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Contents

Public Support of Private Innovation: An Initial Assessment of the North Carolina SBIR/STTR Phase I Matching Funds Program

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ABSTRACT

Several U.S. states have developed matching grant programs to increase the likelihood of commercialization of technologies from business that receive federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards. One such program, the One North Carolina Small Business Program, has four specifically enumerated goals: (1) increase the amount of federal research dollars received by North Carolina small businesses; (2) increase the intensity of the research conducted under Phase I, making North Carolina small businesses more competitive for Phase II funds; (3) help North Carolina businesses bridge the funding gap period between the final Phase I payment and the first Phase II payment in the federal SBIR/STTR Program; and (4) encourage the establishment and growth

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

Since its establishment in 2005, the One North Carolina Small Business Program has made 423 awards totaling nearly $26 million to over 250 businesses located across 25 North Carolina counties. The Program's grantee companies have had several notable successes, including receiving considerable follow-on funding from a variety of sources, creating and/or retaining hundreds of scientific and professional jobs, collaborating frequently with universities, and commercializing technologies to achieve significant sales.

The purpose of this monograph is to describe the One North Carolina Small Business Program's purpose and history, as well as offer an assessment of whether it has met its stated goals and objectives. Through an analysis of data collected through a 2017 survey of all the Program's grantee companies, this monograph provides both descriptive findings as well as econometric assessments of the Program against its four stated goals. Both the descriptive findings and the econometric analyses are supportive of the conclusion that the Program is meeting its legislatively authorized purpose and goals.

This monograph is divided into five sections. Section 1 provides background context on the One North Carolina Small Business Program. Section 2 describes the Federal SBIR and STTR Programs and how North Carolina has fared under the programs since their establishment. Section 3 presents descriptive information on the Program's survey and sets the stage for Section 4, which details the econometric assessment of the Program. Concluding observations are presented in Section 5.

1

Background on the One North Carolina Small Business Program

> *The philosophy of the school room in one generation will be the philosophy of government in the next.*
>
> —Abraham Lincoln

In 1963, the North Carolina General Assembly established the North Carolina Board of Science, Technology, and Innovation (the Board) to encourage, promote, and support scientific, engineering, and industrial research applications in North Carolina.[1,2] To meet these goals, the

[1] Since its creation in 1963, and until 2014, the Board was named the "Board of Science and Technology." In 2014, through Session Law 2014–18, Section 2.1, the Board's name was changed to "Board of Science, Technology, and Innovation." For consistency and currency, we use the Board's current name throughout this monograph.

[2] As authorized by NC General Statute 143B-472.81, the North Carolina Board of Science, Technology, and Innovation consists of the Governor, the Secretary of Commerce, and 23 members appointed by the Governor and state legislature. As authorized by NC General Statute 143B-472.80, the Board has the following powers and duties: (1) Identify and 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) 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

Board works to investigate new areas of emerging science and technology, and it conducts studies on the competitiveness of state industry and research institutions in these fields. The Board also works with the state's General Assembly and the Governor to put into place the infrastructure that keeps North Carolina on the cutting edge of science, technology, and innovation.

As a unit of the North Carolina Department of Commerce, the Board advances science, technology, and innovation to further the Department's mission *to improve the economic well-being and quality of life for all North Carolinians.* One of the Board's cornerstone programs, administered through its Executive Director in the Department's Office of Science, Technology, and Innovation, is the One North Carolina Small Business Program, which helps small businesses develop and commercialize innovative technologies to benefit the general population. In the process, the Program helps high-technology businesses attract more funding to the state—stimulating entrepreneurship, keeping home-grown entrepreneurs and technologies in North Carolina, and creating more high-paying jobs.[3]

The One North Carolina Small Business Program is comprised of two sub-programs: the SBIR/STTR (Small Business Innovation Research/Small Business Technology Transfer) Phase I Incentive Funds Program (currently inactive as of 2019),[4] and the SBIR/

growth and development of North Carolina; (3) 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) Advise and make recommendations to the Governor, the General Assembly, the Secretary of Commerce, and any North Carolina nonprofit corporation with which the Department of Commerce contracts pursuant to G.S. 143B-431.01 on the role of science, technology, and innovation in the economic growth and development of North Carolina.

[3]See, https://www.nccommerce.com/grants-incentives/technology-funds/one-north-carolina-small-business-program#program-history.

[4]As authorized by North Carolina General Statute §143B-437.80, the SBIR/STTR Phase I Incentive Funds Program provides reimbursement to qualified North Carolina businesses for a portion of the costs incurred in preparing and submitting Phase I SBIR or STTR proposals to federal agencies. The goal of the program is to increase the number of North Carolina applications for SBIR and STTR Phase I awards. This program was active in FY 2008 and FY 2009. It has been inactive in subsequent years because experience showed that the statutory cap of $3,000 on the incentive

STTR Phase I Matching Funds Program (the subject of this monograph).[5]

The SBIR/STTR Phase I Matching Funds Program was authorized in 2005 by North Carolina General Statute §143B-437.81 (see the appendix to this section for the complete General Statute and for the press release about the Program from the Governor's Office). The purpose of the Phase I Matching Funds Program is:[6]

> . . . to foster job creation and economic development in North Carolina by increasing the competitive position of North Carolina small businesses in attracting SBIR and STTR grant funding, and to provide an incentive for Phase I award-winning firms to participate in the more substantial Phase II program. The goals of the Matching Program are to:
>
> 1. Increase the amount of federal research dollars received by North Carolina small businesses;
> 2. Increase the intensity of the research conducted under Phase I, making North Carolina small businesses more competitive for Phase II funds;
> 3. Help North Carolina businesses bridge the funding gap period between the final Phase I payment and the first Phase II payment in the federal SBIR/STTR Program; and
> 4. Encourage the establishment and growth of high-quality, advanced technology firms in the State of North Carolina.

Archival information on the genesis of the idea for the Program identifies Dr. Robert McMahan, Director of the Board from 2003 to 2008, as the

grants was not large enough to significantly increase the number of North Carolina applications for SBIR and STTR Phase I awards. Efforts may be undertaken in the future to increase the statutory cap to a level that significantly increases the incentive for North Carolina businesses to submit Phase I SBIR or STTR proposals.

[5] See Section 2 for a discussion of the federal SBIR and STTR programs.

[6] See the FY 2018 annual report on the One North Carolina Small Business Program submitted to the North Carolina General Assembly, https://www.nccommerce.com/grants-incentives/technology-funds/one-north-carolina-small-business-program#legislative-reports.

source of the idea for the Program. As documented in the Board's 2003 report, *Tracking Innovation: North Carolina Innovation Index, 2003* (North Carolina Board of Science, Technology and Innovation, p. 39):[7]

> North Carolina falls well below the U.S. average in terms of SBIR funding per capita. In 2001, the state's per capita funding was $1.67, down from $1.81 in 1998 . . .

McMahan had been a previous recipient of an SBIR award, and he realized the economic development value of such awards for small businesses in the state and for the state overall. Taking advantage of the fact that the executive branch and legislative branch of North Carolina's government were both controlled by the same political party (Democratic), and were both supportive of targeted state intervention, in 2004 and 2005 McMahan worked with his board to successfully promote the Program through the Governor's policy staff and the legislature.[8]

To meet the goals of the Program, the SBIR/STTR Phase I Matching Funds Program awards matching funds to North Carolina businesses that had received a federal SBIR Phase I or federal STTR Phase I award. Funds are awarded in the North Carolina fiscal year (July 1–June 30) in which the business received the federal award.

Descriptive information about previous solicitations to and awards by the Matching Funds Program is in Table 1.1. The number of matching Phase I awards and the total dollar amount of the matching Phase I awards is shown in the table by fiscal year. To date, 423 awards have been made, and those awards total nearly $26 million (nominal dollars).

[7] See, https://www.nccommerce.com/about-us/divisions-programs/science-technology-innovation#research-&-reports.

[8] In developing the One North Carolina Small Business Program, McMahan and his staff examined the structures and operations of similar programs in the small number of other states with such programs at the time. See Figure 1.3 for details on SBIR/STTR matching programs in other states. State matching grant programs of this type are valuable because the federal funds are often insufficient to meet all the Phase I project needs and because the federal funds have restrictions on their uses. State matching programs help provide the additional funding needed and often in ways that are more flexible than the federal funds.

Table 1.1: Number of awards and total award amounts from previous solicitations of the North Carolina SBIR/STTR Phase I matching funds program, FY 2006–FY 2019

Fiscal Year*	Number of Awards	Award Amount
FY 2019	25	$1,201,990
FY 2018 (no funds available)	–	–
FY 2017	62	$3,686,680
FY 2016	40	$1,954,004
FY 2015	51	$2,500,000
FY 2014 (no funds available)	–	–
FY 2013 (no funds available)	–	–
FY 2012 (no funds available)	–	–
FY 2011	44	$1,311,513
FY 2010	22	$1,018,940
FY 2009	54	$3,968,589
FY 2008	49	$4,675,952
FY 2007	51	$4,553,918
FY 2006	25	$1,111,817
Total	423	$25,983,401

Source: https://www.nccommerce.com/grants-incentives/technology-funds/one-north-carolina-small-business-program#program-history.

*The fiscal year for North Carolina government offices begins on July 1.

Figure 1.1 shows, for those fiscal years when State moneys were available to sponsor a solicitation (see Table 1.1), a descriptive relationship between total award funds available (nominal dollars) and number of awards. Visually, there is a positive relationship between these two metrics.[9]

For each solicitation, the Board sets a maximum percentage match and a maximum dollar amount for the match. The maximum matching percentage has either been 50 percent or 100 percent; however, the

[9]This relationship is not 100 percent positive because the Board decreases the level of the cap below $100,000 when program funding levels are lower. This enables the limited funding to be rationed across multiple businesses, rather than having full awards go to a relatively small number of businesses. As a result, the minimum number of awards during an annual solicitation period has never been below 22. The reflects the Board's view that it is important to maximize the number of businesses receiving awards, while at the same time keeping the awards sizes sufficiently large to be valuable to the businesses.

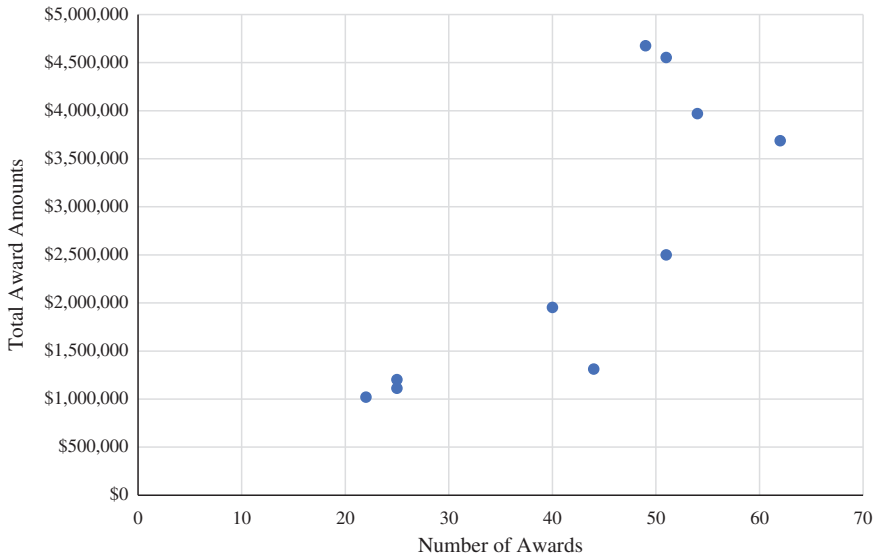

Figure 1.1: Number of awards and total award amounts from previous solicitations of the North Carolina SBIR/STTR Phase I matching funds program, FY 2006–FY 2019.

Source: Table 1.1.

Note: Data shown only for those FYs when State funds were available.

award guidelines also have a maximum dollar amount for an award, which varies by year based on how much funding is appropriated for the Program. This information is reported in Table 1.2.

Previous matching Phase I awards have been allocated to businesses in many of the 100 counties of the State of North Carolina. Table 1.3 shows the distribution of previous matching Phase I awards by the county of the company that received the awards.[10] Three counties are highlighted in Table 1.3: Durham County, Orange County, and Wake County. Over 75 percent of the State's Phase I matching awards were to companies in these three counties. These are so-called human

[10]Throughout this monograph, we use the term *company* and *business* interchangeably, although the Office's survey uses the term *company* throughout. Additionally, in most cases the unit of analysis for the survey is the grant award, not the company, as some companies received more than one grant over time. The survey intent was to target grant-specific effects.

Table 1.2: Award guidelines from previous solicitations of the North Carolina SBIR/STTR Phase I matching funds program

Fiscal Year*	Maximum Matching Percent	Maximum Award Amount
FY 2019	50%	$50,000
FY 2018 (no funds available)	–	–
FY 2017	50%	$65,000
FY 2016	50%	$50,000
FY 2015	50%	$50,000
FY 2014 (no funds available)	–	–
FY 2013 (no funds available)	–	–
FY 2012 (no funds available)	–	–
FY 2011	50%	$30,000
FY 2010	50%	$50,000
FY 2009	100%	$75,000
FY 2008	100%	$100,000
FY 2007	100%	$100,000
FY 2006	50%	$50,000

Source: https://www.nccommerce.com/grants-incentives/technology-funds/one-north-carolina-small-business-program#program-history.
*The fiscal year for North Carolina government offices begins on July 1.

capital-endowed counties; Duke University is in Durham County, the University of North Carolina at Chapel Hill is in Orange County, and North Carolina State University is in Wake Country. Together, these three universities account for at least 80 percent, and in recent years nearly 90 percent, of all academic R&D expenditures within the state.[11] And visually, when mapped, these three universities form a scalene triangle that is the home of Research Triangle Park.[12] As reference, the 100 counties in North Carolina, as well as the number of matching grants made to companies in these counties, are also shown in Figure 1.2.

[11] *Tracking Innovation: North Carolina Innovation Index, 2017*, indicator 2.3: Academic Science & Engineering R&D, multiple years. Data for indicator 2.3 come from National Science Foundation, National Center for Science and Engineering Statistics, Higher Education R&D Expenditures by Source of Funds dataset.
[12] See, https://www.rtp.org/.

Table 1.3: Distribution of previous matching Phase I awards by county of the recipient business, 423 total awards for all fiscal years

County (Alphabetical)	**Number of Matching Phase I Awards**	**Percent of Awards**
Alamance	2	0.47%
Buncombe	10	2.36%
Burke	1	0.24%
Cabarrus	1	0.24%
Carteret	3	0.71%
Chatham	1	0.24%
Davie	1	0.24%
Durham	**162**	38.30%
Forsyth	16	3.78%
Guilford	13	3.07%
Henderson	1	0.24%
Iredell	5	1.18%
Lee	1	0.24%
Mecklenburg	20	4.73%
Moore	1	0.24%
New Hanover	4	0.95%
Orange	**55**	13.00%
Pamlico	1	0.24%
Pasquotank	2	0.47%
Pitt	6	1.42%
Randolph	1	0.24%
Stanly	4	0.95%
Surry	4	0.95%
Wake	**103**	24.35%
Yadkin	5	1.18%
	423	100%

Source: https://www.nccommerce.com/grants-incentives/technology-funds/one-north-carolina-small-business-program#program-history.

In FY 2018, the Office of Science, Technology, and Innovation (the Office) administered a multi-part survey to the companies receiving the 398 previous grant awards from FY 2006–FY 2017. The purpose of the survey was to learn from each company about:

- the current status of the SBIR/STTR project funded by the Phase I Matching Funds Program;

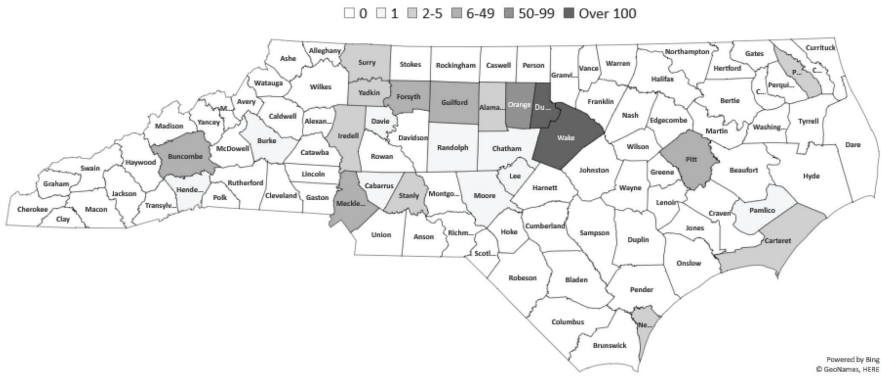

Figure 1.2: Total number of one North Carolina small business program grants to companies across North Carolina counties, 2006–2019.

Source: Table 1.3.

- the impact of the Phase I Matching Funds Program on businesses' federal Phase I projects, on businesses' follow-on success in obtaining federal Phase II funding from the federal agency that supported the Phase I project, and on businesses' ability to attract follow-on funding related to its Phase I research project; and

- the federal Phase I project's economic outcomes such as creating jobs and retaining employees, commercializing new technology-based products and/services, and realizing sales and revenue growth.

With this institutional background in mind, the purpose of this monograph is to describe the North Carolina SBIR/STTR Phase I Matching Funds Program through an analysis of the data collected through the Office's survey. Most reviews of state-level investments in technological research and development (R&D) are primarily descriptive[13] or have assessed impact at a multi-state level.[14] In contrast, this monograph focuses in depth on a single state's program to pursue three objectives: (1) to analyze the survey information obtained by the Office, (2) to

[13]See: Berglund and Coburn (1995), Combes and Todd (2006), Hardin *et al.* (2015) and Plosila (2004).

[14]See: Lanahan (2016) and Lanahan and Feldman (2018).

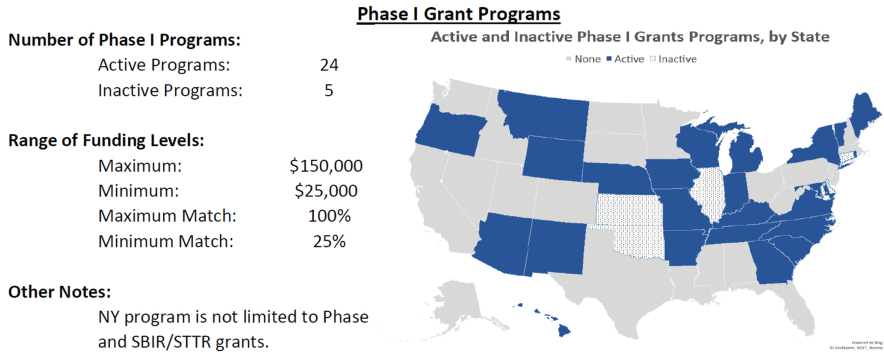

Figure 1.3: States with Phase I matching funds programs (as of the publication of this monograph).

Sources: Information compiled by authors via web search; detailed information from authors available upon request. See also, Biotechnology Innovation Organization (2019), Eva Garland Consulting (2019), and Feldman (2016).

characterize appropriate dimensions of an assessment of the Phase I Matching Funds Program, and (3) to infer policy implications from the analysis about future Matching Funds Program characteristics in North Carolina or in other states that have or are planning a matching program.

Regarding objective (3), our background research shows that, as of 2019, 24 other states support Phase I matching programs, and thus the lessons learned from North Carolina's Phase I Matching Funds Program might provide guidelines for future program evaluations of these state programs as well as motivations for other states to consider implementing a Phase I SBIR/STTR-like matching funds program.[15] See Figure 1.3.

The remainder of this monograph is outlined as follows.[16] In Section 2, we provide an overview of the federal SBIR and STTR programs, and we describe Phase I and Phase II federal awards to North Carolina businesses in an effort to place North Carolina's small business research within a national perspective.

[15]See Lanahan and Feldman (2015) for an earlier count of states with Phase I matching programs.

[16]The structure of the remaining sections, especially the empirical sections, is Mansfieldian in nature. See Link and Scherer (2005).

Descriptive information about respondents to the FY 2018 Office of Science, Technology, and Innovation survey of previous matching Phase I matching award recipients is presented in Section 3, along with their responses to the objective questions on the Program's survey. This information is presented within the context of the FY 2018 survey.[17]

The responses to the FY 2018 survey are analyzed descriptively and statistically in Section 4, along with an analysis of related public domain data. The analysis is exploratory. We consider two descriptive empirical relationships related to an assessment of the Phase I Matching Funds Program. When there are related academic literatures, especially threads in the literatures related to the federal SBIR program, we note that fact in footnotes in an effort to maintain within the thematic framework of this monograph the overall descriptive nature of Office's informational survey.

Finally, concluding observations about the SBIR/STTR Phase I Matching Funds Program are offered in Section 5.

Appendix: North Carolina SBIR/STTR Matching Funds Program Enabling Legislation and Press Release from Governor Michael F. Easley

§ 143B-437.81. North Carolina SBIR/STTR Matching Funds Program.

(a) Program. – There is established the North Carolina SBIR/STTR Matching Funds Program to be administered by the North Carolina Board of Science, Technology, and Innovation. In order to foster job creation and economic development in the State, the Board may provide grants to eligible businesses to match funds received by a business as a SBIR or STTR Phase I award and to encourage businesses to apply for Phase II awards.

(b) Eligibility. – In order to be eligible for a grant under this section, a business must satisfy all of the following conditions:

[17]The survey is dated November 15, 2017, as that is when it was launched; most responses to the survey arrived at the Office in early 2018.

(1) The business must be a for-profit, North Carolina-based business. For the purposes of this section, a North Carolina-based business is one that has its principal place of business in this State.

(2) The business must have received a SBIR/STTR Phase I award from a participating federal agency in response to a specific federal solicitation. To receive the full match, the business must also have submitted a final Phase I report, demonstrated that the sponsoring agency has interest in the Phase II proposal, and submitted a Phase II proposal to the agency.

(3) The business must satisfy all federal SBIR/STTR requirements.

(4) The business shall not receive concurrent funding support from other sources that duplicates the purpose of this section.

(5) The business must certify that at least fifty-one percent (51 percent) of the research described in the federal SBIR/STTR Phase II proposal will be conducted in this State and that the business will remain a North Carolina-based business for the duration of the SBIR/STTR Phase II project.

(6) The business must demonstrate its ability to conduct research in its SBIR/STTR Phase II proposal.

(c) Grant. – The North Carolina Board of Science, Technology, and Innovation may award grants to match the funds received by a business through a SBIR/STTR Phase I proposal up to a maximum of one hundred thousand dollars ($100,000). Seventy-five percent (75 percent) of the total grant shall be remitted to the business upon receipt of the SBIR/STTR Phase I award and application for funds under this section. Twenty-five percent (25 percent) of the total grant shall be remitted to the business upon submission by the business of the Phase II application to the funding agency and acceptance of the Phase I report by the funding agency. A business may receive only one grant under this section per year. A business may receive only one grant under this

section with respect to each federal proposal submission. Over its lifetime, a business may receive a maximum of five awards under this section.

(d) Application. – A business shall apply, under oath, to the North Carolina Board of Science, Technology, and Innovation for a grant under this section on a form prescribed by the Board that includes at least all of the following:

(1) The name of the business, the form of business organization under which it is operated, and the names and addresses of the principals or management of the business.

(2) An acknowledgement of receipt of the Phase I report and Phase II proposal by the relevant federal agency.

(3) Any other information necessary for the Board to evaluate the application.

Michael F. Easley
Governor

State of North Carolina
Office of the Governor

Governor's Press Office
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733-5612 - Toll Free 1-
800-662-7005
FAX (919) 733-5166

For Release: **IMMEDIATE** Contact: Jill Warren Lucas
Date: Dec. 7, 2005 Phone: 919/733-5612

GOV. EASLEY ANNOUNCES NEW SMALL BUSINESS STATE GRANT PROGRAM

One North Carolina Fund to Provide Matching Money for Research and Development Technology

RALEIGH – Gov. Mike Easley today announced that applications will be accepted beginning Jan. 1, 2006, for the new One North Carolina Small Business Fund, which will provide grants to small businesses to help them conduct research and technology development projects. The special fund was created during the last legislative session using $1 million through Easley's One North Carolina Fund to provide its first grants.

"These grants will allow more of North Carolina's small businesses to conduct the innovative research and technology development that is critical to the future growth of our state's economy," Easley said. "This program will further ensure that North Carolina is well positioned to remain a top competitor in the global marketplace."

The One North Carolina Small Business Fund will support small businesses engaging in research projects through the federal Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) programs. Requests for grant proposals (RFPs) and guidelines

are posted on the N.C. Department of Commerce's N.C. Board of Science and Technology website.

The program allows a portion of the One North Carolina Fund economic development incentive money to be used for state matching funds for businesses that receive federal SBIR or STTR Phase I awards. Under this year's program solicitation, an eligible company may receive an unrestricted grant award from the state of up to 50 percent of the company's federal grant award up to $50,000. Applications for state matching funds must be received within 45 days of notification of a Phase I award by the federal SBIR/STTR agency.

For more information about the One North Carolina Small Business Fund, visit the N.C. Board of Science and Technology's website at www.ncscienceandtechnology.com.

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