructure to all areas of North Carolina. The NCIH has evolved into the backbone for the transport of data, video, and voice that

Key Fact:

During the early 1980s, the Board of Science & Technology was responsible for proposing many of NC's core innovation-based institutions, including the NC Biotech Center, the NC School of Science and Mathematics, MCNC, and the First Flight Venture Center.

Key Fact:

During the 1990s, The Board of Science & Technology built on NC's strong innovation-based institutions by initiating and collaborating with a wide variety of far-reaching strategic initiatives statewide, nationally, and internationally.

NCIH Website



- 19

- **Global Spatial Data Infrastructure (GSDI, 1996):** The Board was instrumental in the development and support of the World Steering Committee effort to create a Global Spatial Data Infrastructure Initiative <http://www.gsdi.org>. More than 40 countries have signed on to this effort. Conferences have been held in 12 countries, with North Carolina being the location for the U.S. conference. Global Spatial Data is the foundation for countries being able to exchange information on a data and technology framework that underlies many major application areas that must crunch and display massive amounts of data. Initiatives such as tracking environmental sustainability, emergency management, large-scale planning efforts (such as in transportation projects) and many other types of metadata efforts are examples of these applications. The commercial, government, and education sectors make major use of spatial data in all of their applications. The National Image Mapping Agency within the US Department of Defense is just one of the major users with whom the Board staff worked.
- **Virtual Collaboratories (1998):** “Collaboratories” are centers without walls, in which users can perform their research without regard to geographical location—interacting with colleagues, accessing instrumentation, sharing data and computational resources, and accessing information in digital libraries. The Board, with support from its staff, led nationally in the effort to establish collaboratories by teaming up with the National Research Council (NRC), the White House Office of Science and Technology Policy, and the Office of the Undersecretary of Commerce for Technology. In August 1998, the Board co-hosted an interactive forum on bioscience collaboratories with the NRC leading to the publication of Improving Research Capabilities in Chemical and Biomedical Sciences.
- **Grassroots Science Program for Water Quality Testing (1999):** The Board sponsored an innovative project through Grassroots Science, a non-profit affiliate of North Carolina's science museums, to engage fifth-grade students, through their science classes in water quality testing all over the state. The Board was also successful in advocating for the addition of funds for the Science museums in North Carolina.
- **Vision 2030 (1998-1999):** A comprehensive "real-options" planning initiative undertaken to strengthen the competitiveness of North Carolina's workforce and industry by taking advantage of science

GSDI Website

and technology-driven economic development opportunities in the areas of information technology, bioscience/biotechnology, and new materials sciences. Jointly sponsored by the General Assembly's House and Senate Information Technology Committees, as well as by the Department of Commerce and the state's Regional Economic Development Partnerships, Vision 2030 yielded several outputs, including a series of benchmarking reports, policy recommendations, and draft legislation, along with recommendations that would assure the potential for North Carolina to remain competitive in science and technology-based economic development. The two-year initiative, managed by the staff, also hosted science and technology roundtables in several North Carolina cities, organized in conjunction with local authorities such as those in the Chambers of Commerce or Regional Economic Development Partnerships. Many of the initiative's resulting recommendations have since been implemented, and the Board's staff has continued to expand and refine the benchmarking efforts.

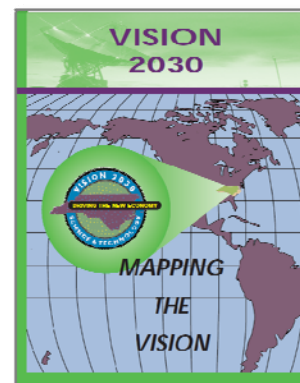
2.c. Current Program Activities (2001-Present)

As noted above, upon moving to the Department of Commerce in 2001, the Board was inactive for two years and four existing staff positions (Associate Director, Science and Mathematics Education Specialist, Administrative Officer, and Social Research Assistant) were eliminated. Of the two remaining positions, only the Administrative Secretary position was filled during 2001-2002, serving as support staff for other Department of Commerce functions.

In December 2002, Governor Easley reactivated the Board, appointing 13 new members and charging the Board with leading the state's efforts to use science and technology to help build a knowledge-based economy and create high-quality jobs. In March 2003, a Chief Policy Analyst position provided by UNC-Chapel Hill on a time-limited basis began providing core research and policy support to the Board, and in September 2003 Secretary of Commerce Fain appointed an Executive Director for the Board. These two new staff (one time-limited, the other permanent), together with the existing one permanent staff, constituted the Office of Science & Technology and began initiating several key projects directed at keeping North Carolina competitive in the New Economy. These included:

- **Tracking Innovation in North Carolina (2000 and 2003):** An "innovation index" assembling information from a wide variety of primary and secondary sources to document and benchmark innovation- and technology-related activity in the state. Containing

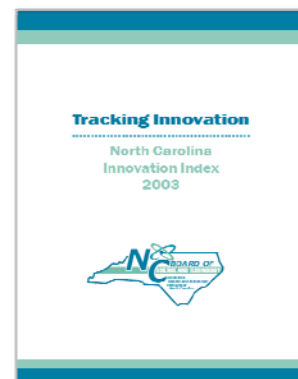
Vision 2030 Report



Press Release announcing reactivation of Board, 2001



Tracking Innovation Index



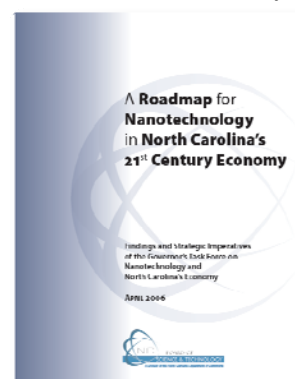
more than fifty measures (e.g., R&D expenditures, venture capital, high-tech startup activity, broadband access, educational attainment) and developed by the OST staff, the Index compares North Carolina's innovation-related performance to that of other states. The index has served, and continues to serve, as the basis for many of the Board's policy recommendations, including grant programs to provide early-stage financial capital to small businesses (e.g., see the **One NC Small Business Program** below), technology incubators and accelerators, and improved science, technology, engineering, and math (STEM) programs throughout the state.

- **Roadmap for Nanotechnology in North Carolina's 21st Century Economy (2006):** A coordinated initiative to advance successful nanotechnology-based economic development and high-wage employment across the state.³ Produced by a 28-member "Governor's Task Force on Nanotechnology and North Carolina's Economy" organized and managed by OST staff, the Roadmap issued a call to action for North Carolina's political and policy leaders, industry, research institutions, educators, and the public:
 - to increase the state's ability to innovate,
 - increase the levels of collaboration between the state's companies and R&D centers,
 - develop a well-educated and trained workforce,
 - provide a supportive public and political policy environment, and diversify the state's technology cluster portfolio to include nanotechnology.

The *Roadmap* laid the groundwork for numerous follow-on activities, such as:

- a nanotechnology-focused website administered by the OST staff;
- an annual Nanotechnology Commercialization Conference managed by the OST staff;
- the Center of Innovation for Nanobiotechnology (COIN), initiated by the Biotechnology Center;

NC Nanotech Roadmap



Nanotech Commercialization Conference Program



³ Nanotechnology is the creation of materials, components, devices, and systems at the near-atomic, or nanometer, level. Nanotechnology is creating a wealth of new materials and manufacturing possibilities, which in turn will profoundly impact our economy, our environment, and our society. For more information, see <http://www.nccommerce.com/scitech/nanotechnology>.

- and the Joint School of Nanoscience and Nanoengineering, administered by NC A&T State University and the University of North Carolina at Greensboro.

These activities and others have directly contributed to North Carolina's ranking as the 9th most active state, and RTP as the 4th most active region, in terms of nanotechnology research, development, and commercialization.

- ***Advancing Innovation in North Carolina Report (2008):*** A comprehensive high-level report issuing a call to action to the state's policymakers, business leaders, educators, and citizens. The 76-page report, researched and written by OST staff, starkly defined the innovation challenge facing the state, extended and enhanced the metrics outlined in the Board's previous *Tracking Innovation* reports, and recommended an innovation framework that leverages the state's unique strengths while addressing its specific challenges. Since its release in December 2008, the report has been accessed nearly 5,000 times from more than 40 countries and more than 40 states, served as a key impetus for Governor Perdue's establishment of the state's first-ever Innovation Council, and generated dozens of requests for presentations by, and meetings with, the Board's staff to review the report's metrics and recommendations.
- **North Carolina Innovation Council: Initial Recommendations Report (2010):** Recognizing that North Carolina must stay on the cutting edge of innovation in order to remain globally competitive, in November 2009 Governor Perdue formed, via Executive Order number 29, the North Carolina Innovation Council and charged the OST with providing staff support, facilities, and resources for the Council. Meeting bi-monthly throughout 2010, the Council produced a year-end report outlining 10 "front-burner" recommendations designed to make North Carolina become the go-to place for innovation, the place where the world looks to create the "next big thing" and to solve its greatest problems, a state thriving with innovative people, companies, organizations and culture. Throughout 2011, the OST has continued to staff the Council as it works on crafting a more targeted, strategic set of proposals to strengthen the foundations of North Carolina's innovation ecosystem even further.

Additionally, following on improved state budgets through the mid-late 2000s, OST staff enhanced the Board of Science & Technology's original mission of dispensing grants through three distinct, yet complementary

Advancing Innovation Report



Innovation Council Report



programs:

- **One North Carolina Small Business Program:** Initially proposed by OST staff in 2004 in response to a strong need for early-stage small business capital that was highlighted in the 2003 *Tracking Innovation* report, the One NC Small Business Program was established by the General Assembly in the 2005 legislative session to provide seed funding to NC small businesses to help them develop and commercialize innovative new technologies. The Program provides matching grants to the small, early-stage businesses that have been awarded federal Phase I Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants designed to help them commercialize their innovative technologies.

Since its founding, the Program has awarded 245 matching grants, totaling nearly \$17 million, to hundreds of small businesses throughout the state. These investments, nearly half of which are still supporting active projects, have already helped the businesses that have completed their projects create and retain hundreds of jobs, leverage more than \$85 million in external capital investments, generate more than \$73 million in follow-on Phase II federal SBIR/STTR funding, and project to produce hundreds of patents, licenses, and products (*see more detail in section 3 below*).

- **North Carolina Green Business Fund:** Established by the General Assembly in 2008, the Fund awards competitive grants to North Carolina organizations that have projects focused on developing and commercializing promising and innovative “green” technologies, such as biofuels, green building, and environmentally conscious clean technology and renewable energy products. Funded projects are cross-cutting and capacity-building, spanning all facets of the economy and society. Since its founding, the Program has awarded 85 grants, totaling nearly \$12 million, to a variety of organizations—primarily small businesses—to 39 cities and 29 counties throughout the state. Many of these projects are still active and have not yet completed their work. To date, however, the 29 completed projects (total investment: \$1.79M) indicate that 76 jobs have been created, 18 patents have been filed or are expected to be filed, 8 licenses projected (total projected value of patents and licenses exceed \$118M), and \$15.9M in follow-on funding is currently committed or under negotiation. These impacts will multiply greatly as more projects are completed and companies continue to grow (*see more detail in section 3 below*).

One NC
Small Business Program



NC Green Business Fund



- **North Carolina Energy R&D Cost-Sharing Program:** Funded by the General Assembly in the 2010 Budget Bill, this program is designed to help North Carolina research institutions win federally funded Energy R&D projects that require cost-sharing, expand the volume and range of Energy R&D in North Carolina, and generate intellectual property that can lead to energy-related jobs in the long term. Research organizations compete for funding by submitting proposals in response to solicitations issued for the U.S. Department of Energy (DOE) Programs. As a new program, to date it has awarded one grant, \$197,500, which went to NC A&T State University to enable it to apply for and win a \$937,000 Energy Research Center from DOE.

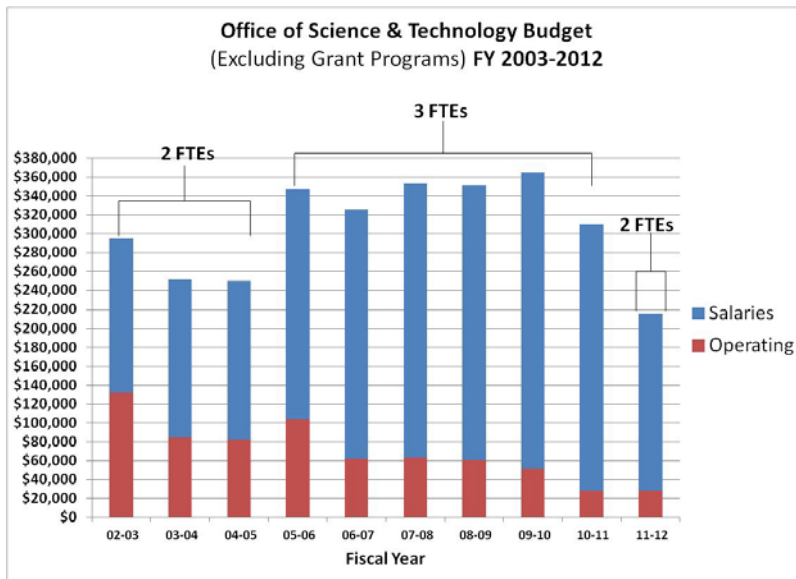
*Energy R&D
Cost-Sharing Program*



2.d. Resource Allocation

The resource information presented here covers the FY 2003-present period, which represents OST's recent and current operations. **It addresses only OST's personnel and operating expenses, as funded via recurring appropriations. The resources allocated to the grant programs OST administers are funded via non-recurring appropriations and are discussed in section 3 below. OST staff administer those programs using OST's lean operating budget.**

As noted in the previous section, upon moving to the Department of Commerce in 2001, the Board of Science & Technology was inactive for two years. Beginning in FY 2003, however, it resumed operations with support from a reconstituted OST, whose historical budgets since FY 2003 are displayed in the following chart.



Beginning at \$295,548 in FY 2003, OST's Total budget decreased by 15 percent for FY 2004 and FY 2005, as salaries remained roughly the same but its operating budget decreased by nearly 35 percent, or \$50,000. In FY 2006, OST's total budget increased to \$347,487, when the Chief Policy Analyst position that previously had been provided by UNC-Chapel Hill on a two-year time-limited basis was made recurring in OST's budget, thus increasing OST's FTE count from two to three people. During the next three years, OST's total budget increased slightly to a high of \$364,745 in FY 2010, as the FTE count remained at three but the staff's responsibilities and salaries increased.

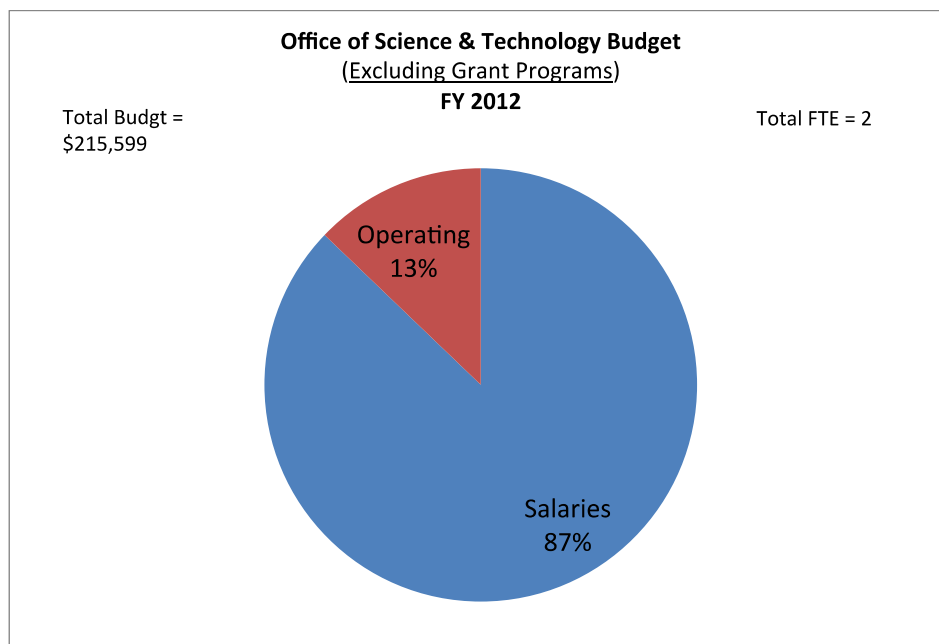
Throughout this three-year period, however, OST's operating budget decreased by more than 40 percent. And as discussed in footnote 2 above, in spring 2011, one senior-level OST position was transferred to the

Key Fact:

Since FY 2003, OST's overall budget has decreased by 27%, in turn decreasing the state's focus on New Economy issues. These decreases run counter to patterns occurring nationwide and worldwide.

Department of Commerce's newly formed Energy division, thus decreasing OST's salary budget 10 percent in FY 2011, and another 40 percent in FY 2012 as a full-year's budget decrease took effect with the removal of one full FTE. Throughout this most recent two-year period, OST's operating budget has decreased by nearly 50 percent, from slightly more than \$300,000 to just under \$220,000.

Overall, between FY 2003 and FY 2012, OST's operating budget decreased by 80% and its salary budget increased by 15 percent, decreasing its total budget by 27 percent. OST's total budget currently stands at \$215,999, a 40 percent decrease from its high FY 2010. Nearly 90 percent of that total budget is accounted for by two FTE positions—the Executive Director and Executive Assistant—who execute the numerous important, wide-ranging, and specialized duties outlined in the Description of Office" (see section 2.a. above and section 3 below). OST has no additional budget support for performing these duties.



With shrinking resources, OST's ability to execute these duties has diminished significantly, in turn decreasing the state's focus on New Economy issues. With other states and nations increasing and sharpening their focus on the New Economy, North Carolina must do the same to keep pace. It is the surest way to improve the economic well-being and quality of life of all North Carolinians.

The recommendations below in sections 5 and 6 address how to increase that focus by improving OST's effectiveness.

3) PROGRAM PERFORMANCE ⁴

As outlined above in section 2c above, OST currently administers three grant programs, which consume at least 70-80 percent of the staff's time and effort. The remaining staff time and effort are devoted to strategic priorities, such as staffing the NC Board of Science & Technology and NC Innovation Council, leading strategic initiative and programs (e.g., nanotechnology roadmap and nanotechnology commercialization conferences), and researching and writing strategic studies, reports, and presentations for statewide audiences, private and public.

Given this distribution of activities, the majority of the performance measures below relate to OST's primary two grant programs: the One NC Small Business Program and the NC Green Business Fund. To the extent possible, the impact of OST's other activities are documented and measured.

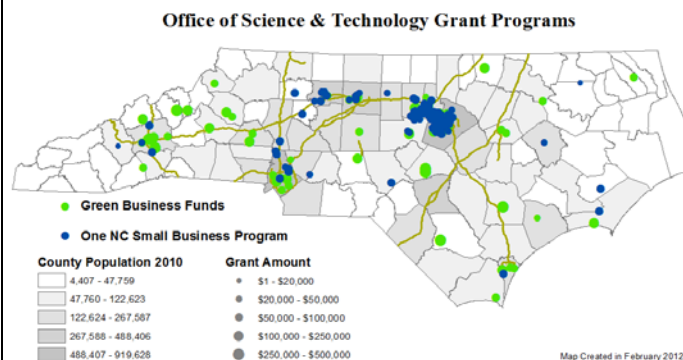
3.a. Discussion & Analysis of Performance Measures & Data

An extensive set of performance measures—both quantitative and qualitative—is available for the OST's primary two grant programs, the One NC Small Business Program and the NC Green Business Fund.⁵ These measures derive from a series of reports each grantee submits during and at the completion of its funded project, as well as from a detailed survey that OST staff conducted of all grantees during January and February 2012. The results of those reports and that survey are presented below, after each program's history, design, and administration are discussed.

In addition, profiles of selected grantees and the leveraging actions and impacts of OST work are

Key Fact:

Since 2006, OST has awarded 424 grants, worth more than \$29 million, to organizations in 65 cities and 43 North Carolina counties. Combined, those counties account for more than 2/3 of North Carolina's population.



Grantee Testimonial:

"Dr. Hardin and Ms. Guffey are extraordinary to work with on this grant program. They are informed, knowledgeable, prompt, professional, responsive and communicate well. It is a rare pleasure to work with a group who knows exactly what they are doing and do it well. Their service to the business community and the State of NC is exceptional."

*~Rivis, Inc.,
Raleigh*

Grantee Testimonial:

"The staff are outstanding people who understand early stage start up companies and are committed to the success of these companies in NC."

*~Physcient, Inc.,
Durham*

⁴ The layout of section 3 of the report changes to two equally sized columns, with tables/charts in the right column, and descriptive text in the left column.

⁵ The Energy R&D Cost-Sharing Program is not evaluated here because it is very new and does not yet have a track record.

presented in Exhibit D. Please review these profiles to get a sense of the nature of the grantee small businesses, their products and services, and the impact of the state grants on their work.

One NC Small Business Program: **Establishment**



With the passage of North Carolina's FY 2006 budget, a bipartisan coalition of state lawmakers established the One North Carolina Small Business Program (NC General Statute §143B-437.81). **The program broadened and realigned the existing One North Carolina Program to include aggressive and comprehensive financial support for entrepreneurial growth companies within the state.**

Lawmakers created the program in response to a realization that one of North Carolina's greatest economic development opportunities was in bridging the gap between its internationally regarded innovation capacity and the creation of small businesses that can commercialize it. The program recognizes the importance of entrepreneurial growth companies to the state's economy and places efforts to enhance them on equal footing with efforts focused on traditional recruiting and expansion.

It does so by making North Carolina small businesses eligible for **state matching grants** to support research projects funded under the federal **Small Business Innovation Research (SBIR) and the Small Business Technology Transfer (STTR) programs (see text box below)**.

SBIR/STTR award rates are a good proxy for the level of critical technology commercialization activity within a state. In recent years, North Carolina has ranked above the national average in R&D funding, but at or below the national average in SBIR/STTR funding. The One NC Small Business Program bridges that gap.

Key Fact:

Since 2006, for the One NC Small Business Program, OST staff have:

- *Reviewed and awarded 245 grants to 165 different small businesses*
- *Prepared and approved 245 grant agreements*
- *Made 441 payments to grantees*
- *Reviewed 1,423 Interim Final, and State Grant Compliance reports from grantees to track the performance and measure the impact of the grants*
- *Engaged in more than 3,000 electronic communications with grantees*

Key Quote:

"We in government must work in partnership with small businesses to ensure that technologies and processes are readily transferred to commercial applications."

**~Ronald Reagan,
July 22, 1982**

Grantee Testimonial:

"We are very grateful for the funding provided by The One NC Small Business Matching Grant Program (and will always remain grateful)! The funds were very integral in the startup/early phase of our company as well as crucial to helping the company through the period of time between the STTR Phase I and STTR Phase II grants. This funding also made our company look good in the analysis by private investors when they saw the federal agency funding along with the state funding. I do hope that this program continues--I think that it is a very effective tool to help create new companies as well as retain a great work force within the state!."

**~GreatWall Systems, Inc.,
Winston-Salem**

Federal
Small Business Innovation Research (SBIR) and
Small Business Technology Transfer (STTR)
Program Overview

In the 1970's and 80's, concerns arose about the ability of the U.S. to compete in the global market. Nations such as Japan were commercializing new technologies at a much faster pace than the U.S., and they were quickly outpacing us in terms of technological innovation.

As this issue rose to the forefront of policymakers' minds, U.S. small businesses began attracting more attention than they had in the past, and they were recognized for their important contributions to the nation's economy. Not only did small businesses exhibit high levels of innovation, they also generated the majority of the new jobs in the U.S.

Yet the risk and expense of exploratory R&D, which necessarily preceded innovation, was often beyond the means of small firms lacking financial resources. If a lack of funding caused U.S. small businesses simply to discard a large number of potential innovations in the early stages, the U.S. might never keep pace with other countries' innovations.

To ensure this didn't happen, the U.S. government created the Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs in 1982, as part of the Small Business Innovation Development Act. This Act, signed into law by President Ronald Reagan, required federal agencies with research budgets over \$100 million to reserve a portion of their annual budgets for SBIR/STTR awards.

Phase I SBIR funding helps small businesses conduct research on the technical merit and feasibility of an idea; Phase II funding helps small businesses implement their research and develop prototypes. Success in the SBIR program also attracts additional outside capital investment. Nationally, companies that receive SBIR Phase II funding have significantly out-performed similar companies that do not receive such support.

The STTR Program facilitates partnerships between small businesses and non-profit research institutions, including universities. STTR funds provide an indication of how well the state's universities are collaborating with small businesses on R&D efforts. Similar to the SBIR Program, the STTR Program follows a two-phased approach.

Currently, eleven agencies—from the Department of Defense to the Department of Agriculture—take part in the SBIR program, and five agencies participate in the STTR program. Each department funds a unique set of innovative efforts. Three agencies, the Department of Defense, the National Institutes of Health, and NASA, account for the majority of SBIR/STTR funds.

In fiscal year 2011, the SBIR and STTR programs combined awarded more than \$2.5 billion (compared to approximately \$750MM in private placements and venture capital), making them the largest single source of early-stage funding for small business.

North Carolina's entrepreneurial community enthusiastically heralded the program's creation for its impact on growing the state's entrepreneurial economy and for the fact that it reflects a substantial recognition by lawmakers of the importance of innovation and entrepreneurship to the economic health of the state. The program enables North Carolina's small businesses to conduct research and technology development that will generate the kinds of innovation critical for making the state a leader in the New Economy.

But North Carolina has strong competition from other states in this arena. Specifically, the following 15 states—Connecticut, Florida, Hawaii, Illinois, Indiana, Kentucky, Michigan, Montana, Nebraska, New Jersey, New York, Oklahoma, South Carolina, Texas, and Virginia—have financial support programs to assist their small businesses in applying for federal Small Business Innovation Research (SBIR) or Small Business Technology Transfer (STTR) grants, to provide matching funds to their small businesses once they are awarded SBIR/STTR grants, or both. Many of the programs were modeled after North Carolina's. While they vary in structure and award amounts across the states, all recognize the importance of supporting their states' SBIR/STTR award-winning small businesses and leveraging the federal grants.

Design

Administrative responsibility for the program rests with OST. Immediately following the program's establishment in July 2005, OST, with oversight from the Board of Science & Technology, accomplished the following steps:

- Drafted comprehensive guidelines regarding the program's structure and administration.
- Published the draft guidelines on OST's site for a 30-day period and provided notice to the public.

Grantee Testimonial:

"United Protective Technologies certainly benefited from the receipt of our state matching fund grant. We used the funds as an opportunity to "bridge" funding of R&D on this project between the first phase and follow-on funding. From a long-term perspective, the company remains focused on raising R&D funds for this effort, which translates into jobs and production revenues in Locust, NC. In this scenario, the NC match funding is an investment in job creation and technology on a long-term basis."

**~United Protective Technologies,
Locust**

Grantee Testimonial:

"I cannot overemphasize the value of this grant to our company, our research, and our success. To receive this kind of funding so early in our research gave us an enormous advantage over other companies with whom we were competing for Phase 2 funds. We used the funding for a variety of purposes, but most importantly, it allowed us to hire a full-time engineer to work solely on this project, and that is something very few start-up companies can afford to do. The success of our research, and the acceleration of our commercialization plan, are due almost entirely to the added engineering resources we have been able to commit to the project."

**~ManningRF, LLC,
Chapel Hill**

- Reviewed more than 60 comments from the public regarding the guidelines.
- Amended the guidelines and published the final version on OST's Web site.
- Drafted a solicitation—incorporating the guidelines—to outline the terms for the specific matching grant offerings.
- Developed internal procedures for reviewing grant applications and disbursing grant payments to awardees.
- Developed an online grants management system (***the first in NC state government***) to accept and administer grant applications and reports (***see text box at right***).
- Published the solicitation on OST's Website, notified the public, and engaged the small business community.

Consistent with its legislative intent, the goal of the program is to foster job creation and economic development in North Carolina by increasing the competitive position of North Carolina small businesses in attracting federal SBIR/STTR grant funding. Similarly, it provides an incentive for Phase I award-winning firms to participate in the more substantial Phase II program. The specific objectives of the program are to:

1. Increase the amount of federal research dollars received by North Carolina small businesses;
2. Help North Carolina small businesses bridge the funding gap period between the final Phase I payment and the first Phase II payment in the federal SBIR/STTR program;
3. Increase the intensity of the research conducted under Phase I, making North Carolina small businesses more competitive in the competition for Phase II funds; and
4. Encourage the establishment and growth of

The *sciGrants* Online Grants Management System

The *sciGrants* system easily enables North Carolina small businesses to submit their matching grant applications and their required follow-up reports online. It also easily enables the OST staff to review applications and track the program's performance, outputs, and outcomes. *sciGrants* is the model for the online grants management system the NC Department of Commerce is currently developing to manage all its grant programs.

high-quality, advanced technology firms in the North Carolina.

To accomplish these objectives, the state grants match funds that a North Carolina business receives under a federal SBIR/STTR Phase I award, up to a maximum of \$100,000. Matching grants are disbursed in two stages:

- **Stage 1** - 75% of the total match award is disbursed upon proof of Phase I award.
- **Stage 2** - 25% of the total match award is disbursed upon submission of the Phase II application and acceptance of the Phase I report by the federal SBIR/STTR program agency.

Administration

The population of businesses eligible for the program's state matching grant entails the approximately 90 North Carolina small businesses that receive a federal SBIR or STTR grant in given year. To receive such a grant, the companies submit proposals to federal agencies, which then subject the proposals to a rigorous merit-based review process in which **only the best proposals (typically 15% or less) receive funding. Thus, a key strength of the state matching program is that it leverages the due diligence of the federal review process and enables OST's staff to focus administratively on a targeted set of eligibility criteria, as outlined in the program's enabling legislation and guidelines.**

Award disbursements under the program are made in two stages, each of which requires an application process. To be eligible to submit an application, a company must:

1. Be a for-profit small business with its principal place of business in North Carolina.
2. Meet all federal SBIR/STTR program eligibility

Grantee Testimonial:

"Semprius has benefitted greatly from its interactions with the Green Business Fund, whether from the actual award money, the publicity generated from the award, the focus of the Green Business Fund funding process on creating jobs in North Carolina, or from the interactions with the diligent and accessible Fund staff. It is clear, through interactions with the Green Business Fund, that the State Government is highly attentive to facilitating business growth in North Carolina."

*~Semprius,
Durham*

(announced 256 new jobs in expansion to Henderson in July 2011)

Grantee Testimonial:

"This grant was key to the success of OrganoFuels, but its benefits within the state are significant as well. This program is an outstanding way for North Carolina to improve its employment avenues by increasing small business opportunities. This grant also brought funding to areas outside the Research Triangle, improving the technological sector employment opportunities across the state. North Carolina is working hard to support new innovations, especially in the environmentally friendly technologies. The NC Green Business Fund Grant was a key decision in the future of North Carolina. Small businesses, like OrganoFuels, will provide new employment and revenue generating platforms hardly imagined years ago."

*~OrganoFuels,
Candler*

requirements that are applicable to the relevant federal solicitation.

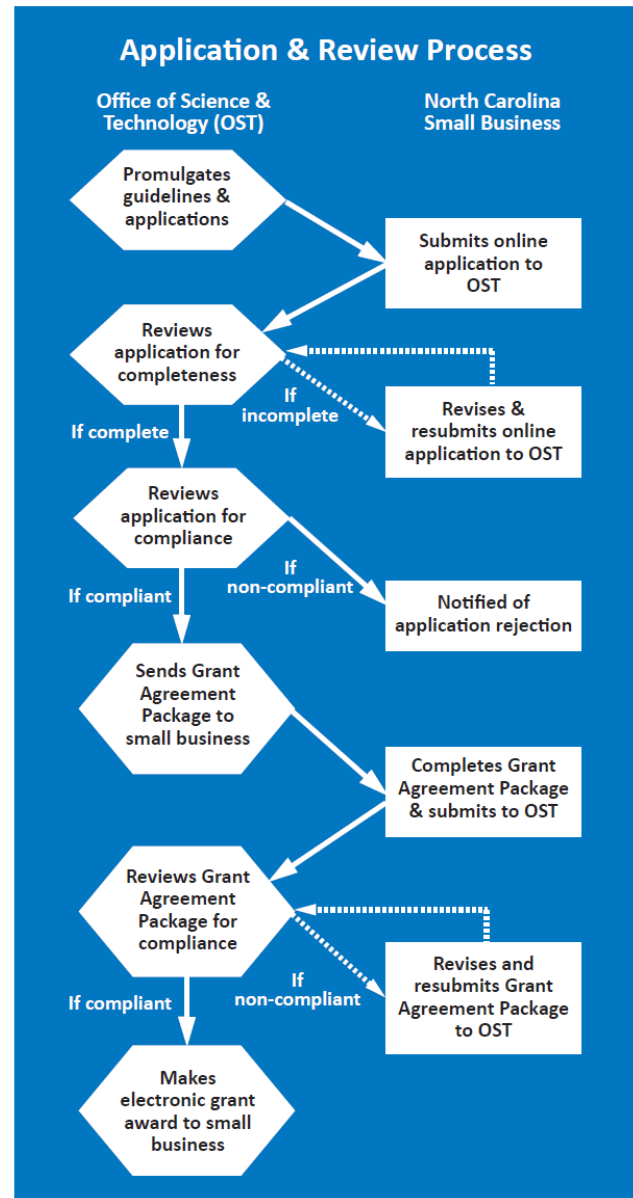
3. Have received an official notification of federal SBIR/STTR program Phase I SBIR or STTR award (*To receive a Stage 1 grant*).
4. Have (*To receive a Stage 2 grant*):
 - a. Received a Stage 1 NC SBIR/STTR Matching Funds program award.
 - b. Successfully completed the Phase I effort corresponding to the federal award and submitted a final Phase I report to the granting federal SBIR/STTR program agency;
 - c. Received notification of the successful completion of the Phase I effort from the participating federal SBIR/STTR program agency;
 - d. Demonstrated that the participating federal SBIR/STTR program agency has an interest in the related Phase II proposal;
 - e. Submitted a Phase II proposal in response to the federal SBIR/STTR program agency's Phase II proposal request.
5. Certify that at least fifty-one percent (51%) of the activity conducted under the Phase I research and subsequent Phase II effort, if awarded, will be performed in North Carolina.

Using these criteria, OST's staff review submitted applications for compliance (*see box at right*)

Evaluation

Monitoring and evaluating the program are key to advancing its goals and objectives. Accordingly, each of the program's matching grant recipients must submit three types of reports:

1. An **Interim Status Report** submitted every six months after receipt of an grant award until the small business receives the federal Phase



II award or notification that the federal award will not be granted. The report collects mid-project quantitative impact data as well as qualitative assessments of the program's value.

2. A **Final Report** submitted within thirty days of notification of a federal Phase II contract award or denial. The report collects completed-project quantitative impact data as well as qualitative assessments of the program's value.
3. A **State Grant Compliance Report** submitted within six months after the end of the recipient's fiscal year in which a Match Award was received. Using reporting forms developed by the Office of State Budget and Management and of the Office of the State Auditor, the recipient submits a certified Schedule of Receipts and Expenditures and an Activities and Accomplishments Report.

In addition to submitting these reports, matching grant recipients agree to complete and submit to OST a Matching Funds Program Evaluative Survey for a period of up to five years following receipt of the matching grant. During January and February of 2012, OST staff conducted a detailed survey of all grantees, with 200 companies, more than 82 percent, of all the grantees responding to the survey.

Based on information and findings from these reports and this survey, the OST modifies the program as needed to ensure that it efficiently and effectively advances its goals. **The findings below regarding the program's activities, outputs, and outcomes come directly from these reports and surveys.**

Performance Metrics – Descriptive

Since its beginning in FY 2006, the program has matched a total of 245 **Phase I federal grants, worth \$35,856,785**, to North Carolina small

Grantee Testimonial:

"Our program director at the NIH went out of his way to find funding from other institutes for our Phase I SBIR when he learned of the NC matching program, because he "would get more bang for his buck." Without the matching program, the grant would have been delayed to the following year and most likely not funded. The NC matching program definitely makes NC companies more competitive and is an effective tool for bringing federal funds to NC."

*~ Brighton Development, LLC,
Cary*

Key Quote:

"In March of 2012, my company will celebrate its 6th full year of business (all of which have been profitable). Although growth has been slow and painful at times, the future of my company is now brighter than ever. This is in no small way due directly to the Matching Funds program. I will always be thankful for the funds from the program and I hope that it is continued to help other small businesses like mine that just need that little bit of help to be successful."

*~ GTCAllison, LLC,
Mocksville*

businesses. The **state match award totaled 16,628,228, about half the amount of the original federal awards.** While the maximum amount of the match allowed by statute is \$100,000, the actual amount of the match per business has varied each year depending on how much funding was appropriated to the program. In years with significant appropriations (e.g., 2007 and 2008), the full match was awarded; in years with smaller appropriations (e.g., 2006 and 2010), a smaller match (e.g., \$30,000-\$50,000) was awarded. The program received no appropriations in FY 2012.

Although the small businesses receiving the program's grants vary in the types of activities they conduct, they reflect North Carolina's high-tech strengths overall. Consistent with the state's high rankings in biotechnology, nearly 1/3 of the businesses receiving the program's grants work in the biotechnology sector. Other significant sectors include advanced materials, computer software, defense, and medical/pharmaceutical. Each of these sectors plays a critical role in North Carolina's economy and is expected to grow significantly in the coming years. In total, small businesses representing more than 16 sectors received the program's grants.

Because the small businesses receiving the program's grants are focused on creating and commercializing new technologies, a majority (53%) of the 2,393 employees working in those businesses have professional or scientific training. Moreover, a significant share of the other employees are classified as management or technical in nature. A small minority of the employees are skilled or unskilled labor. The high-tech, innovative nature of these small businesses means that the average salaries of their employees will be significantly higher than the state average.

One NC Small Business Program: Funding, FY 06-11

FY	Appropriated \$	Awarded #	Awarded \$
2006	\$1,000,000	25	\$1,111,816
2007	\$5,000,000	51	\$4,553,917
2008	\$4,830,000	49	\$4,675,962
2009	\$3,500,000	54	\$3,968,588
2010	\$700,000	22	\$1,006,439
2011	\$1,500,000	44	\$1,311,513
Total	\$16,530,000	245	\$16,628,228

Notes: In FY 2006, \$111,816 was funded from the 2007 appropriation. In FY 2009 and 10, awarded \$ included deobligated funds recycled and carried forward from previous years when some grantees did not meet requirements for receiving their Stage 2 payments.

One NC Small Business Program: Grantee Main Business Activity, FY 06-11

Grantee's Main Business Activity	#	%
Biotechnology	74	30%
Advanced Materials	30	12%
Medical	25	10%
Computer Software	24	10%
Defense	22	9%
Other	21	9%
Education	13	5%
Pharmaceuticals	7	3%
Subassemblies/Components	6	2%
Environmental	4	2%
Photonics	4	2%
Test & Measurement	4	2%
Chemicals	3	1%
Energy	3	1%
Manufacturing Equipment	3	1%
Telecommunications/Internet	2	1%
Total Grantees	245	100%

One NC Small Business Program: Employees (at the time of award) by Type, FY 06-11

Type	#	% of Total
Professional/Scientific	1,278	53%
Management	441	18%
Technical/Technician	417	17%
Skilled Labor	176	7%
Unskilled Labor	21	1%
Other	60	3%
Total	2,393	100%

Note: The average number of employees per company is 10.

The small businesses receiving the state matching grants expend the funds in a number of ways. Nearly half the expenditures go toward covering the wages and salaries of employees, the businesses' most important assets. Twelve percent of the expenditures pays for research-related equipment, 10 percent for supplies, and six percent each for facility rental and consultant fees. Two percent covers computer software, while the remaining 11 percent covers other costs, such as patent and legal fees or specialized training and workshops.

Performance Metrics – Outputs and Outcomes⁶

The state grants play a significant role in boosting the number of jobs the small businesses can create and retain. Specifically, with the state grants the businesses have created a total of 241 new jobs and retained 246 exiting jobs. In total, the estimated net employment impact of the state grants is nearly 500 jobs, or 20 percent of the companies' existing workforce. Given that the small businesses devote 53 percent of the grant funds to wages and salaries, that makes the cost per job created/retained just over \$18,000.

A primary goal of the program, as outlined in the program's statutorily required guidelines, is to help the small businesses be more competitive in the competition for Phase II SBIR/STTR awards from the federal agencies. The companies report that the program is achieving that goal, as 82 percent of the businesses strongly agree or moderately agree that the state matching funds helped them in their pursuit of Phase I Funds.

Together, the businesses were awarded \$73,313,803 in follow-on Phase II SBIR/STTR grants.

A related and broader goal, also outlined in the program's statutorily required guidelines, is to

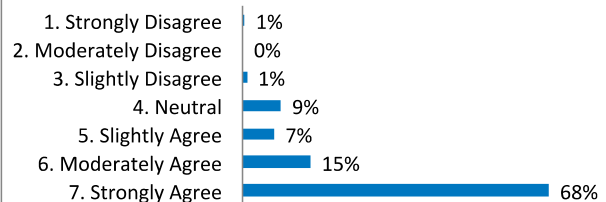
One NC Small Business Program: Use of Funds, FY 06-11

Type	Matching \$	% of Total
Wages and salaries	\$8,862,142	53%
Equipment	\$1,984,994	12%
Other	\$1,843,635	11%
Supplies	\$1,637,191	10%
Facility rental	\$1,000,130	6%
Consultant fees	\$941,646	6%
Computer software	\$370,991	2%
Total	\$16,640,729	100%

One NC Small Business Program: Jobs Created/Retained, FY 06-11

Job Category	Created	Retained
Professional/Scientific	120	144
Management	17	30
Technical/Technician	58	42
Skilled labor	19	15
Unskilled labor	19	7
Other	8	9
Total	241	246

Helped my company be more competitive in competition for Phase II funds



⁶ For space reasons, not all the outputs- and outcomes-focused survey results are presented here. All the results, which are very positive, are available from OST staff upon request.

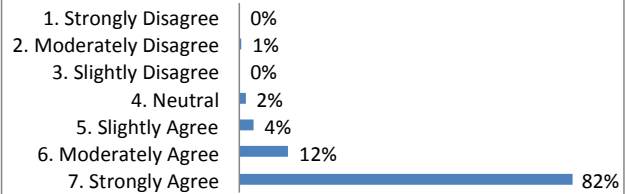
encourage the establishment and growth of advanced technology firms in North Carolina, as these firms are the drivers of the New Economy. The companies report that the program is achieving that goal, as 94 percent of the companies strongly agree or moderately agree that the state matching funds help encourage such firms.

The program also encourages the small business to collaborate with the state's universities. Of the 59 percent of grantee businesses that collaborate with university or college, 91 percent did so with a North Carolina institution.

The ultimate benefits of using the state grants to leverage the initial Phase I federal grants is the additional funding the small business are able to garner from multiple sources, as well as the sales revenue they will generate from the innovative products and services they develop with the funding.

In terms of additional funding, the 200 small businesses completing the survey indicate receiving more than \$85 million dollars to directly support the further development and commercialization of the products and services they develop with the initial federal and state funding. Thus, combined with the follow-on Phase II SBIR/STTR funding above, the total amount of additional funding the businesses received amounts to \$158,620,084, meaning that **for every \$1 the state provides to the small businesses with matching grants⁷, they receive an additional \$9.5 dollars from other sources.**

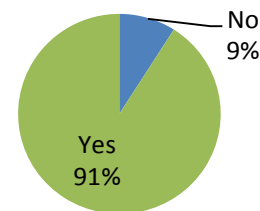
Encourages establishment and growth of advanced technology firms



One NC Small Business Program:

NC University/College Partnerships, FY 06-11

Partnership with university or college based in North Carolina?



One NC Small Business Program:

Additional Funding Directly for Technology Developed During Project, FY 06-11

Additional Funding	Count	Dollars
Colleges/Universities	83	\$600,000
Foreign investment	76	\$125,000
Non-Profit	62	\$435,000
Non-SBIR/STTR federal	103	\$21,326,825
Other domestic company	116	\$10,948,403
Other private equity	97	\$11,613,000
Personal funds of company	97	\$905,084
SBIR/STTR federal funding	95	\$28,608,219
State or local governments	88	\$1,807,250
U.S. venture capital	87	\$6,700,000
Your own company	102	\$2,237,500
Total	1,006	\$85,306,281

⁷ \$16.6 million total.

This funding is what enables the small businesses to create and produce innovative new products and services. For example, the 200 businesses responding to the survey have applications pending for 34 copyrights and have received seven⁸. They also have applications pending for 90 patents and have received 31.⁹ This intellectual property is the basis for much of the businesses' products and operations, and without it they could not compete in the U.S. and world marketplace.

In addition, the 200 small businesses project that during 2012, they or their technology licensees or spin-off companies will have a total sales of more than \$57 million. Those sales numbers will increase as the technologies and services develop further over time.

Finally, as summary measure of the program's value, the small businesses who received grants ranked the program on two dimensions:

- (a) the **overall effectiveness** of the program (relative to its statutorily created goals)
- (b) the **overall efficiency** of the program (in terms of its administration and ability to achieve its goals)

As indicated in the figure to the right, **148 (74 percent) of the 200 grantee survey respondents strongly agree that the program is both effective and efficiently managed.**

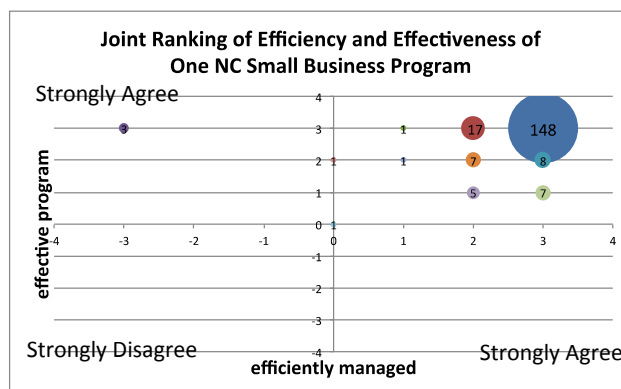
In sum, the output and outcome measures presented above indicate that the One NC Small Business Program is effectively and efficiently fulfilling its statutorily defined goals and objectives.

**One NC Small Business Program:
Intellectual Property for Technology
Developed as a result of State Grant, FY 06-11**

Intellectual Property	#	\$
Copyrights		
Applied for but Pending	34	\$1,550,000
Received	7	\$1,005,020
Patents		
Applied for but Pending	90	\$1,520,468,000
Received	31	\$394,700,000

**One NC Small Business Program:
2012 Sales Resulting From Technology
Developed During Project, FY 06-11**

	Total
Total sales of product(s), process(es), or services(s) expected during calendar year 2012	\$37,826,500
Other sales (e.g., rights to technology, sale of spin-off company) expected during calendar year 2012	\$19,488,000
Total	\$57,314,500



⁸ In the U.S. a copyright is a form of protection grounded in the U.S. Constitution and granted by law for original *works of authorship* fixed in a tangible medium of expression.

⁹ In the U.S., a patent consists of a set of exclusive rights grounded in the U.S. Constitution and granted by law to an inventor or their assignee for a limited period of time in exchange for the public disclosure of an *invention*.

NC Green Business Fund**Establishment**

With the passage of North Carolina's FY 2008 budget, a bipartisan coalition of state lawmakers established the North Carolina Green Business Fund. A competitive grants program, its eligible entities are private NC businesses with fewer than 100 employees, nonprofit organizations, local governments, and State agencies. ***Its goal is to encourage the expansion of small to medium-sized businesses to help grow a green economy in the state in three priority areas: biofuels, green building, and environmentally conscious clean technology and renewable energy products.***

While similar to the One NC Small Business Program, it differs in two key respects:

- (1) It is a **competitive**, not a matching, program, and
- (2) It focuses on **green** (i.e., energy efficient, clean) technologies.

Lawmakers recognized that it is important to focus on the green economy for three interconnected reasons:

- *Weakened National Security*—i.e., dependence on foreign sources of energy.
- *Potential Environmental Damage and Climate Change*—i.e., need for cleaner energy sources and remediation technologies.
- *De-industrialization of US Economy*—need to develop new industries, based on new technologies.

North Carolina's entrepreneurial and high-tech communities enthusiastically heralded the program's creation as the first of its type in the Southeast and one of the first in the nation. As with the One NC Small Business Program, the NC Green Business Fund enables North Carolina's

Key Fact:

Since 2008, for the NC Green Business Fund, OST staff have:

- *Reviewed 879 pre-proposals requesting more than \$165 million;*
- *Reviewed 358 full proposals requesting more than \$60 million;*
- *Prepared and approved 88 grant agreements;*
- *Made 348 payments to grantees;*
- *Reviewed 257 Interim, Quarterly Narrative, Final, and State Grant Compliance reports from grantees*
- *Engaged in more than 4,000 electronic communications with grantees*

Grantee Testimonial:

"Our NCGBF award has been fundamental to our success. The award made it possible to transition our wastewater treatment and recycle system prototype into an automated production model that is simple to operate and that consistently produces clarified water that has less heavy metals than the EPA's threshold for drinking water."

**~ Clean Marine Solutions, LLC,
Wilmington**

Grantee Testimonial:

"In a time that was very difficult for my industry in general (automotive manufacturing), the NCGBF allowed my company to develop products that has me well positioned for the increased activity I have seen in the last 6 months. I have been able to hold on and grow my product offering with new technology because of the grant."

**~ Aerofab Manufacturing,
Apex**

small businesses and other organizations to conduct research and technology development that will generate the kinds of innovation critical for making the state a leader in the New Economy.

Design

Administrative responsibility for the program rests with OST. Immediately following the program's establishment in July 2007, OST, with oversight from the Board of Science & Technology, accomplished the following steps:

- Drafted comprehensive guidelines regarding the program's structure and administration.
- Published the draft guidelines on OST's site for a 30-day period and provided notice to the public.
- Reviewed more than 20 comments from the public regarding the guidelines.
- Amended the guidelines and published the final version on OST's Web site.
- Drafted a solicitation—incorporating the guidelines—to outline the terms for the specific matching grant offerings.
- Developed internal procedures for reviewing grant applications and disbursing grant payments to awardees.
- Incorporated the program's application and structure into *sciGrants*, OST's online grants management system (*see box above in One NC Small Business Program section*).
- Published the solicitation on OST's Website, notified the public, and engaged the small business community.

Grant funds are disbursed in three stages:

- **Stage 1** - 50% of the total award is disbursed at time of initial award.
- **Stage 2** - 25% of the total award is disbursed

Grantee Testimonial:

"Supporting the innovations such as our natural, green, energy saving technology is a win/win for the state. The ROI in jobs and taxes is significant. The savings of energy, reduction in CO and the creation of a new NC-based industry are benefits that can be quantified and far outweigh the initial investment. The Green Grants given to Phazetek/QuarTek and Phase Change Energy Solutions/Vesture led to a merger of the two entities into a new Company that is projected to be well over \$150 million in sales, employing ~100 people within three years. We are on the brink of a \$20 million capital infusion that will enable this growth. All of this stemmed from the shared belief in the technology and the vote of confidence plus financial assistance of the grants."

**Phase Change Energy Solutions~,
Asheboro**

Grantee Testimonial:

John Hardin, Sharlini Sankaran and Paul Shannon provided excellent guidance to Clean Marine Solutions throughout the grant application process. They consistently provided timely, clear and concise advice and guidance. If all government agencies provided this level of service, business owners and the general public would have far fewer headaches.

**~ Clean Marine Solutions, LLC,
Wilmington**

Grantee Testimonial:

"The managing of the program has been very professional from a logistics stand point and from the support of the staff. Anytime I have had a question, they have gone above and beyond to respond to me accurately and promptly.."

**~ Caldwell Community College and Technical
Institute, Hudson**

at project midpoint, upon submission of a suitable Interim Report by the grantee.

- **Stage 3** – The remaining 25% of the total award is disbursed at project endpoint, upon submission of a suitable Final report by the grantee.

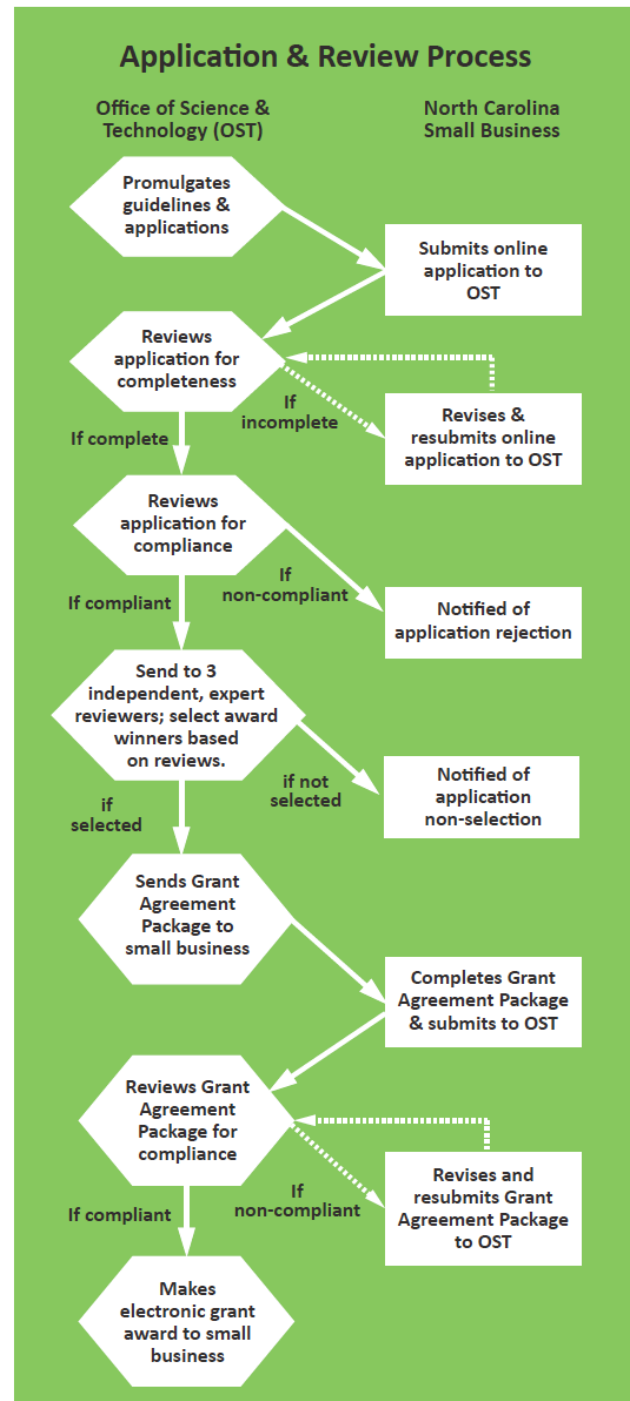
Administration

The population of organizations eligible for the program's Green Business Fund grants entails the thousands of organizations that fall into one of the following categories: NC businesses with fewer than 100 employees, nonprofit organizations, local governments, and State agencies. All have to have their principal place of business in North Carolina.

To receive a Green Business Fund grant, the eligible organizations submit proposals to OST in response to an annual solicitation for proposals that it announces (*see box at right for application and review process*).

Each year, the number of proposals has far exceeded the amount of funding available to be awarded. For example, in FY 2009, the program's second year, OST received 299 pre-proposals requesting a total of \$25 million. OST staff reviewed all pre-proposals and then invited 93 to submit full proposals, totaling \$8 million in requests. From these, the top 14 were selected to receive a total of \$950,000, an average of \$68,000 per awardee.

Before selection, **each full proposal undergoes a rigorous review process in which it is reviewed—using an extensive set of quantitative and qualitative criteria—by three independent technology/business experts.** Based on the findings of those reviews, as well as an in-person meeting in which the reviewers discuss the proposals and their rankings of them, the winners are selected and grant agreements



are issued. As with the One NC Small Business Program, as a condition to the grant agreement, grantees must certify that at least fifty-one percent (51%) of the activity conducted under the grant will be performed in North Carolina.

Evaluation

Monitoring and evaluating the program are key to advancing its goals and objectives. Accordingly, each of the Green Business Fund grant recipients must submit three types of reports (identical to those described in more detail in the One NC Small Business Program section above):

1. An **Interim Status Report**
2. A **Final Report**
3. A **State Grant Compliance Report**

In addition to submitting these reports, matching grant recipients agree to complete and submit to OST a Matching Funds Program Evaluative Survey for a period of up to five years following receipt of the matching grant. During January and February of 2012, OST staff conducted a detailed survey of all grantees, with 24 companies, more than 88 percent, of all the grantees responding to the survey. **The findings below regarding the Program's activities, outputs, and outcomes come directly from these reports and surveys.**

Performance Metrics – Descriptive¹⁰

State-Funded and DOE/ARRA-Funded Grants

Since beginning in FY 2008, the program has awarded 88 grants, **worth \$12,152,275** to North Carolina small businesses and other eligible organizations.

During the first year of the program, FY 2008, grants were funded entirely with state appropriations, were capped at \$100,000, and one round of awards was made. During FY 2009, grants were funded with a combination of state

Grantee Testimonial:

"The NC Green Business Fund provides crucial funding to companies within NC that would otherwise not have the opportunity to further develop, commercialize or expand their companies/products within the state. This fund helps support and maintain green jobs while also highlighting their importance to the state's economy."

~ **Microcell Corporation,**
Raleigh

NC Green Business Fund Funding, FY 08-11

FY	Funding \$	Funding Source	Awarded #	Awarded \$
2008	\$1,000,000	State	13	\$950,000*
2009	\$1,000,000	State	14	\$950,000*
2009	\$1,154,887	DOE/ARRA	14	\$1,154,887
2009	\$471,455	State	13	\$471,455
2010	\$4,580,686	DOE/ARRA	15	\$4,580,686
2011	\$3,691,709	DOE/ARRA	19	\$3,691,709
Total	\$12,152,275		88	\$12,152,275

**Note: As allowed by legislative provision, during FY 2008 and 09, five percent was used for program administrative expenses.*

¹⁰ Because the descriptive data gathered for the **state-funded** and **DOE/ARRA-funded** Green Business fund are similar, the descriptive data are grouped for the two funding sources.

funds and U.S. Department of Energy (DOE) American Recovery and Reinvestment Act (ARRA) funds, were capped at \$100,000, and three rounds of awards were made. And during the program's most recent two years, grants were funded by DOE/ARRA, were capped as \$500,000, and two rounds of awards were made. The program received no appropriations in FY 2012.

While the state funds were directed to be used for technology development and commercialization, the DOE/ARRA funds could be used only for the deployment and installation of *already commercially available* energy-saving technologies.

As with the One NC Small Business Program, the Green Business Fund grantees vary in the types of activities they conduct. Here, too, they reflect North Carolina's high-tech strengths overall, but many of the businesses do not focus primarily on energy or environmental technologies. Instead, they represent a broader spectrum of sectors, each of which has a role to play in the green economy. In total, organizations representing more than nine sectors received the program's grants.

Because many, but not all, of the small businesses and other organizations receiving the program's grants focus on creating and commercializing new technologies, the largest category (43%), but not a majority, of the 1,647 employees working in those businesses have professional or scientific training. Moreover, a significant share of the other employees are classified as management or technical in nature. A small minority of the employees are skilled or unskilled labor.

The small businesses receiving the Green Business Fund grants expend the funds in a variety of ways. More than a third of the expenditures go toward equipment, either for use in the R&D process or to implement the finished product. Slightly more

**NC Green Business Fund,
Grantee Main Business Activity, FY 08-11**

Grantee's Main Business Activity	#	%
Other	30	34%
Energy	21	24%
Environmental	11	13%
Biotechnology	7	8%
Advanced Materials	7	8%
Manufacturing Equipment	7	8%
Education	4	5%
Subassemblies/Components	1	1%
Total	88	100%

**NC Green Business Fund:
Employees (at the time of award) by Type, FY 08-11**

Type	Number	% of Total
Professional/Scientific	701	43%
Management	196	12%
Technical/Technician	264	16%
Skilled Labor	237	14%
Unskilled Labor	110	7%
Other	139	8%
Total	1,647	100%

**NC Green Business Fund:
Use of Funds, FY 08-11**

Type	Matching \$	% of Total
Equipment	\$4,397,691	37%
Wages and salaries	\$3,324,115	28%
Other	\$2,289,452	19%
Supplies	\$902,798	8%
Consultant fees	\$825,031	7%
Facility rental	\$117,461	1%
Computer software	\$62,387	0%
Total	\$11,918,935	100%

than one-fourth of the expenditures go toward covering the wages and salaries of employees, while 19 percent of the expenditures pays for other miscellaneous costs associated with developing and commercializing the technologies. The remaining minority is spread across four categories, supplies, consultant fees, facility rental, and computer software.

Performance Metrics – Outputs and Outcomes¹¹ ***State-Funded Grants***

The state-funded grants play a key role in determining the number of jobs the small businesses can create and retain. Specifically, with the state grants the businesses have created a total of 46 new jobs and retained 51 existing jobs. In total, the estimated net employment impact of the state grants is nearly 97 jobs, or slightly more than three jobs per company. Given that the small businesses devote only 28 percent of the grant funds to wages and salaries, that makes the cost per job created/retained minimal.

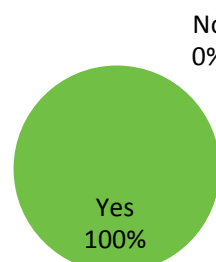
The program also encourages the small business to collaborate with the state's universities. Of the 50 percent of Green Business Fund grantees businesses that collaborate with university or college, 100 percent did so with a North Carolina institution.

Key to expanding their operations is for the small businesses to garner additional funding from multiple sources. In terms of additional funding, the 24 small businesses completing the survey indicate receiving more than \$15 million dollars to directly support the further development and commercialization of the state funding provided by the Green Business Fund. Thus, given that

NC Green Business Fund: Jobs Created/Retained, FY 08-11

Job Category	Created	Retained
Professional/Scientific	11	16
Management	4	8
Technical/Technician	13	9
Skilled labor	14	9
Unskilled labor	-	6
Other	4	4
Total	46	51

Partnership with university or college based in North Carolina?



NC Green Business Fund: Additional Funding Directly for Technology Developed During Project, FY 08-11

Additional Funding	Count	Dollars
Colleges/Universities	15	10,000
Foreign investment	14	-
Non-Profit	15	-
Non-SBIR/STTR federal	15	2,570,500
Other domestic company	19	4,258,000
Other private equity	16	150,000
Personal funds of company	15	1,280,000
SBIR/STTR federal funding	14	250,000
State or local governments	15	184,000
U.S. venture capital	17	6,000,000
Your own company	19	476,465
Total	177	15,178,965

¹¹ For space reasons, not all the outputs- and outcomes-focused survey results are presented here. All the results, which are very positive, are available from OST staff upon request. Additionally, because the **outputs and outcomes** data gathered for the **state-funded** and **DOE/ARRA-funded** Green Business fund are differ substantially, the data are presented separately for the two funding sources.

they received a total of \$1.9 million from the state, **for every \$1 the state provides to the organizations, they receive an additional \$7.8 dollars from other sources.**

This funding is what enables the small businesses to create and produce innovative new products and services. For example, the 27 businesses responding to the survey have applications pending for have received seven copyrights . They also have applications pending for 9 patents and have received 2. This intellectual property is the basis for much of the businesses' products and operations, and without it they could not compete in the U.S. and world marketplace.

In addition, the 24 small businesses project that during 2012, they or their technology licensees or spin-off companies will have a total sales of more than \$4.1 million. Those sales numbers will increase as the technologies and services develop further over time.

Finally, as summary measure of the program's value, the small businesses who received grants ranked the program on two dimensions:

- (a) the **overall effectiveness** of the program (relative to its statutorily created goals)
- (b) the **overall efficiency** of the program (in terms of its administration and ability to achieve its goals)

As indicated in the figure to the right, **13 (50 percent) of the 24 grantee survey respondents strongly agree that the program is *both* effective and efficiently managed.**

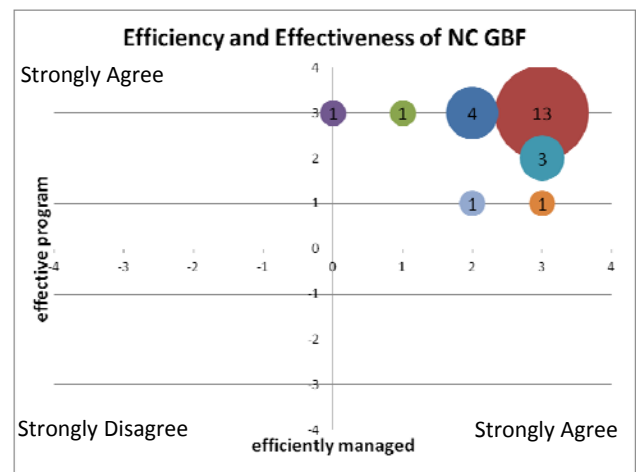
In sum, the output and outcome measures presented above indicate that the state-funded NC Green Business Program is effectively and efficiently fulfilling its statutorily defined goals and objectives.

**NC Green Business Fund:
Intellectual Property for Technology
Developed as a result of State Grant**

Intellectual Property	#	\$
Copyrights		
Applied for but Pending	0	0
Received	3	\$505,000
Patents		
Applied for but Pending	9	\$ \$80,000,000
Received	2	0

**NC Green Business Fund:
2012 Sales Resulting From Technology
Developed During Project, FY 08-11**

	Total
Total sales of product(s), process(es), or services(s) expected during calendar year 2012	\$350,000
Other sales (e.g., rights to technology, sale of spin-off company) expected during calendar year 2012	\$3,811,000
Total	\$4,161,499



Performance Metrics – Outputs and Outcomes¹²
DOD-ARRA-Funded Grants

As discussed above, during FY 2009 and 2010, the NC Green Business Fund was funded via U.S. Department of Energy (DOE) American Recovery and Reinvestment Act (ARRA) funds. These funds could be used only for the deployment and installation of *already commercially available* energy-saving technologies.

Because these 48 projects ended on December 31, 2011, their impacts have not yet been fully realized. The table below presents metrics of their impacts as of February 15, 2012. OST staff will partner with the State Energy Office to have technical assistance providers conduct additional measurement and verification of the impacts during spring 2012.

Grantee Testimonial:

"This project has helped us to significantly lower our costs while simultaneously lowering our impact on the environment. Additionally, we now have a much better understanding of the energy side of our operations. We are very thankful for the vision of the North Carolina Office of Science & Technology and those state legislators who support the NC Green Business Fund."

~ Kyma Technologies
Raleigh

Metric	Unit	Amount
First Year Energy Cost Savings	(\$)	794,502
Greenhouse Gas & Criteria Air Pollutant Emissions Reduced	(tons, CO2-E)	8,335
Jobs Created, ARRA Funds	(hrs)	42,459
Jobs Created, Leveraged Funds	(hrs)	17,644
Number of Wind Turbines Installed	(#)	12
Capacity of Installed Wind Turbines	(MW)	0.02
Energy Generated by Wind Turbines, annually	(MWh)	0.24
Number of Solar Photovoltaic Systems Installed	(#)	15
Capacity of Installed PV Systems	(MW)	0.60
Energy Generated by PV Systems, annually	(MWh)	114
Number of Biomass Systems Installed	(#)	4.00
Capacity of Biomass Systems Installed	(MW)	0.81
Energy Generated by Biomass Systems, annually	(MWh)	2,380
Number of Buildings Retrofitted	(#)	104
Area of Retrofitted Buildings	(sq.ft.)	1,413,258
Number of Geothermal Systems Installed	(#)	1
Capacity of Geothermal Systems Installed	(tons)	-
Number of Solar Thermal Systems Installed	(#)	17
Capacity of Solar Thermal Systems Installed	(sq.ft.)	1,440
Reduction in Electricity Demand	(MW)	0.57
Reduction in Electricity Consumption	(MWh)	3,929
Reduction in Fuel Oil Consumption	(gal)	11,762
Reduction in Natural Gas Consumption	(MMcf)	1,321
Number of Training Sessions Held	(#)	102
Number of Attendees at Training Sessions	(#)	37,445
Number of Audits Conducted	(#)	1,484
Area of Buildings Audited	(sq.ft.)	487,623
Auditor's Estimated Energy Savings Potential	(MWh)	90,338

¹² As noted in footnote 8 above, because the **outputs and outcomes** data gathered for the **state-funded** and **DOE/ARRA-funded** Green Business fund differ substantially, the data are presented separately for the two funding sources.

Performance Metrics –Nanotechnology Leadership

As noted in section 2c above, since 2005 a key strategic and tactical priority of OST has been accelerating the development and deployment of nanotechnology in North Carolina.

Nanotechnology is the creation of materials, components, devices, and systems at the near-atomic, or nanometer, level. Nanotechnology is creating a wealth of new materials and manufacturing possibilities, which in turn will profoundly impact our economy, our environment, and our society.

Using nanotechnology, researchers and manufacturers can fabricate materials literally molecule-by-molecule. They can harness previously inaccessible properties of matter and “custom design” ultra-precise new structures, devices, and systems with new, unique, and often remarkable properties—such as materials with vastly increased strength, vastly decreased weight, vastly greater electrical connectivity, or the ability to change shape or color on demand.

Over the coming decades, North Carolina can create more new, high-wage jobs for its citizens from the effective use of science and technology-based economic development policy than from any other source. Nanotechnology is vital to building and sustaining North Carolina’s reputation as a frontrunner in science and technology.

As such, in addition to crafting North Carolina’s Nanotechnology Roadmap and developing the **www.NCnanotechnology.com** website, one of the primary ways OST has helped advance nanotechnology in North Carolina is to hold an annual Nanotech Commercialization Conference. Summary metrics regarding the conference are as follows:

Client Testimonial:

I want to congratulate you on an exceptional [2010] Nanotech Commercialization Conference in Greensboro (and your support in welcoming NanoMedica as a transplant biotech startup from NJ to NC). I've been following the nanotech "industry" for over 20 years now, and the Greensboro conference was, without question, the most topical, relevant, well-organized and well-targeted of any I've attended in this country and others. Congratulations on a job well done.

~Roger Cubicciotti, Ph.D., President, NanoMedica, Inc., Winston-Salem

- Three conferences have been held:
 - Raleigh (2009)
 - Greensboro (2010)
 - Charlotte (2011)
- The fourth will be April 4-5, 2012 in Durham
- 200-250 attendees at each conference
- All expenses paid via external sponsorships and attendee registration fees; no state funds used to pay expenses
- Comments regarding the conference have been universally strong, and post-conference surveys of the attendees were conducted each year. Sample results from the 2011 survey are as follows:
 - Approximately 2/3 of the attendees had not attended conference before. A large percentage of these new attendees were from the Charlotte region, highlighting a key reason the conference moves throughout the state each year: to target and attract attendees from throughout NC and other regions.
 - The single largest group self-identified "industry" as its profession. Other significant groups included academia, entrepreneurs, business developers, government officials, consultants, students, non-profit representatives, technology transfer professionals, and legal professionals.
 - More than half (53%) of the respondents "agreed" and nearly half (45%) "strongly agreed" with the following statement: "I enjoyed the conference."
 - 91% of the respondents said they "expanded their network," and 79% said they "made contacts they expect to lead to collaborations, partnerships, or deals."
 - 97% of the respondents agreed or

Nanotech Commercialization Conference
"Coming Soon!" Card



strongly agreed that the “conference was well organized.”

- 91% of the respondents agreed or strongly agreed that the cost of the conference was “acceptable.”
- 61% of the attendees said they *will* attend future NCNCC conferences, and large percentage (38%) said they *may* attend future NCNCC conferences. Only 3% said they do not plan to attend a NCNCC conference in the future.


In sum, the overall assessments of the conferences have been very strong overall, and the business and nanotechnology community consider the conference very valuable for enhancing their work.

Performance Metrics –Board of Science & Technology Quarterly Meetings

As discussed in section 2.a above, OST staffs the NC Board of Science & Technology, which has been responsible for initiating many of North Carolina’s most important institutions and programs focused on improving North Carolina’s competitive position in the New Economy.

The Board meets quarterly, and at each meeting it hears updates on the work of the OST staff, hears and discusses information from outside speakers, and advises the OST staff on the nature and performance of its work. The meetings are very well attended, and Board members actively participate in discussions. Through this close relationship with the Board members, OST staff ensure that their work is addressing the needs of North Carolina’s businesses, academic institutions, and citizens.

Sample Board of Science & Technology Meeting Agenda

		 North Carolina Board of Science & Technology April 28, 2011 9:00 A.M. – 12:45 P.M. Board Room, Dept. of Commerce Raleigh, North Carolina	
9:00 a.m. 9:10 a.m.	Welcome and Introductions <ul style="list-style-type: none"> Opening Remarks Approval of October 21, 2010 Minutes 	Brian Cottrill	
9:10 a.m. 9:40 a.m.	NC Innovation Council Update <ul style="list-style-type: none"> Review of 2010 Work Initial Recommendations Report Review of 2011 Work Discussion 	Albert DeLo, John Hardin, & Board Members	
9:40 a.m. 10:10 a.m.	Southern Innovation Agenda Overview <ul style="list-style-type: none"> Southern Technology Council Characteristics of an Innovative State Advanced Manufacturing in the South Discussion 	Scott Ervine, John Hardin, & Board Members	
10:10 a.m. 10:30 a.m.	NC Budget Update <ul style="list-style-type: none"> Review Discussion 	Kelly Grice & Board Members	
10:30 a.m. 11:30 p.m.	Board Programs Update <ul style="list-style-type: none"> NC Nanotechnology Commercialization Conference Commercialization of Films and Nano Systems (CFMS) Conference Onix NC Small Business Program Energy R&D Cost-Sharing Program NC Green Business Fund 	John Hardin, Shafrin Sammons, & Board Members	
11:30 a.m. – 11:45 a.m.	Break		
11:45 a.m. 12:30 p.m.	Board Programs Discussion <ul style="list-style-type: none"> Onix NC Small Business Program – Proposed Amendments to Matching Program Guidelines Strategic Initiatives NC Innovation Index 	John Hardin, Tina Kaurer, & Board Members	
12:30 p.m. – 12:45 p.m.	Review and Closing Discussion	Brian Cottrill	

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3.b. Discussion of Whether Objectives Have Been Achieved

The preceding discussion of programs (Section 2.c) and performance measures, outputs, and outcomes (Section 3.a) clearly indicate progress toward achieving OST's mission ***to improve the economic well being and quality of life of all North Carolinians through advancing science, technology, and innovation.*** Specifically, OST has:

- **Provided primary staff support for the development of major strategic institutions initiated by the North Carolina Board of Science & Technology. Primary among these are the of the NC School of Science and Mathematics, the NC Biotechnology Center, and MCNC.**
- **Provided primary staff support for the development and implementation of major strategic initiatives, programs, and studies, such as North Carolina's Nanotechnology Roadmap, the North Carolina Innovation Council's 2010 recommendations to the General Assembly and Governor, North Carolina's innovation Indexes, and North Carolina's strategy for advancing innovation statewide.**
- **Proposed, developed, and administered major grant programs—most notably the One North Carolina Small Business Program and the North Carolina Green Business Fund—that have awarded more than 330 grants to small businesses and other organizations throughout the state to help them develop, commercialize, and deploy innovative new technologies that will make the state competitive in the New Economy. These programs have**
 - **enabled creation and retention of hundreds of high-skills, high-paying jobs throughout the state,**
 - **enabled technology- and business-development partnerships among North Carolina universities and businesses,**
 - **enabled the development of hundreds of new forms of intellectual property,**
 - **enabled the small businesses and other grant recipients to garner and leverage significantly larger amounts of funding from external sources (More than \$170 million—on average, for every \$1 the state provides to the organizations, they receive an additional \$8 dollars from other sources).**
 - **enabled the small businesses and other grant recipients to project more than \$60 million in 2012 sales directly related to the products and services developed and commercialized with state support.**

Key Quote:

"The choice is straightforward: in the 21st century, a developed nation can either innovate or evaporate. It can invest in the future, or it can enjoy the present until the present becomes the past."

~Norman R. Augustine, Retired Chairman and Chief Executive Officer, Lockheed Martin, Corporation, Co-Chair, National Innovation Initiative Advisory Committee, 2008

Despite these successes, however, the State of North Carolina and OST have much more to achieve, having barely scratched the surface of an opportunity that is more imperative than ever.

In particular, due to limited staff and operational resources and increased programmatic responsibilities, at least 70-80 percent of the staff's time since 2006 has been devoted to administering grant programs. While clearly impactful and efficiently managed (*see section 3.a above*), these grant programs, which serve primarily a *tactical* function, have greatly reduced the amount of time the staff (in particular, the Executive Director) have had to focus on *strategic* initiatives and programs.

Examples of strategic, high-impact work OST could and should undertake include championing and communicating statewide the importance of science, technology, and innovation for North Carolina's competitiveness in the New Economy; identifying important R&D needs of organizations in North Carolina that relate to the State's economic growth and development; and evaluating North Carolina's strengths and weaknesses in order to effectively advise the General Assembly, the Governor, and other state officials on the role of science and technology in the economic growth and development of North Carolina.

Staying competitive in the dynamic and ever-changing New Economy is an *ongoing process* involving sustained interactions and partnerships between the public and private sectors. Now more than ever, North Carolina must develop an innovation-fostering framework and *process* that has strong leadership, recognizes and respects its regional differences, and optimizes its innovation assets through establishing strategic, ongoing collaborative strategic relationships between the private sector and government.

Thus, to differentiate itself, North Carolina must strive to develop smart, unique, targeted approaches that build on its strategic strengths, accommodate its unique constraints, and integrate them in various economic contexts to maintain and grow our leadership. North Carolina was one of the early leaders in this policy race—benefiting early from its first-mover advantage—yet now finds itself running as fast as ever but in the middle of the pack on a number of indicators and lacking a clear framework for future prowess. Now is the time to run not only faster but smarter.

In sum, to run *faster*, OST's tactical programs should continue and be given the support they need to maximize their impact. And to run *smarter*, OST's focus on strategic priorities should increase and be given the support needed position North Carolina to be as competitive as possible in the New Economy. Section 5 below outlines the resources needed to achieve this.

Key Quote:

*"It is pointless to obsess, as is common in many discussions of industrial policy, about policy instruments and modalities of interventions. What is much more important is to have a **process** in place that helps reveal areas of desirable interventions."*

**~Dani Rodrik,
Economist, 2007**

4) LINK BETWEEN FUNDING RESOURCES & STATEWIDE SOCIETAL IMPACT

Clearly, science and technology are transforming the economy and government. To succeed in this new environment, governments around the globe and across the U.S. are adopting integrated strategies and responding to the need to adapt their governance structures and tools to work with, not against, the changes driven by science, technology, and the economy.

In this setting, the most important roles for government are to maximize the strengths and minimize the weaknesses of the market-based economy—to ensure macroeconomic stability and promote open and competitive markets—as well as to take proactive steps to stimulate and support innovation. Governments increasingly recognize that they play two roles in the New Economy: *creating a general landscape on which economic activity can flourish, and targeting the specific conditions that encourage innovation to take place and diffuse throughout the economy.*

Given these trends, and in the environment of limited resources that the state currently faces, a logical and strong relationship must exist between resources invested and their ultimate societal impact statewide. Furthermore, there must be a logical and identifiable progression from resources input, to activities performed, to outputs generated, to outcomes achieved and, ultimately, to positive societal impact achieved. Put another way, there must be bang for the buck and a logical progression from investing the buck to achieving the bang.

As illustrated in section 3 above, OST has fulfilled and demonstrated this relationship effectively and efficiently on several fronts. OST is a lean, mission-driven, outcome-focused organization whose activities generate impact statewide, ranging from putting in place the infrastructure and programs necessary to facilitate companies' innovative activities in the New Economy, to helping companies create and retain jobs, to helping companies develop and commercialize new technologies, to helping companies leverage additional funding from other sources, to helping companies generate additional sales, to helping the public and policy makers understand the importance of science and technology to the economy and all North Carolinians.

The bottom line is that resources invested in OST and its programs produce positive societal impact statewide. Properly resourced and focused on strategic and tactical initiatives, OST will expand its production of positive societal outcomes in the future.

5) PROGRAM JUSTIFICATION

5.a. Rationale for Recommended Funding Level

As outlined in the following table, the options for OST moving forward range from moderate expansion, to low-cost expansion, to continuation as is. Each of these options, discussed in more detail below the table, offers the General Assembly a choice that entails balancing critical goals (e.g., economic development; job creation/preservation, improved quality of life) and budget constraints. Moreover, recognizing the current intensity of the budget constraints and the desire not to increase the size of government, the options are modest in their request.

Each of these three options assumes continued funding for at least one of the grant programs OST administers. If only one grant program can be funded, OST staff recommends that it be the One NC Small Business Program, which has the largest leveraging affect, requires the fewest resources to administer, and impacts the broadest array of economic sectors. The *minimum* amount necessary to enable that program to fulfill its statutorily defined goals is \$2.5 annually, but more than twice that amount is needed to fulfill the program's goals optimally. The second recommended program is the NC Green Business Fund, whose structure the OST staff recommends preserving but whose name OST staff recommends changing. Examples of possible new names include the "NC Energy Independence Fund," the "NC Energy Technology Fund," or the NC Clean Technology Fund." The *minimum* amount necessary to enable that program to fulfill its statutorily defined goals is \$1 annually, but high demand for the program makes a strong case for more, if available.

Options

Options	Implications for OST	Pros	Cons
1. Moderate Expansion	1 additional FTE plus a team of low/no-cost interns to help manage, direct, and implement new strategic initiatives and new and existing tactical programs , as directed by General Assembly	Increases NC's competitiveness and economic well-being in short run and long run, in turn increasing economic activity and tax revenues without raising tax rates	Increases OST budget expenditures (moderately)
2. Low-Cost Expansion	1 additional FTE to manage and implement existing tactical programs , thus enabling Executive Director to focus more on strategic initiatives, as directed by General Assembly	Increases NC's competitiveness and economic well-being in short run and long run, but less so than option 1	Increases OST budget expenditures (minimally)
3. Status Quo	Continue to operate OST as is	Doesn't increase state expenditures; uses existing staff	Reduces NC's competitiveness

Option 1, a moderate expansion, entails 1 additional FTE plus a team of low/now-cost interns to addresses the largest gaps and limitations in North Carolina's current New Economy strategic framework.

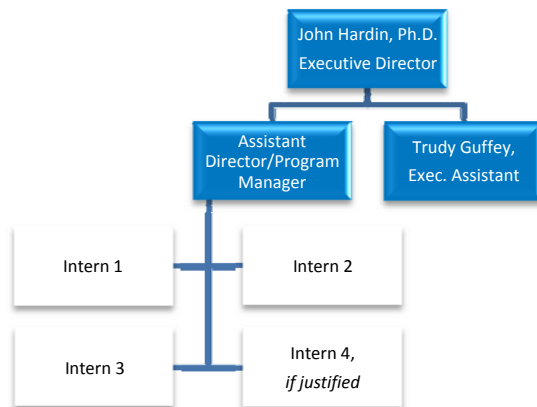
Increasing the OST staff by one FTE would begin restoring OST to its previous staffing levels (i.e., 2003-2005 and pre-2001) and enable the Executive Director to devote more time to *strategic* functions and less on *tactical* functions. The new staff position would have the title of Assistant Director and Program Manager, assuming primary responsibility for overseeing OST's grant programs, other tactical functions, and interns.

Based on previous patterns, the expected fully loaded cost of this position would be \$75,000-\$85,000 annually. Additionally, OST has extensive experience working with interns—most from the state's universities—but it has yet to formalize the process and to make maximum use of the available resources. The Assistant Director would be responsible for developing a more structured, effective, and efficient process for obtaining and utilizing interns in a way that minimizes use of state resources but maximizes the impact to the state by assigning the interns to perform tasks such as strategic research and analysis, and logistics associated implementing initiatives. Many university departments offer their students course credit for internships with state agencies, and so formalizing a relationship with those departments would be a key priority and would be mutually beneficial for OST, the departments, and the students.

This option would allow the Executive Director, with a minimal amount of additional funding (30% increase), to implement a targeted set of investments, strategies, & programs designed to increase, to the extent possible with a limited set of resources, NC's competitiveness and economic wellbeing in short run and long run. The Executive Director would work closely with the General Assembly, the Governor, and the Board of Science and Technology to develop a strategic focus and set of strategic efforts most impactful for North Carolina.

It is anticipated that OST would need a slight increase (e.g., \$20,000) in its operating budget to cover the additional costs associated with leading, developing, and executing new strategic initiatives and new tactical programs. Care would be taken to maximize use of in-kind resources and to obtain external sponsorship and assistance, where appropriate, to minimize state expenditures.

With these changes, OST's organization chart could look as follows:



Shaded = state-funded, recurring FTEs.

Not-shaded = low/no-cost interns.

While the investments and programs would focus primarily on synergizing and optimizing North Carolina's existing New Economy assets and organizations, they also potentially would entail a small number of new programs targeted at the state's greatest challenges and opportunities. The aim is to take existing governmental and economic actors and create a better-aligned network that would better enable the actors to foster and spread innovation. Market forces and private entrepreneurship would still be the main actors in the economy, but OST, with a larger set of additional resources, would play an enhanced strategic and coordinating role that would better enable and encourage the actors to collaborate and innovate in their respective spheres. Examples of strategic and tactical initiatives OST could undertake, if directed by the General Assembly, include the following:

1. **Increasing access to early-stage capital investment in innovative, entrepreneurial NC businesses.** Possible means include developing a state funding program that matches private investments for early-stage capital investment, expanding the venture capital base for NC start-ups by recruiting VC investment from other states, and/or developing and recommending incentives to stimulate early-stage capital investment in innovative, entrepreneurial NC businesses.
2. **Enhancing public understanding of New Economy issues, particularly the nature and importance of science, technology, and innovation for the workforce, economic well-being, and quality of life.** Possible means include partnering with the Grassroots Science Museums Collaborative (whose funding is administered by the NC Department of Commerce and with which OST has initiated a relationship) to reach a broad audience statewide, and/or delivering world-class STEM education online to

students across the state by leveraging NC's statewide broadband fiber to reach them and assets such as the School of Science & Math to provide the content.

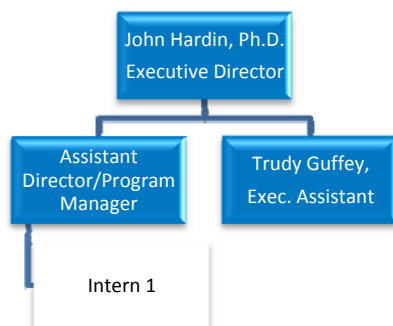
3. **Rebuilding and enhancing North Carolina's advanced manufacturing sector to on-shore jobs that have gone off shore and to employ North Carolina's highly skilled, highly motivated workforce.** Possible means include tasking and enabling the NC Industrial Extension Service and Small Business Technology Center to work with existing firms to speed the adoption of New Economy technology & processes and/or hosting conferences featuring existing NC firms that are implementing New Economy technology and processes and speakers on these topics.
4. **Significantly increasing the Department of Commerce's focus on strategy-based, proactive, targeted recruiting of high-growth, innovative, entrepreneurial firms.** Possible means include tasking OST's Executive Director and staff with reaching out to select prospective high-tech firms in key industries from potential states and proactively attracting them to move to North Carolina and/or aggressively marketing, via several media, NC's innovation assets nationally and internationally.

The four options above just begin to scratch the surface of possibilities.

Option 2, a low-cost expansion, entails 1 additional FTE to help addresses a smaller number of and limitations in North Carolina's current New Economy strategic framework.

Option 2 is very similar to option 1, with the primary difference being that the number of new strategic initiatives and tactical programs OST could undertake and execute would be smaller. Additionally, the number of interns, if used, would be much smaller. OST would focus only on a very limited number of initiatives and programs having the lowest cost and/or having the largest impact. Accordingly, it is not anticipated that OST would need an increase in its operating budget.

With these changes, OST's organization chart could look as follows:



Shaded = state-funded, recurring FTEs; Not-shaded = low/no-cost intern.

Option 3, continuing on the current path and operating OST as is, would do little to “move the needle” in terms of North Carolina’s ability to compete in the New Economy.

Specifically, option 3, while low-risk and low-cost, is also low-impact. It essentially continues North Carolina’s more than decade-long decreased emphasis on the New Economy, which has limited the ability of North Carolina’s policy makers’ to see and promote the complementarities that exist between innovation-driven New Economy needs in different industries and geographic regions. As a result, this decreased emphasis on the New Economy has limited policy makers’ ability to capitalize on synergies from the state’s existing resources and programs that can serve those New Economy needs. As noted above, given the resources and organizations that our competitor states and nations are devoting to the New Economy, continuing on the current path does not serve the state well. But if the state were to continue on this path, OST would need, at a minimum, reinstatement of recurring funding at least at the current annual rate of \$216,000 annually for personnel and operating expenses, as, as noted above, funding for at least one of the grant programs OST administers.

With no changes to OST’s structure or budget, its organization chart would look as follows:



5.b. Consequences of Discontinuing or Reducing Program Funding

A decision to discontinue funding for OST would have significant short-term and long-term negative consequences for North Carolina.

In the short run, the most significant impact would be that a large number of active grants currently administered by OST would have to be administered by another organization, one that is not familiar with the purpose, structure, or administrative duties associated with the programs. Similarly, the administering organization would lack working relationships with any of the existing grantee businesses, as well as lack knowledge of the specific history associated with any particular grant.

As discussed in section 2.a above, the grant programs OST administers require specialized knowledge of the more than 11 federal agencies involved

with awarding Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants. Each of these agencies has multiple subdivisions that award SBIR and STTR grants, each with its own specialized requirements and procedures, and a working knowledge of these cross-agency, cross-division differences is invaluable.

As of March 1, 2012, OST has at least 50 grants still active. While that number will decrease over time as the businesses complete their project, it is anticipated that, even if no new grant awards are made, some number of existing grants would need to be administered (i.e., reports reviewed, payments disbursed, grantee questions answered, reports to the General Assembly prepared) for a minimum of one year and potentially as long as two or three years. In short, someone would have to perform this work, and OST can do it most efficiently and effectively.

While the short-term consequences of discontinued funding are significant, the long-term consequences would be even more substantial. Most importantly, at a time when most other states and nations are increasing their focus on the New Economy—which is fueled by science, technology, and innovation—*discontinuing or even diminishing OST would send a loud and clear signal to the world: North Carolina is de-emphasizing its focus on the New Economy and choosing to make its businesses and citizens less competitive in that economy.*

While the signals we send often matter more than the reality we achieve, in this case they are one in the same. This is because, in addition to sending the wrong signal, discontinued or diminished funding for OST would, in fact, diminish the state's ability to keep pace with changes occurring worldwide. North Carolina is, in part, responsible for these global changes. Our past successes and leadership have been a beacon for the world and have encouraged other countries to follow our example and boost their innovation infrastructures.

Increasingly, the quality, coordination, and timing of a government's innovation-based investment strategies are becoming the primary determinants of its economic success and prosperity. Public-private partnerships are more common and necessary than ever.

Thus, discontinuing or diminishing OST would eliminate or weaken one of North Carolina's longest-running, most impactful organizations, not just in the realm of economic development, but within North Carolina government overall. Now is not the time to decrease the state's ability to work with the private sector to ensure its high-tech, innovation-based needs are met.

6) RECOMMENDATIONS TO IMPROVE EFFICIENCY & EFFECTIVENESS

6.a. Improving Services

Although the OST has existed, in one form or another, since the General Assembly established the Board of Science & Technology in 1963, it remains a small, nimble and lean office. A key reason is that, even as it has designed and implemented the initiatives and programs described in this report, it has constantly evaluated its ongoing operations. These evaluations include assessment of both efficiency, in terms of outcomes achieved versus costs incurred, and effectiveness, which incorporates the value or the “so what” factor into the assessment process. Using these evaluations, OST makes changes when needed to its objectives and activities.

A second reason is that OST’s strong analytic policy-making capabilities, coupled with its well-informed, non-partisan leadership from the Board of Science & Technology, have produced a good mixture of smart, bold, effective action. OST would have outlived its usefulness long ago had it not exhibited the flexibility and resourcefulness necessary to respond to continually changing circumstances. For example, during times when the state budget was particularly tight, OST typically has turned its attention toward supporting operations at the Department of Commerce and toward strategic visioning and planning. Alternatively, during years in which the state budget was stronger, OST has devoted a larger portion of its efforts toward and allocating grant funds to the state’s most innovative businesses.

With respect to improving services, the recommendation of this report is for OST to continue to refine and enhance this self-evaluation process with closer assistance and oversight of the General Assembly and its staff. In recent years, particularly since OST’s move to the Department of Commerce in 2001, interactions between OST and the General Assembly have been rare. This has been to the detriment of OST, the General Assembly, and the citizens of North Carolina. In part it explains why OST is currently undergoing Continuation Review. OST has failed to do a sufficient job of communicating to its stakeholders the nature, volume, and impacts of the work it performs. As a result, the General Assembly currently knows little about OST and rightfully questions its value to the state.

If the General Assembly elects to continue OST, OST staff are committed to working with the General Assembly members and staff to ensure that North Carolina’s state government does what it can and should *to improve the economic well-being and quality of life of all North Carolinians through advancing science, technology, and innovation.*

6.b. Reducing Costs or Duplication

On the cost side of the efficiency equation, the OST is a very lean and frugal organization that operates with little infrastructure and very low overhead. To a large degree this is because it resides in the Department of Commerce and is able to draw upon and partner with sister offices within Commerce, such as the Labor and Economic Analysis Division (LEAD – formerly known as PRSP [Policy, Research & Strategic Planning]), Fiscal Management, Legal, and Marketing/Graphics. This leveraging of resources allows OST to be bigger and more impactful than its small size might suggest, and helps keep its costs minimal and reasonable.

With respect to potential duplication with other offices and organizations, OST has close and productive working relationships with related organizations, both public and private, and works to ensure that it adds value and does not duplicate their efforts. **As indicated in the letters of support in Exhibit C, organizations such as the Small Business & Technology Development Center (SBTDC), the North Carolina Biotechnology Center (NCBC), MCNC, the North Carolina Technology Association (NCTA), and NCIDEA (an early-stage financing organization in Durham) work regularly with OST and value its services and staff.** When interacting with these organizations and others, OST regularly evaluates the extent and manner with which its services complement or potentially duplicates theirs.

To our knowledge, the services OST provides are unique within North Carolina. Specifically, OST is the only organization that provides matching funding to small businesses that have received federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants, the only organization that operates a program with a purpose similar to the NC Green Business Fund, and the only organization providing *statewide and technology-wide* strategic planning and resource allocation advice to state policy makers. To the extent that this is not the case, OST staff is interested in knowing and will make every effort to change its operations accordingly.

6.c. Statutory, Budgetary or Administrative Changes

OST's primary statutory need to increase effectiveness is reinstatement of recurring funding by the General Assembly of at least the level of the current fiscal year. With the State's long term investment, OST will continue set the course for the State's investments in science, technology, and innovation and assist in moving the state down that path.

To that end, and consistent with the recommendation in section 6.a., above, OST offers three additional options for statutory changes the General Assembly to consider. These options relate directly to the Board of Science

& Technology, as it is statutorily authorized the General Assembly and is the organization from which OST derives its goals, powers, and duties.

1. **Increase # of legislative appointees to the Board of Science & Technology** – Currently, of the Board’s 19 members, only two are appointed by the legislature—One by the President Pro Tempore of the Senate, and the other by the Speaker of the House. The remaining 17 are appointed by the Governor. An increase in legislative appointees could be accomplished statutorily in at least two ways: (a) keeping the total number of appointees the same and allocating more appointees to the legislature, or (b) increasing the total number of appointees and designating the new appointees to be legislative appointees.
2. **Increase geographic representation of the Board of Science & Technology** – Currently, as well as historically, the Board’s membership draws heavily from metropolitan areas, particularly the Research Triangle Region. This is not surprising, given that such areas have higher concentrations of population and science, technology, and innovation resources. Moreover, the geographic profile of the Board depends, in part, on the statutorily designated organizational representation of its members. For example, seats are reserved for a representative of each of the large universities in the Triangle Region (Duke, NC State, and UNC-Chapel Hill), as well as for RTP-based organizations such as the Biotechnology Center and MCNC and universities, which tend to be in metropolitan areas. Increasing the geographic representation of the Board could be achieved statutorily in at least two ways (a) keeping the total number of appointees the same but changing the organizational designation of certain seats, or (b) increasing the total number of appointees and designating the new appointees to be from organizations or regions traditionally underrepresented.
3. **Increase the industry/sector representation of Board of Science & Technology** – Currently, as well as historically, a minority of the Board’s membership from industry in general or from a diverse set of industry sectors. Only four of the Board’s 19 seats are formally designated for representatives of industry. In actually, the number of industry representatives is typically larger than four, because some of other members not formally designated as industry in fact represent industry sectors (e.g., biotech or info tech), but rarely is the total number of industry representatives larger than six. Similar to the first two recommendations, increase in legislative appointees could be accomplished statutorily in at least two ways: (a) keeping the total number of appointees the same and allocating more appointees to representatives of private industry, or (b) increasing the total number of

appointees and designating the new appointees to be representatives of private industry.

Any one or a combination of these recommendations would serve to make the Board more representative of the state government, the state as a whole and, and the economy with which OST interacts.

7) EXTERNAL FACTORS

7.a. Policy Issues for Consideration by the General Assembly

As the State of North Carolina confronts revenue shortfalls for FY2009-2010 and makes difficult choices about funding State programs, it will have to consider the following two key policy questions:

1. **Does the State want to lead or to follow in the New Economy?** OST's view is that, faced with a dynamic and uncertain future, the best approach is to shape it rather than be shaped by it—to lead rather than to follow. North Carolina is fortunate in that, more than most states and nations, it has in place many of the institutions and programs necessary for responding to this challenge. These simply need to be enhanced, optimized, realigned, and supplemented in targeted places to foster and accelerate the spread of innovation, both within government and externally throughout the state's economy to the broader society.
2. **Assuming the answer to question 1 is "North Carolina wants to lead," does the State want OST to be a part of that leadership?** OST's view is that, given both historical and the recent success and impacts of OST, the State would do a disservice to its citizens and its economy if it were to discontinue or decrease OST. Specifically, OST has a statewide mandate, has a proven track record of success, has far-reaching and influential relationships in the relevant sectors (private, public, non-profit, educational), receives direct oversight from key State policy institutions, uses a diverse and supportive (rather than punitive or regulatory) toolkit, has clear benchmarks and evaluative criteria for makes decisions regarding its performance and the need to change, targets high-tech and innovative activities, is low-cost, and recognizes that risk and change are integral parts of innovation and, as a result, doesn't attempt to minimize all chances of failure, but rather minimize the costs of failures when they occur and to apply constructively the knowledge learned from those failures.

Key Point: In difficult economic times such as these, it is essential for the State to stay engaged and to invest in the New Economy, including OST, the primary organization within North Carolina State government that focuses exclusively on the New Economy. Doing so will help grow jobs, expand the economy, and improve quality of life in North Carolina.

7.b. Other Relevant Information

OST should be judged on its accomplishments, as well as its potential and the need for its services. Although OST's metrics are currently impressive, outcomes will increase even more over time as the funding it has awarded to

small, innovative, high-tech businesses continues to help them grow internally and ripples externally through the economy. Similarly, the strong foundation it has laid and is continuing to lay in changing technologies such as biotechnology, nanotechnology, information technology, and materials technology will serve the state well as it continues to compete in the New Economy.

OST is aware that the General Assembly is currently considering possible alternations to the state's economic delivery system, including the Department of Commerce and its programs, the Economic Development Board, and the Regional Economic Development Commissions. Consideration of this type is good and necessary, as government organizations **must**, to stay relevant and useful, respond to and evolve with changes occurring nationally and globally, economically and socially. Given that changes on all those fronts are driven by science and technology, it makes sense that OST should play a key role in whatever changes the General Assembly chooses to make to the state's economic delivery system.

Continued funding from the General Assembly and the flexibility to commit these resources to new and expanding programs has been essential in the past, and will be even more essential in the present and future, to the success of OST and the state's efforts to compete in the New Economy.

OST thanks the General Assembly for its continuing support.

EXHIBIT A:
CURRENT MEMBERS OF THE NC BOARD OF SCIENCE & TECHNOLOGY

Ex-officio

- **The Honorable Beverly Perdue**, Governor of the State of NC
- **The Honorable J. Keith Crisco**, Secretary of Commerce

Chair

- **A Blanton Godfrey**, Dean, College of Textiles, NC State University

15 Members Appointed by the Governor

- **Norman R. Cohen (Vice-Chair)**, President and CEO, Unitec, Inc.
- **John Bardo**, Former Chancellor, Western Carolina University
- **Leslie Boney**, VP for International Community and & Economic Engagement, UNC General Administration
- **Jud Bowman**, President & CEO, Appia, Inc.
- **Goldie Smith Byrd**, Nathan F. Simms Endowed Professor/Chair, Dept. of Biology, NC A&T State University
- **Joseph Freddoso**, CEO, MCNC
- **Buck Goldstein**, Entrepreneur in Residence/Professor of the Practice, Dept. of Economics, UNC-Chapel Hill
- **Jeffrey C. Hart**, Attorney, Robinson Bradshaw & Hinson
- **Terri Lomax**, Vice Chancellor for Research, Innovation & Economic Development, NC State University
- **Mike McBrierty**, Senior Manager, Public Affairs, Biogen Idec
- **Scott Ralls**, President, NC Community College System
- **James Siedow**, Vice Provost for Research, Duke University
- **Lynn Soby**, VP, Innovation and Commercialization, RTI International
- **Ken Tindall**, Senior VP, Science and Business Development, NC Biotechnology Center
- **Mark Welker**, Associate Vice Provost for Research, Wake Forest University

One Member Appointed by the Speaker, NC House of Representatives

- **Mark McNeilly**, Adjunct Professor of Marketing, UNC Kenan-Flagler Business School, UNC-Chapel Hill

One Member Appointed by the President Pro Tempore, North Carolina Senate

- **Christine Woodhouse**, Eaton Corporation

GRANTEE OVERVIEW

- Semprius, founded in 2006 and based in Durham, has developed & patented a technology for massive parallel printing of circuits in a very small-size chip.
- This enables the company to create highly efficient biophotonic materials that can concentrate the sun's energy 1,100 times, creating the world's smallest, most cost-effective solar panels.
- Semprius will locate a pilot production plant in Henderson, with plans to make a capital investment of \$89.7 million and create 256 jobs over five years. The jobs are expected to average \$45,565 a year, well above the Vance county average.

GRANTEE MISSION

- Dramatic growth in the solar energy production market and rapid growth in solar energy installations are projected.
- Semprius' mission is to be the lowest-cost producer for electric generation through solar arrays and to be directly competitive with other fossil fuel energy sources.
- Its long-range plan is to be a critical component supplier to large-scale electrical equipment companies (e.g., Siemens) that operate on a global scale for industrial and commercial applications.

OST LEVERAGING ACTION

- In 2007, OST awarded Semprius \$99,413 under the One NC Small Business program to match and leverage a federal Small Business Innovation Research (SBIR) grant of the same amount from the National Science Foundation (NSF).
- The funding helped Semprius determine the applicability of its core patented micro-transfer printing process to create flexible displays on plastic substrates, which allowed quantum gains in sun-concentration technology.
- In 2010, OST awarded Semprius \$99,486 under the NC Green Business Fund to determine the feasibility of a silicone-on-glass lens for use in solar modules. This technology greatly increases the efficiency of solar panels.

OST IMPACTS

- The grant-funded process and technology are what is being commercialized today in the pilot plant facility in Henderson.
- The early-stage grants from OST helped Semprius by laying the groundwork to acquire follow-on funding, including:
 - State of NC Job Development Investment and One North Carolina Fund grants, as well as grants from the Golden LEAF Foundation, Vance County, and the NC Community College System, totaling more than \$7.88 million.
 - More than \$25 million in investments from other sources.



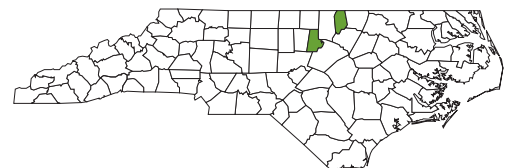
- Semprius' pioneering technology forms high-performance thin-film electronic devices on plastic substrates, which no other company has achieved previously.
- Its unique manufacturing processes allow it to offer an advantageous cost point and execute rapid, capital-efficient expansion.



TESTIMONIALS

“These Small Business and Green Business grant programs are an effective and efficient funding mechanism for the state because they leverage other invested money and take advantage of collective vetting. Semprius is using technology developed under both grants to drive down cost and improve efficiency of our modules. The result is a world-record efficiency product.”

Russ Kanjorski, VP of Business Development at the company.



GRANTEE OVERVIEW

- Bennett Aerospace, based in Cary, is a veteran-owned, woman-owned, minority-owned small business that creates innovative technology solutions to some of the most difficult challenges of its government and commercial clients.
- Its expertise lies in the innovation, design, development and manufacture of advanced technologies and materials, including bio/chem systems, photonics (optics/lasers/displays), intelligence/cyber/communication systems, advanced materials, and robotics.
- Founded in 2008, the company currently employs 5 full-time and 12 part-time professionals. Revenue for 2011 was \$1.6M.

GRANTEE MISSION

- Bennett Aerospace is working to become a leading innovation technology developer and provider for government and commercial clients in the science and technology industries.
- In 5-10 years, it projects to launch 4-5 successful spin-out companies, creating hundreds of skilled and professional jobs throughout North Carolina.
- “Aerospace” encompasses a wide variety of advanced technologies, from biosciences to flight hardware to nanoscale materials. The company pursues projects in line with this broad-reaching sector, undertaking R&D with potential to positively impact society and create market growth.

OST LEVERAGING ACTION

- Bennett Aerospace was founded in 2008 at a time of difficult economic conditions.
- In 2009, the Department of Defense awarded it a \$99,995 Phase I Small Business Innovation Research (SBIR) grant to design a system to train supervisors on detecting and thwarting insider threats to critical DOD computing systems. OST matched and leveraged the federal funds with a \$75,000 One North Carolina Small Business Matching grant.
- This funding was critical to the startup and continued operation of the company during the recession. Early projects directly led to future successes, including an \$80,000 SBIR grant from the Navy to develop infrared lasers for high-energy laser applications.

OST IMPACTS

- Subsequently, the company has been successful in winning 18 Phase I and Phase II Federal grants (totaling \$3.6 million), substantially expanding its scope of project activity and market share.



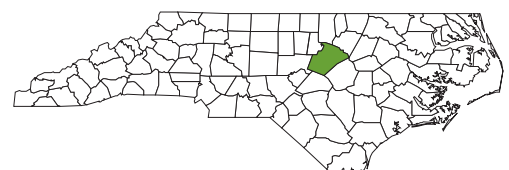
- Bennett Aerospace is focused on several innovative technologies, including green energy harvesting, non-invasive point-of-care disease detection, and see-through displays for mobile applications.
- Bennett Aerospace is finding power in innovative places—including developing applications embedded in clothing that create power from movement of the human body.



TESTIMONIALS

“The grants enabled us to stay in business during the Great Recession. The federal contracts alone would not have supported that. This is not case of ‘how much better did our R&D go.’ It was a question of survival. Today, 17 people are employed because those grants landed when we really needed them. I launched the company because I knew that if we landed one federally funded Phase I effort, the state would match it.”

Douglas Bennett, President of the Company



GRANTEE OVERVIEW

- GrassRoots Biotechnology, located in Durham, is developing technologies to create better crops for the agricultural and biofuels markets.
- It formed in 2007 to commercialize innovations developed by Dr. Philip Benfey at Duke University. Dr. Benfey is one of the world leaders in the fields of genomics and plant development.
- The company began as a two-person start-up and has now grown to 25 employees.

GRANTEE MISSION

- GrassRoots' mission is to employ cutting-edge expertise in agricultural biotechnology to create better biofuel, food, and industrial crops.
- In the biofuels area, it is working to create enhanced switchgrass and sorghum crops. Traits the company is focusing on include rapid root establishment and greater root extension. These traits will increase yield with fewer inputs.
- GrassRoots is also conducting research to discover trait genes to improve resistance to insects and other stresses.

OST LEVERAGING ACTION

- **GrassRoots used the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) and the One NC Small Business Matching grants to develop improved crop strains for agricultural and biofuel use.**
- **The National Science Foundation (NSF) awarded Grassroots a \$150,000 Phase I STTR grant, which OST leveraged with a \$100,000 One NC Small Business Matching grant. This state support helped the company win a much larger \$500,000 Phase II grant from NSF.**
- **The US Department of Agriculture (USDA) awarded GrassRoots an \$80,000 Phase I SBIR grant, which OST leveraged with a \$75,000 One NC Small Business Matching grant. This state support helped the company win a much larger \$400,000 Phase II grant from the USDA.**

OST IMPACTS

- **In 2009, the company announced it had formed a three-year collaboration with Monsanto Corporation to source novel genetic elements that can enhance and protect crop yield.**
- **In 2011, Monsanto and GrassRoots announced that the collaboration would be extended through early 2014.**
- **Dr. Philip Benfey, GrassRoots' CEO and Co-founder stated, "Monsanto's decision to extend the alliance underscores the importance of enhanced promoters for new crops and validates the state-supported R&D GrassRoots is conducting in this area."**



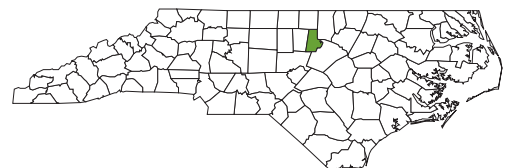
- GrassRoots' optimizes plant root structure to enable more efficient uptake of water and nutrients from the soil.
- GrassRoots also conducts research to identify genes and gene promoters to increase agronomic productivity of crops for both food and energy.



TESTIMONIALS

"The public funds to support early-stage private industry are critical. GrassRoots employs twenty-five people that work in downtown Durham. This is good for the city, the county, and the state. The initial federal grants and matching grants from the state enabled us to get started."

Doug Eisner, Co-Founder and Chief Operating Officer of the Company.



GRANTEE OVERVIEW

- HERMES LLC. (Health Education Research, Management and Epidemiologic Services) is a woman-owned small business with a primary office in Wilmington.
- Founded in 2002 by Danielle Laborde, a UNC-CH trained epidemiologist with expertise in infectious disease and intervention research, the company employs experts in health education, project management, and biostatistics.
- The company offers infectious disease-related and mental health-related research expertise and technical assistance to government, private, and non-profit organizations.

GRANTEE MISSION

- HERMES' mission is to be a model professional research services company by excelling in methodology, innovation, and technical assistance.
- It improves public health practice through the application of academic research methods and informing clinical research to improve its relevance to community and global health needs.
- HERMES' clients and partners include, among others, Battelle, PPD Inc., Abt Associates, Research Triangle Institute, Westat, and the New Hanover Police Department.

OST LEVERAGING ACTION

- In 2008, the National Institute of Mental Health (NIMH) awarded Hermes a \$251,000 Small Business Innovative Research (SBIR) Phase I grant to test the feasibility of tailoring a community integration training model to address emerging post-disaster mental health problems in black communities.
- OST provided a matching grant of \$ 100,000, which enabled the company to bridge the gap between the Phase I and Phase II work by covering additional salary, material, and operating costs.

OST IMPACTS

- In 2011, HERMES was awarded a three-year, \$1,677,512 Phase II SBIR grant from the NIMH to further develop and field test a clinical provider and community leader post-disaster mental health training model.
- HERMES has successfully contracted with the NIMH's Office on Women's Health for five years to develop and implement gender-based, culturally sensitive, and needs-based HIV/AIDS/STDs prevention education strategies for women attending Historically Black Colleges and Universities.



HERMES LLC

- Contracts include the development of an HIV/AIDS prevention and mental health treatment community partnership with Duke.
- Work with the New Hanover Police Department developed a gang unit outreach program; work for Triangle Family Services evaluated the domestic offenders alternative sentencing program.



TESTIMONIALS

"The NC matching grant was essential to our ability complete our work over the extended one-year hiatus between Phase I and Phase II, which was during the 2010 U.S. congressional budget deliberations. The support provided by the state assisted our entrepreneurship efforts by meeting our basic costs of staying in business at the startup phase."

Dr. Danielle Laborde, Founder and President of the Company



GRANTEE OVERVIEW

- NanoTechLabs (NTL), based in Yadkinville, is a disabled veteran-owned nanotechnology materials company.
- It focuses on the development and production of military and commercial products that have performance benefits through the incorporation of nanotechnology, technology that operates at the near-atomic, or nanometer, level.
- Founded in 2005, the company currently has 18 employees and annual sales of more than \$2 million. Within 5-10 years, it expects to have approximately 50 employees.

GRANTEE MISSION

- NTL's mission is to be a recognized development and manufacturing company for nanomaterials.
- Its goal is to provide high-paying, high-skilled manufacturing jobs as well as R&D positions.
- It purchases a considerable portion of its chemicals and services in NC, thus additionally contributing to secondary jobs in NC.

OST LEVERAGING ACTION

- Since 2006, NTL has received multiple Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) grants from the Air Force, the Missile Defense Agency, and the National Science Foundation to develop and manufacture its innovative materials.
- Together, these federal grants amount to nearly \$500,000, which the One NC Small Business Fund provided has matched with state grants totaling more than \$315,000.
- In 2008, NTL also received a \$70,000 grant from the NC Green Business Fund, which enabled the company to develop high surface area electrode for energy storage devices, critical components of renewable energy power systems such as wind and solar power as well as advanced transportation solutions such as hybrid and electrical vehicles.

OST IMPACTS

- The state grants allowed NTL to put more effort into its federally funded Phase I projects than would have been possible otherwise.
- The NC money supported worker salaries and materials for additional research on the topic, helping the company win the larger Phase II grants under the federal SBIR and STTR programs.
- In total, the projects matched with funds from the One NC Small Business Fund have brought in more than \$1.5 million in Phase II federal funding and enabled the company to apply for patents worth nearly \$500,000.



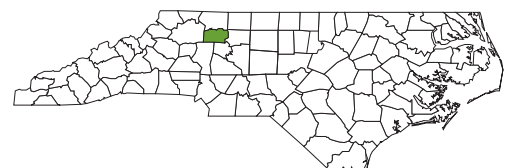
- Many of the materials currently used by the military are not fully optimized to meet DoD specifications.
- NTL's composite materials offer significant improvements over current technologies, such as substantial weight savings, increased performance and service life, and greater flexibility.



TESTIMONIALS

“Research and development for DoD platforms is very expensive and requires long time frames. Venture and angel funding is difficult to obtain in these areas because of the long timeframes and the fairly restricted prime contractor market. The state matching program is a good way to leverage DoD funding to create a strong, diversified technology base in the state.”

Richard Czerw, CEO of the company.



GRANTEE OVERVIEW

- SoyMeds, based in Davidson, spun out of the UNC Charlotte Department of Biology in October 2005.
- The company brought together faculty expertise in plant genetics and immunology to develop novel applications for soybeans.
- It currently employs four professionals and maintains a close working relationship with UNC Charlotte. Success could grow the company to 20 or more biotechnology professional employees during the next few years.

GRANTEE MISSION

- SoyMeds' mission is to develop and validate soybean seed-based therapeutics that can be used to treat, prevent, cure, and diagnose disease.
- A soybean seed-derived vaccine will address many of the challenges associated with conventional vaccine production and distribution (e.g., costs, storage, need for refrigeration), while soy-based toleragens will provide a therapy for treating and potentially curing autoimmune disease.
- SoyMeds' business model is to partner with a manufacturing company to produce, market, and sell its end products or to provide licenses for such partnerships.

OST LEVERAGING ACTION

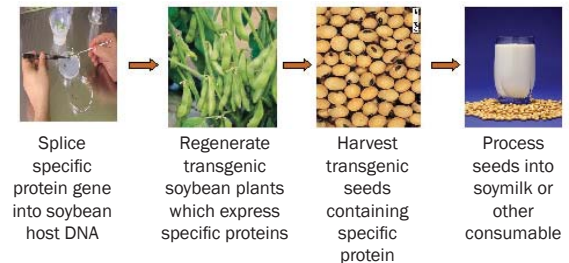
- **Soymeds has received multiple federal Small Business Innovation Research (SBIR) and Small Business Technology transfer (STTR) technology grants to develop its technologies.**
- **Between 2007 and 2010, OST provided Soy Meds three matching grants, totaling \$205,000, to match more than \$600,000 in SBIR/STTR Phase I grants from the National Institutes of Health (NIH).**
- **One of those Phase I grants has already been awarded a Phase II grant worth nearly \$900,000. The remaining two Phase I grants are currently nearing completion and are eligible for significantly larger follow-on Phase II funding from NIH.**

OST IMPACTS

- **In November 2011, SoyMeds won the NC Technology Association's (NCTA) 21 Award in the category of Technology Industry as Life Science Company of the year.**
- **A biodefense vaccine, a potential treatment for Multiple Sclerosis, and a diagnostic for use in kits to screen for thyroid disease are products currently in development.**



- Through manipulation of the genetics of soybeans, SoyMeds has secured multiple patents for medical applications, such as vaccines and efficient diagnostic testing.
- The founders have raised more than \$1.5MM in grant funding to pursue soybean applications for patient-consumable treatments.



TESTIMONIALS

"The state matching grant was awarded in the first years of our company. This early-stage support helped us pay personnel, achieve all of the goals of the Phase I project, and generate preliminary data that helped us obtain the larger Phase II grant. It also helped us establish business infrastructure. Our company couldn't have proceeded without the state matching monies."

Kenneth Pillar, President of the Company



GRANTEE OVERVIEW

- Alderon Biosciences, based in Newport, is a diagnostic testing equipment company. Its patented electrochemical platform measures and assesses a wide variety of disease factors.
- The key advantage is that the platform is a small portable device that is simpler, faster, and less expensive than traditional diagnostic methods. It is well suited to many point-of-care environments.
- The technology is particularly applicable to public health issues such as lead poisoning in disadvantaged urban environments and HIV/AIDS viral load determination.

GRANTEE MISSION

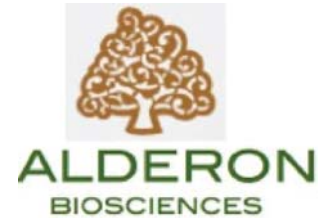
- Alderon's mission is to provide simpler, faster, and more economical diagnostic systems for medical, environmental, and laboratory research testing needs.
- The company's novel electrochemical assay products are designed for the detection of toxic metals (lead), nucleic acids, proteins and antigens.
- The company provides a faster, cheaper, more precise testing capability in resource-poor environments (rural/poverty/extreme undeveloped areas), thereby advancing medical service delivery and public health.

OST LEVERAGING ACTION

- Alderon and its affiliated company, AndCare, have won over \$4.4MM via 39 federal Small Business Innovation Research (SBIR) phase I grants, and over \$12MM via 20 multiyear phase II SBIR grants from several federal agencies.
- Alderon has received three One NC Small Business Program SBIR Matching Grants, all relating to progress in diagnostic measurement:
 - \$50,000 in 2006 for a method to measure HIV viral load;
 - \$100,000 in 2008 for printable, disposable sensors for quantitative HIV-RNA measurement of viral load; and
 - \$75,000 in 2009 for target amplification diagnostics.

OST IMPACTS

- The state matching grants allowed Alderon to engage highly skilled technical consultants to overcome R&D obstacles in the projects, in-turn allowing the company to win larger federal Phase II funding (\$1.4 MM to date).
- NC matching funds have also helped Alderon to leverage federal funds by filling a funding gap in federal contracts, keeping research progressing while additional funding was won.



- Alderon has collaborated with and leveraged other NC resources:
 - UNC's Center for AIDS Research helped with studies of virus transmission.
 - Duke University's chemistry Department brought expertise in biosensor design.
 - Duke's VA medical center contributed with clinical trials of new approaches to viral diagnostics.



TESTIMONIALS

"The Matching Grants Program fills a very useful need. We are working toward innovative ways to bring medical diagnostics to the point-of-care where they can best treat disease. To do the R&D, input from consultants in the field is needed but could not be budgeted for in the federal grant, so the NC match grant helped us obtain the guidance needed to be more competitive in the Phase II application."

*Robert Henkins , President
and CEO of the company*



GRANTEE OVERVIEW

- Phase Change Energy Solutions is a unit of Quartek Corp., operating in Greensboro and Asheboro.
- Founded in 2004, it uses nanotechnology (the creation of materials, components, devices, and systems at the near-atomic, or nanometer, level) and advanced materials processing to create high-energy efficiency building materials.
- The company's phase-change materials (PCMs) are in commercial production, currently with annual sales of \$2M.

GRANTEE MISSION

- Phase Change's mission is to offer simple, economic, and environmentally friendly solutions that dramatically reduce heating/cooling energy use.
- The company is growing rapidly, with a revenue goal of \$157M by 2015; financing is being secured to expand production capability toward a goal of employing 80-100 workers in NC.
- The "Green" building market will experience very rapid growth as PCM replaces more expensive, less efficient material, a major step toward having more LEED (Leadership in Energy and Environmental Design) buildings.

OST LEVERAGING ACTION

- Phase Change, through its predecessor organizations (Phazetek Corp. and Vesture Corp.), received two grants from the NC Green Business Fund, administered by OST.
- A 2008 grant, in the amount of \$75,000, developed specific energy savings through wallboard and other building products. A 2009 grant, also in the amount of \$75,000, developed the biotechnology of phase change materials beyond the simple function of insulation.
- Both grants were instrumental in bringing the company to the point of commercial production today, with very positive growth prospects.

OST IMPACTS

- The NC Green Business Fund provided the salary for a highly skilled bioscience professional and the purchase of equipment for assessment of heat transference properties of biomaterials.
- Timely NC grant monies helped drive the company to its current commercial stage.
- Phase Change CEO, Reyad Sawafta, stated, "Utilizing these state-supported green materials in building products has a great impact on the environment, human health, and the economy. A 'green' or 'sustainable' building uses resources as efficiently as possible while constructing healthier, more-efficient, and environmentally friendly buildings."



PHASECHANGE
energy solutions

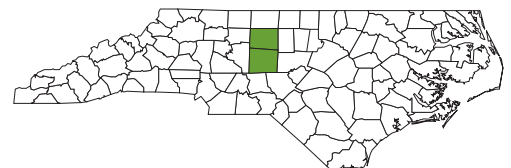
- Phase Change's unique process reduces external heat absorption under hot conditions and releases heat for warming under cool conditions.
- The materials significantly reduce the carbon/energy footprint for buildings & also absorb carbon dioxide in the material fabrication.



TESTIMONIALS

"The NC Green Business Fund helped drive our progress in delivering 'Green' building materials. This industry will drive production, employment, and energy savings for our counties and for North Carolina. We anticipate significant job growth and revenue growth in next few years."

Dixon Johnston, Executive VP of the company.



GRANTEE OVERVIEW

- Blue Ridge Biofuels, based in Asheville, serves the biofuels needs of Western North Carolina.
- Starting from a volunteer co-op in 2005, it uses cooking oil and other natural bio oils as the feedstock to produce high- efficiency, clean-burning biofuels.
- It has grown to a commercial scale, employing 12 people, with an annual through put of 1M gallons of blended biofuel and revenue of \$2M

GRANTEE MISSION

- The company operates with sustainable business practices that offer opportunities for community development, well-paying local jobs, and expertise in biodiesel and other biofuels.
- Its mission includes biofuels education, stimulation of public fleet biodiesel usage, and municipal awareness of the use of biofuel for heating and transportation.
- The company's services include collecting and recycling "waste" cooking oil for restaurants, treating and refining the feed stock, producing readily usable fuel blends, and reselling these for transportation and home and commercial heating purposes.

OST LEVERAGING ACTION

- **Blue Ridge Biofuels recognized the opportunity to go from a volunteer organization to a commercial venture with much wider impact. Crucial to building its business was a 2008 grant from the NC Green Business Fund, administered by OST.**
- **The grant, in the amount of \$77,737, allowed Blue Ridge to purchase equipment and conduct critical R&D on the production process for biodiesel—covering salary, laboratory equipment, supplies, and a new higher-capacity reactor.**

OST IMPACTS

- **The materials and techniques provided by the grant enabled the company to boost production capacity, which provided the economy of scale needed to be competitive in the market and to produce widely usable biodiesel blends suitable for road transport and heating applications.**
- **The OST grant was decisive to the company's ability to build a viable business. Blue Ridge is now regarded as a national model for alternative energy production that has fewer emissions and provides a full recycling solution.**
- **The company is committed to fully developing the technology further and showcasing it for the state and industry. Future profits will allow for further investment and enable the company to secure additional private and public funding.**



- Blue Ridge Biofuels is providing sustainable energy products while using community-friendly business practices and creating skilled jobs for western North Carolina.
- The company provides heating oil for over 1,000 homes, transport fuel, and recycling services for their restaurant clients.



TESTIMONIALS

"We would not be here now were it not for the grant we received, which was critical to every stage of our growth. Without the grant monies, we would not have been able to do the necessary R&D and purchase a more advanced reactor to produce the blends of biodiesel that are in demand in Western North Carolina. We strive for sustainability in all its dimensions, and we believe we are delivering an important community service."

*Melita Kyriakou,
Operations Manager of the company*





**North
Carolina
Biotechnology
Center**

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Post Office Box 13547

Research Triangle Park

North Carolina 27709-3547

USA

919-541-9366

main fax 919-549-9710

February 23, 2012

Senator Don East
Senator Brent Jackson
Senator David Rouzer
*Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina State Senate*

Representative Carolyn Justice
Representative Roger West
*Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina House of Representatives*

RE: Office of Science & Technology Continuation Review & Program Evaluation

Dear Senators East, Jackson and Rouzer and Representatives Justice and West:

North Carolina has been successful in creating a large number of high-paying jobs in the high-tech sector. One valuable strategy North Carolina has used for job creation in the new economy is technology based economic development. The Office of Science and Technology is the broad foundation to implement the State's technology based economic development policy.

North Carolina has been influential in the highly competitive world of technology based economic development and much credit for that is due to the Office of Science and Technology. The early days of the Office of Science and Technology and the Board of Science and Technology, which is staffed by the Office of Science and Technology, saw the creation of key institutions to carry out technology based economic development, including the creation of our own organization, the North Carolina Biotechnology Center. The Office of Science and Technology has overseen many important programs to strengthen the new economy, including providing early-stage technology development commercialization grants (~\$20 MM) to nearly 200 NC businesses in the last six years.

In recent years, however, the resources available to the Office of Science and Technology have diminished and the size of its staff has dwindled. Despite this challenge, the Office of Science and Technology has continued to make effective and strategic use of the modest resources available to it.

This has resulted in many accomplishments at a high level, including Innovation Indexes; Innovation Reports; Nanotech Roadmap; tech-commercialization grant programs; making presentations and serving on numerous task forces and Boards statewide, advising the Governor's staff and Innovation Council, as well as staffing for the Board of Science and Technology. The Office of Science and Technology also serves the community through its strategic functions (Champion and Communicator; Evaluator and Advisor) and tactical functions (Convener and Facilitator, Funder and Implementer, Recruiter and Retainer).

Technology based economic development has been so successful a strategy that it has been adopted by many other states and indeed, other countries. The importance of technology based economic development merits state government attention at the highest levels. But even though North Carolina wrote the playbook and set the standards for this area, our early accomplishments cannot be sustained without prompt attention.

This is too important to the future of small and large businesses in the state to fall by the wayside. North Carolina was first to pay deliberate attention to these areas, but other states, late to the game, are spending large sums of money to catch up. The State must maintain its own foundation for technology based economic development, particularly the Office of Science and Technology.

Sincerely,

A handwritten signature in dark ink, appearing to read "E. Norris Tolson". The signature is fluid and cursive, with a large initial "E" and a long, sweeping underline.

E. Norris Tolson

President of the North Carolina Biotechnology Center

cc: Senator Harris Blake
Representative Stephen LaRoque
Representative Efton Sager



MCNC

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Research Triangle Park, NC 27709-2889
T (919) 248-1900 F (919) 248-1101
www.mcnc.org

February 28, 2012

Senator Don East
Senator Brent Jackson
Senator David Rouzer
Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina State Senate

Representative Carolyn Justice
Representative Roger West
Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina House of Representatives

RE: Office of Science & Technology Continuation Review & Program Evaluation

Dear Senators East, Jackson and Rouzer and Representatives Justice and West::

As a member of the Board of Science and Technology, I am pleased to endorse the Office of Science & Technology (OST) based on the results of their work in recent years. The OST has provided the State of North Carolina with a road map for the innovation economy. OST has:

- 1) Published the NCInnovation index;
- 2) Authored a series of innovation reports;
- 3) Developed and implemented a strategy to promote and attract funding to develop private sector companies in the Nanotech space;
- 4) Operated and overseen tech-commercialization grant programs for technology and green sector businesses
- 5) Advised the Governor's staff and Innovation Council of this work
- 6) Participated in the recruitment of science, technology, nano-technology, medical device, bio technology companies to the state

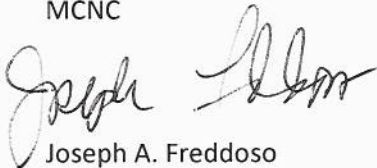
OST has been charged with positioning North Carolina to be able to compete in the new knowledge-based, globalized, and entrepreneurial IT-driven and innovations-based economy. OST provides strategic functions include being champion, communicator, evaluator, advisor, and the tactical functions of convener and facilitator, funder and implementer. They have also been the recruiter and retainer. They serve many facets that are not always recognized.

Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina State Senate
Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina House of Representatives
February 28, 2012
Page Two

Nearly 200 North Carolina businesses in the past six years have benefitted from the OST's early-stage technology development commercialization with approximately \$20MM in total awards. The Board of Science and Technology is wholly staffed by the OST.

Thank you for your consideration of this endorsement.

Sincerely,
MCNC

A handwritten signature in black ink, appearing to read "Joseph A. Freddoso".

Joseph A. Freddoso
President & CEO

cc: Senator Harris Blake
Representative Stephen LaRoque
Representative Efton Sager

February 28, 2012

Senator Don East
Senator Brent Jackson
Senator David Rouzer
Co-Chairs, Appropriation Subcommittee on National and Economic Resources
North Carolina Senate

Representative Carolyn Justice
Representative Roger West
Co-Chairs, Appropriation Subcommittee on National and Economic Resources

Re: Office of Science and Technology Continuation Review and Program Evaluation

Dear Senators East, Jackson and Rouzer and Representatives Justice and West:

I write to share some of my observations with respect to the North Carolina Department of Commerce's Office of Science and Technology (OST) which is overseen by and provides staff support for the Board of Science and Technology. I also want to make it clear why we need to continue the role of the Office.

In retrospect, the establishment of the North Carolina Board of Science and Technology by the General Assembly in 1963 seems to have been a move nearly 50 years before its time. Today, most states are considering technology based economic development initiatives. Newly elected governors are establishing programs and resources to stimulate technology development and commercialization, risk capital formation and enhanced science and technology competencies as a platform for economic growth. In all of these efforts there is not one which creates by statute a state-level policy and program focused body similar to our Board of Science and Technology. This in my opinion is a mistake.

The 1963 creation of our Board was certainly linked to the development of the Research Triangle Park but it was more than just that. It was a conscious decision to provide a state vehicle to energize and initiate a new technology focused infrastructure for North Carolina.

This resulted in the creation of several legacy resources such as the School of Science and Math, MCNC (formally the Microelectronics Center of North Carolina), the NC Biotechnology Center and the North Carolina Technological Development Authority. As noted, other states have noticed and a number have made their own efforts to build their technology capacities but they

are doing it in a “me too” piece meal fashion. What they lack is the policy and program guidance and direction of a broader policy body like our Board.

Over the years, the Office of Science Technology has served as the executive and administrative arm of the Board. Staff support and direction has been needed to maintain the technology readiness, competency and impact of North Carolina vis a vis other states. It has recommended policy changes and program initiatives that have been aimed at sustaining and enhancing our science and technology competitiveness. The One North Carolina One Small Business Fund is a great example of creative efforts to stimulate technology commercialization by small firms. A number of states have since directly replicated this program concept. Other recent examples include administration of an ARRA funded “green business” grant fund on behalf of the state and the leadership role it has played in highlighting North Carolina’s growing nanotechnology strengths.

North Carolina has considerably benefited from having a statutorily authorized Board of Science and Technology to push the policy and program decisions needed to strengthen our technology based economy. If the Board didn’t exist, it’s likely that we would be spending time thinking about inventing it. Certainly other highly competitive states are doing so. The OST is vitally needed to provide the staff support and meet the working agenda of the Board. The Office has been a highly effective and cost efficient resource. Without this office, the Board of Science and Technology cannot function.

From my nearly 30 years of involvement in our state’s technology based economic development infrastructure, I would urge you to support the continuation of the OST as a critical policy and program resource for North Carolina, now and for our future.

I would, of course, be pleased to speak with you personally about this, if I can be of service.

Sincerely yours,



Scott R. Daugherty
Asst. Vice Chancellor for Economic Development and
Executive Director

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February 14, 2012

Senator Don East
Senator Brent Jackson
Senator David Rouzer
Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina State Senate

Representative Carolyn Justice
Representative Roger West
Co-Chairs, Appropriations Subcommittee on Natural & Economic Resources
North Carolina House of Representatives

RE: Office of Science & Technology Continuation Review & Program Evaluation

Dear Senators East, Jackson and Rouzer and Representatives Justice and West:

On behalf of the North Carolina Technology Association, the premier statewide leadership organization representing the North Carolina technology industry, I am writing to support the work of the North Carolina Office of Science and Technology (OST) and to advocate for continued State support for it.

The Board of Science & Technology, staffed solely by OST, has a direct positive impact on North Carolina's economy. It has served as – and continues to be – both an “idea factory” and funder for innovation. It is one of the few entities that can convene subject matter experts to discuss the big picture and develop tangible ideas about where we should aim for new job creation across the state’s many regions and industrial sectors.

As North Carolina competes in the new economy, it is more important than ever to have a focal point for developing ways to succeed in a knowledge-based future that is dependent on technology. The OST drives creative thinking and then produces specific ideas on how we can move forward. In recent years, they have led the thinking on, as well as the implementation of, ideas such as the early-stage technology development commercialization grants, which have assisted nearly 200 businesses statewide in the last six years.

OST is also an important policy resource to key State leaders at the General Assembly and in the Executive branch, and will be a key part of strengthening and growing North Carolina's economy in the years ahead.

Thank you for your consideration of this letter and for continued support for the Office.

Sincerely,

A handwritten signature in black ink that reads "Brooks Raiford". The signature is written in a cursive, flowing style.

Brooks Raiford · President & CEO

cc: Senator Harris Blake
Representative Stephen LaRoque
Representative Efton Sager



February 20, 2012

Attention: NER Subcommittee

Subject: Office of Science and Technology

I am writing in strong support of the continued funding of the Office of Science and Technology (OST).

North Carolina's future is increasingly dependent on advances skills associated with an innovation economy. Whether this is advanced manufacturing, entrepreneurship or research and development the environment fostered by the State will be critical to attracting, retaining, training, and re-training the kinds of people that will allow us to grow effectively in the 21st Century.

To my knowledge, OST is the only organization funded by the State that is focused exclusively on building the skills and relationships necessary for our knowledge-based economy. The relative funding for OST is relatively small but the value received is extraordinarily high.

NC IDEA work in funding and helping grow over 63 companies in the last five years has been aided significantly by OST and our job would be substantially harder without it.

I urge you to continue funding OST and would be happy to meet with any interested parties to further the discuss the importance of this funding.

Very truly yours,

David P. Rizzo
President and CEO
NC IDEA