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LEARNING PLATFORM

**Good practice Identification –  
Advice for transferability  
United States –  
State Aid Regulations  
NYSTAR**

*February 2008*



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# CHAPTER I: Good practice identification

## 1 General description of the good practice

The New York State office of Science, Technology and Academic Research (NYSTAR)<sup>1</sup> represents a strong comprehensive approach to promoting society-driven innovation. It provides a package of programs and policies that have proved to be effective in stimulating and supporting innovation growth throughout the state, and demonstrates a strategic, comprehensive approach that addresses multiple innovation and entrepreneurial needs. These include (but are not limited to) supporting R&D through infrastructure, attraction of faculty, and funding research; collaboration between universities and industry; filling gaps in financing for start-ups; and business/ entrepreneurial assistance that together compose a coordinated, strategic cluster approach – the “whole becoming more than the sum of individual parts.”

NYSTAR’s goals are:

- Spur economic growth in New York State through academic research and development;
- Substantially increase the amount of federal research dollars New York and its researchers obtain;
- Coordinate and organize New York's wide array of science and technology informational resources and provide academic, business, and research communities access to these resources; and
- Develop and recommend policies to the Governor and Legislature that allow the State to take greater advantage of the economic power inherent in the state’s science, technology, and academic research assets.

NYSTAR is a public-benefit authority (quasi-government state agency) that was established in 1999 through state legislation. Several of the programs administered by NYSTAR such as the Centers for Advanced Technology and Regional Technology Development Centers have operated under a former program since the early 1980s. NYSTAR administers the following programs:

- **Centers for Advanced Technology (CAT) Program** – established in 1983, these centers require university-industry collaboration to advance innovation through research and development (R&D), technology transfer and services. There are 15 CATs located at universities throughout the state. This program is the largest funded NYSTAR program.
- **CAT Development Program** – a recent program designed to enhance and expand the capabilities of selected successful CATs.
- **College Applied Research and Technology (CART) Centers Program** – established in 2004, this program is similar but a smaller program than the CATs and focuses on college-industry collaboration. There are programs located at two colleges.
- **Regional Technology Development Centers (RTDCs)** – also one of the original programs that began in the early 1980s, RTDCs are a network of 10 non-profit organizations located throughout the state that provide technology and manufacturing extension services. RTDCs provide entrepreneurial and business assistance, financing and venture capital information, and federal research grant information and assistance in the areas of entrepreneurship, technology commercialization, product development, high-tech incubator management and technology transfer services. This program received the second highest funding after the CATs.
- **Technology Transfer Incentive Program (TTIP)** – provides grants (by FY 2006 – 48 grants) of up to \$750,000 over two years to support commercialization of university-owned technology by a company located in the state. The state requires that the company match the

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<sup>1</sup> NYSTAR was recently reconstituted as a public-benefit corporation to become the New York State Foundation for Science, Technology and Innovation but continues to trade as NYSTAR.

grant at least equally. The program also has been used to build/improve infrastructure for technology transfer in universities including university-affiliated business incubators. This program works hand-in-hand with other NYSTAR programs, particularly CATs.

- **Faculty Development Program** – provides funding for the recruitment of distinguished, entrepreneurial-oriented research faculty in targeted technology fields (clusters).
- **James D. Watson Investigator Program** – provides recognition and professional development for early career scientists.
- **Matching Grants Leverage Program** – provides matching grants for federal grants from the National Institutes of Health and National Science Foundation, etc.
- **Science and Technology Law Center** – located at Syracuse University, serves as a statewide resource for technology-related legal issues.
- **Small Business Technology Investment Fund** – provides early-stage investments in companies that have developed innovative technology products or services, and offers technical and managerial services to those companies. This program was operated by Empire State Development, the state’s financing agency, until early 2007. Two separate state programs have created major pools of investment capital – a CAPCO program and the In-State Private Equity Investing Program – that have leveraged private venture capital investments.
- **Capital Facility Program, Strategically Targeted Academic Research (STAR) Centers, and Advanced Research Centers (ARCs)** – provide funding for construction and renovation of academic buildings, laboratories, etc. and purchase of laboratory equipment.

We focus on three programs here: (1) Small Business Technology Investment Fund and (2) Regional Technology Development Centers, and (3) Centers for Advanced Technology.

### **Small Business Technology Investment Fund (SBTIF):**

SBTIF provides start-up, high-tech companies throughout New York State with a source of venture capital to promote new job creation and economic growth. The Fund makes early stage equity investments in companies that have developed innovative technology products or services and that display significant competitive advantage. It also offers technical and managerial services to growing technology-based business ventures. The Fund was created by the state Legislature to address an insufficient supply of venture capital in the most of the state outside of New York City.

The fund started in the early 1980’s with a \$15 million staged investment from the state – an initial \$1 million and then \$.5 million per year. The former Managing Director believed that the gradual funding from the state was a wise strategy because it allowed the state to learn what worked and did not without risking too much public money in the beginning. In 1995, the Fund became an “evergreen fund” (the fund is self-sustaining) and in FY 2007 was a \$27 million fund.

SBTIP requires a 3:1 match (if they invest \$500,000 the business must itself invest or find other sources to invest at least \$1.5 million). The program provides investments of between \$100,000 – 750,000, and typical investments are between \$250,000–500,000. The equity investments are usually in the form of convertible preferred debt, some with warrants and others without warrants. The SBTIP staff sits on the company’s board of directors but do not vote. The former Managing Director said that although the Fund legally (according to state legislation) can own a substantial (but not majority) portion of the firm, it typically does not own more than 10% because of the political sensitivity associated with being in a position to have undue control over the firm.

To be considered, companies must have well-protected intellectual property. Businesses that seek investments file a business plan which serves as an application. The SBTIP Managing Director and other Directors conduct “due diligence” and evaluate the technology, sometimes with the help of

outside experts from universities and others sources. The following factors are considered as part of SBTIF's due diligence process:

- Evaluation of company history, investors, and board of directors;
- Assessment of the management team;
- Analysis of market potential for the product or service and size of market;
- Relevance of technology presented and level of protection (patents, trade secrets, etc.);
- Evaluation of actual and potential competition;
- Financial analysis of proposed plan in terms of the company's valuation; and
- Potential for creating jobs in the state.

If the company passes this stage, it is asked to make a 15-20 minute presentation to a review committee of four to five professionals. The fund currently has a portfolio of 36 companies, five of these companies are public and the rest are private and represent software, optics, biotech, electronics, telecommunications, and materials science.

Investments are made in companies located in the state and the state expects the company to remain in the state. There is a clause in the contract with the company that stipulates if the company moves out of the state, it must pay us back the state money plus 15% compounded interest. However, there have been cases where the Fund has not enforced this penalty because it was in the Fund's longer-term interest to allow the company to do what is needed to become successful insuring a greater rate of return to the state which enabled the state to invest in other firms that located and remained in the state.

In an interview, the former SBTIF Managing Director said that their investment philosophy is similar to that of a private venture fund, but that the state fund also differs from a private fund in several ways; the SBTIF:

- Does not take a voting position on the company's board;
- Rarely owns more than 10%;
- Has a longer-term, return-on-investment horizon;
- Does not "double dip"; that is, if a company goes public, it does not ask for the return of its investment money and at the same time participate in the initial public offering;
- Views each firm on an individual basis without regard to how it fit into an overall portfolio; and
- Gives some preference to firms in areas underserved by private venture capital.

According to the former Managing Director, a state fund (as opposed to a private fund) has a "double bottom line" – the Fund seeks a return-on-investment but also has to make sure that there is a social return which the state expects in terms of jobs created and other social expectations.

In addition, there are not the same incentives for Managing Directors of a state fund that there are in private funds incentives. Managing Directors of SBTIF are on a salary basis (this is typical of other state seed/venture capital funds as well, except for a few states such as Massachusetts that has incentive compensation). Although the Managing Directors do not have the same incentives as private funds, the former Director said that they have other "intangible incentives" including the personal satisfaction of contributing to a fund that will continue for future generations, helping a company get started, bringing new technologies to the state/world, and creating jobs for the state. The SBTIF staff is small; it is composed of a Managing Director and two Assistant Managing Directors.

State guidelines allow SBTIF to use government funds to invest side-by-side with private venture capital, however, according to the former Managing Director, in reality the SBTIF investments tend to be governed by the state "golden rule" – do not do anything that will embarrass the Governor. He said that a public fund has to be more careful and realistically, to be politically sensitive.

## **Regional Technology Development Centers (RTDCs):**

RTDCs are a network of 10 independent, not-for-profit organizations that provide information, outreach, and technical and entrepreneurial services. The organizations share a common commitment to providing direct, strategic assistance to companies in the areas of entrepreneurship, technology commercialization, product development, high-tech business incubator management and technology transfer services. Primarily through three programs — the state Technology Development Organization (TDO) program, the federal Manufacturing Extension Partnership (MEP) program, and the state Industrial Technology Extension Service (ITES) program — RTDCs provide entrepreneurial and business assistance, financing and venture capital information, and federal research grant information and assistance (primarily on SBIRs). RTDCs receive state, federal and other financial support. We provide below an example of a successful RTDC.

**The Center for Economic Growth (CEG)** -- located in Albany, New York, is a good example of one of the 10 RTDCs. CEG was originally founded as the Capital Region Technology Development Council by the late President Low of Rensselaer Polytechnic Institute (RPI), as part of RPI's three-pronged regional entrepreneurial initiatives – the Rensselaer Incubator, RPI Technology Park, and the current CEG. In the early 1980s the Center became one of the first RTDCs. The Council is a not-for-profit organization and is designed to advance regional entrepreneurs and technology businesses.

CEG's Business Acceleration Program provides a variety of services to start-ups. The Program engages over 100 volunteers who are experienced entrepreneurs, business, management, legal, financial, and other professionals from the community. Acceleration services range from critiquing business plans to helping the businesses assess markets and accelerate the adoption of their technologies by federal agencies.

In 2005 CEG started an incubator located at the Watervliet Arsenal near Troy, New York. The incubator called the Watervliet Innovation Center (WIC) houses several start-ups and has several additional Associates that receive WIC services. WIC focuses on Homeland Security firms and provides firms with extensive services through its Business Acceleration Program. WIC also has formed a relationship with the Chesapeake Innovation Center in Annapolis, Maryland and several other incubators that house start-ups working on Homeland Security technologies. WIC is supported, in part, by funding from the U.S. Department of Defence.

An example of how CEG works with start-ups involves a local start-up that spun off from RPI. The start-up became an Associate of WIC and through WIC's Business Acceleration Program received assistance in setting up its factory, identifying vendors, meeting potential customers, and developing marketing materials. The regional Manufacturing Extension Program (a federal program) that works with CEG also assisted the company, and RPI filed patents and issued a license on behalf of the company.

CEG, in conjunction with RPI's Severino Center for Technological Entrepreneurship, sponsors a business plan competition and investment forum – Venture B – that mentors and showcases start-ups from the region to potential investors. In these events, entrepreneurs make formal presentations to potential investors and typically seek investments of \$500,000 to \$5 million. In eight years, 15 firms have received investments of about \$60-70 million.

CEG also participates in the Tech Valley Angel Network. The Network involves 25-30 angels who provide investments to regional firms. The SmartStart Venture Forum, originally started at the Albany Law School, is now operated by CEG, and CEG participates in UNYTECH, another venture forum available to regional university start-ups in Upstate New York.

CEG additionally provides various innovation information and awareness activities such as technology awards and an online toolkit that includes a comprehensive inventory of regional technology assets, business and commercialization opportunities, and information about global technology trends.

## **Centers for Advanced Technology:**

New York's CAT program was established in 1983 and there are currently 15 CATs that are located at universities. The CAT program is designed to spur technology-based applied research and economic growth in New York; encourage applied research collaboration and innovation with industry; promote workforce development; better leverage state funds with investments from the federal government, industry, foundations, and not-for-profit economic development organizations; and increase the competitiveness of New York state companies. CATs are selected on a competitive basis and each CAT is funded \$1 million and required to provide at least an equal match from other sources. (See "organization" under 2.1 for more details regarding matching requirements.)

Each CAT focuses on a specific technology focus (cluster) and conducts applied research and development (R&D) and works with New York companies to solve production, R&D and technical problems. These problems usually require high-end technology solutions. To ensure that the CAT's resources are invested in areas with the greatest commercial relevance to industry, each CAT is required to create an Industrial Advisory Board that includes representatives from companies operating within the technology focus (cluster) area. Many CATs have membership programs in which private companies contribute a specific amount to gain access to research and services. There are CATs in the following technology focus areas: (a) telecommunications, (b) ceramics, (c) photonics, (d) materials, (e) information management, (f) life sciences, (g) energy, (h) automation, (i) medical biotechnology, (j) integrated electronics engineering, (k) sensors, (l) computer applications and software engineering, (m) nanomaterials and nanoelectronics, (n) biomedical and bioengineering, and (o) electronic imaging. There are several CATs across the state that collaborate on projects involving inter-disciplinary technology areas such as fuel cell projects that involve CATs on automation, advanced materials and ceramics. About one-fourth to one-third of the companies that work with CATs are SMEs.<sup>2</sup>

Each CAT is expected to develop industry-responsive programs with three general objectives:

1. To conduct applied research and technology transfer with industry leading to quantifiable economic impact in New York State;
2. To help incumbent workers expand their skill sets through short courses, seminars, and workshops and provide industry-driven research assistant opportunities for students; and to aid in the development of undergraduate and graduate courses in their technology focus area to help ensure students are trained to meet the current and future needs of industry; and
3. To partner with other organizations to develop outreach networks and ensure that companies receive access to required non-research assistance such as general business consulting. Appropriate partners are those with which the relationship enhances and advances the CAT's ability to aid economic growth in the state.

We discuss the activities of two successful CATs here.

**The CAT in Telecommunications (CATT)** -- located at the Polytechnic University in Brooklyn, serves as a good example. This CAT was one of the first to be funded almost 25 years ago and receives annual funding (on a competitive basis). The CATT focuses on wireless, multi-media and media telecommunications and it partners with Columbia University. Its mission is to transfer technologies, partner with both providers and users of telecommunications and information systems, and help them turn the latest developments in these technologies into competitive services. The CATT provides an independent, objective source of knowledge and experience through a broad-based program of research, education, consulting and business outreach. It has a staff of three full-time researchers and involves about a dozen or more researchers on a part-time basis.

The CATT works with about 20 companies at any given time. One of the CATT's foci involves cyber security and it worked with a private company to develop pda technology for use on the floor of the

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<sup>2</sup> According to the U.S. definition, SMEs have fewer than 500 employees.

New York stock exchange. In another case, a recent spin-off from the CATT developed prediction tools to assist the Personal Communications Services (PCS) industry in selecting base station locations. Since its inception, the CATT has spun off about a dozen start-ups; several failed, but one recent spin-off that focused on network management services was sold to a major corporation for \$700 million. A small incubator on the Polytechnic's campus currently houses a couple start-ups from the CATT and the incubator provides business services to the start-ups. The CATT has used the NYSTAR Technology Transfer Incentive Program to fund commercialization in one of the start-ups. Additionally, the CATT works informally with two of NYSTAR's Regional Technology Development Centers (RTDCs) to market the CATT's capabilities to targeted audiences and the RTDC network also helps the CATT with business leads. The CATT has received a CAT Development Program award to explore the development of an additional research area.

**The Center for Automation Technologies and Systems (CATS)** -- located at Rensselaer Polytechnic Institute in Troy, New York, is another good example. Founded in 1988, the CATS has a long established working relationship with industry that ranges from collaboration on basic research to system design and product line development. In 2006 the CATS worked with over 30 companies, and served multiple functions as a clearinghouse, and conduit to faculty for problem solving, developing prototypes, testing and evaluation, and other services. The CATS program has generated a number of RPI patents, licenses and start-ups and in 2006 at least three of those start-ups were still in business. The CAT also works with university's incubator, Research Park and entrepreneurship programmes, and the Center for Economic Growth, one of the 10 NYSTAR Regional Technology Development Centers. (See discussion of the Center under Regional Technology Development Centers above.) The CAT also works with at least two additional CATs at other universities to transfer technologies that might be further developed in other targeted technology areas.

The central NYSTAR office convenes private meetings of CAT Directors and business development directors two to three times per year to exchange information, and NYSTAR considers this a very important activity. In addition, NYSTAR holds joint meetings between CATs and RTDCs about twice per year in order to encourage collaboration.

## 2 Please describe the selected good practice<sup>3</sup> in terms of:

### 2.1 Uniqueness:

<b>Measure Name:</b>	<b>New York State Office of Science, Technology and Academic Research (NYSTAR)</b>
<b>General description/rationale:</b>	
<p>NYSTAR has awarded more than \$300 million in competitive funds to New York (NY) institutions of higher education and not-for-profit institutions to stimulate and enhance innovation, entrepreneurship and technology-based economic growth in the state through a variety of programs. These programs involve university-industry collaboration, technology extension services, early-stage investments in startups, entrepreneurship information and services, attraction and retention of academic researchers, and others. Some of these programs focus on building up specific technology areas (clusters). NYSTAR is one of the oldest state technology-based economic development programs; its Centers for Advanced Technology and Regional Technology Development Centers started in the early 1980s. NYSTAR is generally considered one of the top state programs; and it's multi-faceted, comprehensive strategy address a broad range of R&amp;D, commercialization, and entrepreneurial needs and fills private sector gaps.</p>	
<b>Innovative characteristics as regards:</b>	

<sup>3</sup>A technique or methodology that has proven to reliably lead to the result that has been aimed for; An activity or procedure that has produced outstanding results in another situation and could be adapted to improve effectiveness, efficiency, ecology, and/or innovativeness in another situation.

<b>Methodology</b>	<b>Organization</b>	<b>Function</b>	<b>Results</b>
<p>NYSTAR currently administers 10 funding programs including: 15 Centers for Advanced Technology (CAT) Program; the CAT Development Program; 2 College Applied Research and Technology (CART) Centers Program; 10 Regional Technology Development Centers (RTDCs); the Technology Transfer Incentive Program; the Faculty Development Program; the James D. Watson Investigator Program; the Matching Grants Leverage Program; the Science and Technology Law Center, the Small Business Technology Investment Fund, and the Capital Facility Program. Of these programs, the CATs and RTDCs are the oldest and most heavily funded (over the program history).</p>	<p>NYSTAR is the authority that oversees numerous programs aimed at innovation and technology-based economic development. Some major programs are aimed at developing specific technology areas.</p> <p>NYSTAR is a “public benefit authority” (a quasi-public agency with special authority that permits it to operate outside the normal government regulations). In 2005, the state legislature transformed NYSTAR into the New York State Foundation for Science, Technology and Innovation and now allows the program to provide grants and make investments directly in high-tech companies.</p> <p>NYSTAR is governed by a Board of Directors, and has about 40-45 full-time employees.</p> <p>All awards are made on a competitive basis. While each NYSTAR program has different criteria, most awards are made based on the scientific quality of the proposal and the proposal's potential for significant economic impact in New York.</p> <p>Some programs require matching funds from the recipient. For example, the CAT program requires that for the first five years the amount provided by NYSTAR must be matched equally by the CAT. Beginning in the sixth year, and for each year thereafter, amounts provided by NYSTAR of</p>	<p>NYSTAR supports many programs, all aimed at technology-based economic development. We focus on three programs – SBTIF, RTDCs, and CATs.</p> <p>The SBTIF is a \$27 million fund that provides early-stage investments and currently has a portfolio of 36 companies. (See full description under #1)</p> <p>The RTDCs are a network of 10 non-profit organizations that provide a variety of outreach, entrepreneurial and business assistance, incubation management, financing and venture capital information (and in some cases) introductions to investors, and federal research grant information and assistance. (See full description under #1)</p> <p>The CAT program is intended to develop industry-responsive programs with 3 objectives: (1) collaborative applied research and technology transfer with industry; (2) industry-oriented education and training; (3) outreach and networking. In the first case, CATs fund one to three-year R&amp;D projects</p>	<p>NYSTAR evaluations show that from FY 2000-06, NYSTAR provided more than \$232 million in funds resulting in over \$5.8 billion in economic impact. This includes 17,000 jobs and \$939 million in wages derived from the creation and retention of those jobs, and an increase of over \$2.2 billion in sales revenues. Evaluations show the establishment of 56 new high-tech companies in New York state.</p> <p>NYSTAR’s research also shows the awarding of 162 patents resulting from NYSTAR funded projects.</p> <p>The NYSTAR total outcomes include the following:</p> <p>Centers for Advanced Technology: (FY 2000-06) NYSTAR investments of \$90 million generated \$3.1 billion in direct economic impact; showing a \$35 return per \$1 state investment.</p> <p>Regional Technology Development Centers: (FY 2000-06): \$54 million of state and federal investments resulted in \$2 billion of economic impact, showing a \$37 return per \$1 state investment.</p>

	<p>up to \$750,000 must be matched equally by the Award Recipient; and amounts provided in excess of \$750,000 must be matched by the Award Recipient in annually increasing amounts, starting in the sixth year with 120% and ending in the 10th year with 200%.</p> <p>Regional Technology Development Centers are designated by the state and incorporated as separate non-profit organizations which receive funding from NYSTAR, federal government and others sources. They also administer the state's federal Manufacturing Extension Partnership.</p> <p>The Small Business Technology Investment Fund is self-sustaining but (since 2007) is overseen by and receives operational funds from NYSTAR (that are reimbursed from the Fund's returns).</p> <p>(Note: the NY Centers of Excellence program is not part of NYSTAR and is operated separately by the State.)</p>	<p>that require university-industry collaboration. In the second case, the CAT is expected to help workers expand skills through short courses, seminars, and workshops and provide industry assistantships for university students. In the third case, the CAT is expected to partner with other organizations (such as economic development organizations and industry associations) to develop outreach networks and give smaller companies access to business consulting resources. (See full description under #1)</p>	<p>Technology Transfer Incentive Program: By FY 2006 companies had generated over \$100 million in impact; showing a \$16 return per \$1 state investment.</p> <p>Small Business Technology Investment Fund: A private estimate shows that by FY 2006, \$40 million had been invested creating more than 2,500 jobs averaging \$60,000/year.</p>
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**2.2 Relevance:**

<b>Problem</b>	<b>Solution that was provided</b>
<p>New York state has much traditional industry and sought to stimulate economic development in emerging clusters.</p>	<p>In the early 1980s, several programs were created to leverage research universities and technology industries and to stimulate research and development in targeted science and technology areas. As a result, the Centers for Advanced Technology were created. The state also created other programs such as the Faculty Development Program that focused on attracting and retaining research faculty in targeted technology areas.</p>
<p>New York sought more entrepreneurial startups that would expand the state's</p>	<p>The state funded incubators (through other state programs) and Regional Technology Development</p>

employment base in high-wage jobs.	Centers through NYSTAR to provide entrepreneurship infrastructure and a range of services.
Corporations and SMEs in New York (as elsewhere) tended not to collaborate with university R&D and technology transfer to private corporations was limited.	Centers for Advanced Technology were created to advance innovation in targeted technology areas (clusters), encourage R&D collaboration between universities and corporations, and promote technology transfer and commercialization. A later program (in the late 1990s), the Technology Transfer Incentive Program enhanced efforts to transfer and commercialize university technologies by the private sector.
Although New York has substantial venture capital it, as other states, has a limited amount of capital that is directed to early-stage enterprises. Moreover, New York's venture capital is concentrated in and around New York City and is not easily accessible by startups in other areas of the state.	<p>The Small Business Investment Finance Program was designed to help fill the early- stage investment gap. Although a very small fund capitalized with only \$15 million, it was designed to invest in early-stage enterprises and those located in areas not well served by private venture capital.</p> <p>Other state programs (not administered by NYSTAR) – a CAPCO program provided \$330 million to participating private venture funds and the In-State Private Equity Investing Program, provided another \$364 million investment funding through at least 12 private venture funds.</p>

### 2.3 Effectiveness:

In addition to the substantial quantitative results that are detailed under “results” in 2.1, NYSTAR programs have resulted in many indirect benefits that do appear in impact studies. NYSTAR Directors of strategic planning and business development believe that NYSTAR funding of innovation programs has generally increased community awareness of science, technology and innovation and that this greater awareness has stimulated some communities to independently support the creation of science camps, science museums, and various educational efforts. In addition, NYSTAR efforts have likely contributed to the attraction of top, entrepreneurial-minded faculty and students interested in working on applied R&D, technology transfer and commercialization, and may have made the affiliated universities and communities more attractive for companies operating in the technology space.

For previous projects, Innovation Associates’ researchers interviewed several Directors from Centers for Advanced Technology and several CEO’s of corporations that interacted with CATS and other NYSTAR-sponsored programs. The CAT Directors believed that the required collaboration between universities and industries has encouraged building of long-term relationships through mutual trust and credibility that comes from working together. These relationships have led to other, informal relationships. In some cases, the companies that participated in CATs and RTDCs, for example, later provided internships for students, participated in mentoring, provided input into university curriculum, and in some cases, contributed funding to support research and entrepreneurial programs.

Partly because of the state’s aggressive efforts that addressed multiple innovation gaps in applied R&D, university-industry collaboration, seed capital, and technology transfer, communities once known for traditional industry (such as in upstate New York) increasingly view research and technology as their future.

## 2.4 User satisfaction:

User group	Primary target group (yes/no)	Feedback provided	Explanation for feedback
Universities	Yes	NYSTAR does not conduct formal feedback from universities (it solicits and receives informal feedback that is not made public).	
Companies involved in CATs, TTIP, and other NYSTAR funding programs	Yes	NYSTAR does not conduct user surveys of companies engaged in NYSTAR programs.	
Companies funded by SBTIF	Yes	Same	

## 2.5 Recognition:

NYSTAR is generally recognized as one of the best U.S. state programs to support innovation and technology-based economic development. Individual programs have won various national association awards over the past 20 years. In addition, scientists and researchers in New York consistently rank in the top 5 in the nation for receiving prestigious National Science Foundation awards, U.S. Presidential Early Career Awards for Scientists and Engineers, National Medals of Science and others. These awards may be partly attributed to NYSTAR programs, and NYSTAR claims credit for 51 national recognition awards to scientists that in some way have benefited from NYSTAR funding.

## 2.6 Context dependency:

New York has excellent, world class universities and NYSTAR programs depend quite heavily on the strength of these universities (such as Columbia University, Rensselaer Polytechnic Institute, Cornell University, University of Rochester, etc.). The Centers for Advanced Technology, in part, are successful because they have top researchers. Many of these universities receive huge research funding from the federal government that dwarf the state research funds. (Federal government funding of research generally represents about 70 percent of all university research funding.) On the other hand, NYSTAR's funding of research facilities and laboratories, its Faculty Development Program, James D. Watson Investigator Initiative, etc. have enhanced the attraction of research faculty and young researchers to New York's universities and its CATs have encouraged collaboration with private industry.

When some of the NYSTAR programs were implemented, there was already an existing entrepreneurial infrastructure in New York State. This infrastructure included incubators available to entrepreneurs throughout the state. (There are currently 65-70 incubators state wide.) The reader keep in mind, however, that many of the incubators and some of the private venture capital have been helped by the infusion of state funds over the past 20 years.

The always critical ingredient in the success of NYSTAR other state innovation programs is the entrepreneurial spirit and culture of the people in the state. New Yorkers (as other Americans) tend to be risk takers and are not easily deterred by previous failures or rejections. The NYSTAR program lowers the risk to the innovator/entrepreneur by providing information and assistance through programs such as the Technology Transfer Incentive Program and the Regional Technology Development Centers but the entrepreneur's success ultimately depends on his/her entrepreneurial character and drive.

From FY 2000-06 NYSTAR provided \$232 million (€343 million)\* in awards (this does not include operational costs). We show total awards for specific selected programs below. The programs in parentheses show program awards from the inception of the program, which in some cases preceded FY 2000; we included these data to give the reader some sense of scale. We then show FY 2007 appropriations generously supplied by NYSTAR.

NYSTAR Program	No. of Awards	Total FY 2000-06 (in \$ million)	Total FY 2000-06 (in €million)*
NYSTAR (Total Awards)		232	343
Centers for Advanced Technology	15	90	133
Regional Technology Development Centers	10	54	81
Capital Facility Program	11	48	70
CAT Development Program	12	(21)	(31)
Faculty Development Program	29	(13)	(19)
Matching Grants Leverage Program	11	(11)	(16)
Technology Transfer Incentive Program	48	(6)	(9)
James D. Watson Investigator Program	36	(3)	(4)

\*Based on exchange of \$1 = €1.48.

Source: Figures were extracted from NYSTAR’s 2006 Annual Report.

FOUNDATION FOR SCIENCE, TECHNOLOGY AND INNOVATION  
STATE OPERATIONS AND AID TO LOCALITIES 2007-08

APPROPRIATIONS

General Fund - State and Local .....	53,657,000
Special Revenue Funds - Federal ....	6,500,000
Special Revenue Funds - Other .....	500,000
Capital Projects Funds .....	0
	-----
All Funds .....	60,667,000
	=====

FOUNDATION FOR SCIENCE, TECHNOLOGY AND INNOVATION  
STATE OPERATIONS AND AID TO LOCALITIES 2007-08

AGENCY BUDGET SUMMARY OF NEW APPROPRIATIONS

Fund Type	State Operations	Aid to Localities	Capital Projects	Total
GF-St/Local	4,227,000	49,440,000	0	53,667,000
SR-Federal	0	6,500,000	0	6,500,000
SR-Other	500,000	0	0	500,000
	-----	-----	-----	-----
All Funds	4,727,000	55,940,000	0	60,667,000
	=====	=====	=====	=====

## 2.7 Replication:

In general, the types of programs funded by NYSTAR could be adapted to other environments taking into account the following stipulations:

- Universities must have some applied research capacity;
- University regulations must allow researchers to work with private corporations and to credit the researchers for their work; and
- There must be an intellectual property infrastructure.

In addition, regions will have an advantage if:

- They already have some private venture capital firms to invest side-by-side with public investments (which lowers the risk of public investments).
- There is some existing entrepreneurial infrastructure such as incubators that already provided some entrepreneurial services which could be linked to CATs, small business technology investment funds, etc.

As one can see from the outcomes listed under “results” in 2.1, NYSTAR exhibits substantial, successful outcomes in relation to situational problems and opportunities<sup>4</sup>:

- **(Problem/Opportunity Related) Goal:** To enhance R&D in emerging technology areas (clusters).  
⇒ **Result:** NYSTAR programs directly resulted in 253 patent applications, 162 patents issued, more than 1,200 articles published, etc. (FY 2000-06).
- **Goal:** To encourage university-industry collaboration and promote technology transfer and commercialization.  
⇒ **Result:** NYSTAR programs produced 43 new licensing agreements between universities and private companies; in addition CATs produced \$1.2 billion in increased revenues and \$452 million in cost savings for clients companies. Moreover, university-industry relationships have indirectly resulted in other paybacks such as internships for students, etc. (See 2.3 – “effectiveness”) (FY 2000-06)
- **Goal:** To increase technology start-ups and high-wage technology jobs.  
⇒ **Result:** NYSTAR programs created and retained more than 17,000 jobs (FY 2000-06).
- **Goal:** To make available early-stage capital, particularly in areas underserved by private venture capital.  
⇒ **Result:** A private estimate shows that by FY 2006, \$40 million had been invested by SBTIF, creating more than 2,500 jobs averaging \$60,000/year. The majority of the investments were early-stage investments, mainly in companies in Upstate New York and other areas outside of New York City.

Without conducting an independent analysis it is not possible to judge whether there is a true causal relationship between NYSTAR funding and the results claimed. Because of the complexity of the programs and the multiple factors that can affect results, we will not attempt to venture an opinion regarding causality and validity of the data.

## 3 Additional information sources

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<sup>4</sup> Note: Data is derived from NYSTAR “2006 Annual Report” except for data related to SBTIF which comes from an independent researcher.

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## **CHAPTER II: Advice for transferability**

### **4 Introduction to the proposed action**

#### **4.1 What are the main actions to be promoted to meet the objective?**

NYSTAR is an example of a comprehensive, multi-faceted state approach designed to stimulate and support innovation. It involves policies and programs that (a) support academic research, (b) encourage start-up, technology-related enterprises and entrepreneurship, (c) facilitate technology transfer and commercialisation, (d) bring together industries and universities for research and development (R&D) and transfer and (e) provide early-stage venture capital. For the EU good practice, we focused on three programs: (a) Small Business Technology Investment Fund (early-stage venture capital), (b) Regional Technology Development Centers (entrepreneurship and technology transfer) and (c) Centers for Advanced Technology (university-industry R&D and transfer). Although each program can stand alone, the “package” of programs forms a broad-based infrastructure that supports and “incentivizes” innovation-based job growth and wealth creation.

#### **4.2 What is the general status of the recognition in the market of the necessity to invest in the proposed policy theme?**

The EU has long recognised the necessity to invest in research and development and innovation (R&D&I) and related activities. Article 163 to 174 of the EC Treaty lays the groundwork for Community activities that support R&D; Article 163 states “The Community shall have the objective of strengthening the scientific and technological bases of industry and encouraging it to become more competitive at international level, while promoting all the research activities deemed necessary ...” Subsequent EU mandates outlined in the EU Framework for Innovation (2006), Sections 1.1-1.2, expands the possibility of aid for R&D to new activities supporting innovation and specifies that these activities should address market failures that hamper innovation. Some of the market failures or inefficiencies involve: (a) positive externalities and knowledge spill-overs – recognizes that “R&D&I often generate benefits for society in the form of knowledge spill-overs;” (b) public good/knowledge spill-overs – recognizes the need for creation of general knowledge, like fundamental research; (c) imperfect and asymmetric information – recognizes that R&D&I often are characterized by a high degree of risk and uncertainty that may lead to private investors reluctance to finance valuable projects; and (d) coordination and network failures – recognizes the need to coordinate R&D&I undertakings with each other. Other EU Communication – Consultation Document on State Aid for Innovation (COM 2005; 436) – recognizes general systemic inefficiencies such as poor industry-academia interaction and lack of collaboration and networking (Annex: Problems affecting innovation in Europe.)

#### **4.3 How is the main policy theme communicated in the market/which guidance material is already available?**

The types of programs and framework exemplified by NYSTAR are also found in part or whole in several other U.S. state programs such as the Ben Franklin Partnerships in Pennsylvania and the Thomas Edison Program and Third Frontier program in Ohio. These programs address market failures/weaknesses by promoting university-industry R&D collaboration and technology transfer from universities; risk capital investments in early-stage enterprises; and regional activities that support entrepreneurship through technical assistance, enterprise forums or other venue that introduce entrepreneurs to potential investors, partners and customers, etc. The different state actions coordinate with and leverage other state actions. In addition, the state actions often complement and leverage federal programs by providing matching grants and assistance to attract federal awards. The reader

should note that the state programs sometimes are accompanied (and additionally supported) by state policy actions such as tax incentives to encourage high-risk investments by angels (Ohio) and formation of private funds (“fund-of-funds” in New York and Pennsylvania).

#### **4.4 What is the expected outcome of the proposed actions?**

The proposed actions here are complex and interrelated and require a review of existing, related EU programs in order to select and integrate elements from the NYSTAR program (as well as similar U.S. state programs). Therefore, the expected outcome would be difficult to predict. NYSTAR has produced impressive outcomes but those outcomes are dependent on many factors, some of which are discussed under section 6.

### **5 The innovation policy measure and its context**

#### **5.1 National and regional governance: please provide a description of the modalities of implementation of the proposed actions. Examples of elements to be taken into account are the role of the institute, the nature and characteristics of that institute that are important for a successful implementation of the good practice.**

NYSTAR is a quasi-government state agency (this legal state structure provides some additional flexibility over a regular state agency). There are several governance aspects that the reader should note. Firstly, although the Small Business Technology Investment Fund is administered as part of NYSTAR (and prior to 2007 was administered by another state agency), most similar state funds operate as separate entities (outside of the state government). The funds most often operate as non-profit corporations and have separate, for-profit corporations that are affiliated with the non-profit corporations. A seed/venture capital program that is incorporated outside of a public or quasi-public agency often has an advantage because it has more flexibility to operate in a similar manner to a private venture capital firm. We believe that such programs should operate outside of a normal government structure provided that there is strict adherence to transparency and oversight by the funding agency.

Secondly, Centers for Advanced Technology (CATs) promote university-industry collaboration by funding R&D that must involve industries. NYSTAR (and similar university-industry collaborative programs) and individual universities that house CATs increasingly are emphasizing technology transfer and commercialisation. The increasing emphasis on technology transfer has some positive and some negative effects, providing greater awareness and higher commercialisation rates but also sometimes hampering flexible, informal collaboration that may produce even greater, long-term benefits. Another governance issue involves the state requirement that CATs match state funds equally until the sixth year and then at an increasing rate thereafter. We believe that this is a beneficial requirement because it encourages the CAT to seek greater collaboration and integration of funding from various sources, which strengthens its reach and long-term chances of sustainability.

Thirdly, it is important to encourage coordination among related state programs in order to provide economies of scale that lowers the cost of individual programs and produces greater total outcomes. An example involves effective synergy between some CATs and (NYSTAR) Regional Technology Development Centers (RTDCs). In some cases, when a CAT has spun off a technology start-up, the RTDC has helped the start-up form a corporate structure, prepare for and introduce them to investors and customers, obtain Small Business Innovation Research (federal) awards, etc. In addition, the integration of some incubation programs with RTDCs provides start-ups with additional support and networking opportunities. RTDCs’ sponsorship of and relationships with external venture/enterprise forums and angel networks leverages other value-added activities. It is also important to encourage

coordination across the same program. For example, CATs specialize in specific technology areas and benefit from sharing information and sometimes coordinating R&D with other CATs in related technology fields. This is increasingly important in an age of growing inter-disciplinary research. One way that NYSTAR encourages this coordination is through semi-annual meetings that involve CAT directors and top research staff.

**5.2 National and regional economic structure of the region where the practice has been developed. We are looking for the main factors for success for implementing the suggested measure.**

NYSTAR is a state-wide New York program. The state has a diverse economic structure with most of the state's economic activity taking place in New York City (NYC). NYSTAR mainly focuses its activities outside of NYC in areas that are traditional industrial areas such as those in Upstate New York. New York has an advantage over many states in the U.S. as well as regions outside of the U.S. because of its excellent universities (Columbia, Cornell, Rensselaer Polytechnic Institute, etc.). The state also has a good entrepreneurial base. However, New York like many other eastern and mid-Western U.S. states, lose technology start-ups to the West Coast and other high-tech hot spots. In addition, although NYC has many venture capital firms, the state does not have as great of an advantage in that area as one would assume, since much of investment is concentrated in NYC or is invested outside the state.

**5.3 The policy measure itself: what was it all about? Who were the actors involved, what actions have been undertaken and which result and impact has been achieved?**

NYSTAR was established in 1999 through state legislation. Several of the programs administered by NYSTAR, however, such as the Centers for Advanced Technology and Regional Technology Development Centers operated under former state programs since the early 1980s. NYSTAR was created by the state legislature to spur economic growth through academic-based R&D and collaboration among academic, industry, business and research communities.

NYSTAR provides a package of programs and policies that have proved to be effective in stimulating and supporting innovation growth throughout the state and demonstrates a strategic, comprehensive approach that addresses multiple innovation and entrepreneurial needs. These include (but are not limited to) supporting R&D through infrastructure, attraction of faculty and funding research; collaboration between universities and industry; filling gaps in financing for start-ups; and business/entrepreneurial assistance that together compose a coordinated, strategic R&D&I approach. We focused the "good practice" example mainly on three NYSTAR programs:

- **Centers for Advanced Technology (CAT) Program** – established in 1983, these centers require university-industry collaboration to advance innovation through research and development (R&D), technology transfer and services. There are 15 CATs located at universities throughout the state. This program is the largest funded NYSTAR program. From FY 2000-06 NYSTAR investments of \$90 million generated \$3.1 billion in direct economic impact; showing a \$35 return per \$1 state investment.
- **Regional Technology Development Centers (RTDCs)** – also one of the original programs that began in the early 1980s, RTDCs are a network of 10 non-profit organizations located throughout the state that provide technology and manufacturing extension services. RTDCs provide entrepreneurial and business assistance, financing and venture capital information and federal research grant information and assistance in the areas of entrepreneurship, technology commercialization, product development, high-tech incubator management and technology transfer services. This program received the second highest funding after the

CATs. From FY 2000-06, \$54 million of state and federal investments resulted in \$2 billion of economic impact, showing a \$37 return per \$1 state investment.

- **Small Business Technology Investment Fund** – provides early-stage investments in companies that have developed innovative technology products or services and offers technical and managerial services to those companies. This program was operated by Empire State Development, the state’s financing agency, until early 2007. A private estimate shows that by FY 2006, \$40 million had been invested creating more than 2,500 jobs averaging \$60,000/year.

NYSTAR evaluations show that from FY 2000-06, NYSTAR provided more than \$232 million in funds resulting in over \$5.8 billion in economic impact. This includes 56 new high-tech companies, 17,000 jobs and \$939 million in wages derived from the creation and retention of those jobs and an increase of over \$2.2 billion in sales.

## **6 The adaptability and transferability of the proposal**

### **6.1 Why is it worthwhile to invest in the proposed action/tool? Did the feasibility study and good practice identification demonstrate substantial added value?**

We believe that many elements of the NYSTAR programs are worth replicating. These elements are: (a) funding and incentives for university-industry R&D collaboration, particularly with the aim of technology transfer and commercialisation; (b) early-stage investments in technology start-ups; (c) regional centers that are well connected to R&D&I activities and that provide enterprise forums, angel networks and other activities intended to fill specific regional gaps (and that have the flexibility to meet different regional needs). (For results, see section 2.1 or 5.3)

### **6.2 If there is to be decided to invest in the proposed action/tool, what are the main factors to pay specific attention to?**

Because the EU has some well established programs that support entrepreneurs and R&D&I, policy makers must be careful not to duplicate existing programs but rather to identify elements of the NYSTAR program that can be integrated and add value to the existing EU programs. We have already mentioned a number of factors that policy makers should consider concerning governance (see 5.1 of this template). Other factors that policy makers should consider include (but are not limited to):

- Incorporating enough flexibility in the programs to meet specific regional needs and goals and to complement existing state programs (for example, Fraunhofer institutes in Germany provide some similar elements as NYSTAR CATs, but other EU states have little or no structure for university-industry collaboration).
- Some university technology transfer infrastructure is required to implement NYSTAR program elements; thus, where that infrastructure is non-existent or limited it would have to be established.
- Insure that industries play a major role in determining technology focus, R&D collaborative and commercialisation terms and services (do not allow universities to dominate).
- Emphasize seed and early-stage capital to a greater extent than now done in the NYSTAR program.
- Require matching funds for several program elements in order for local programs to have a stake in the program and to broaden the funding base and increase the likelihood of self-sufficiency. (Waivers can be instituted for priority regions.)
- Require coordination among program elements and evidence of active coordination as a funding condition.

**6.3 What is the expected impact of implementing the proposed action/tool?**

We will not attempt to estimate the impact since it is dependent upon too many factors including the specific elements that are adapted and the existing program infrastructure in individual EU states.

**6.4 Based on the insights gained in the feasibility studies and good practice identification, what is the judgement/advice on the support that already has been created by stakeholders?**

Since we suggest that NYSTAR elements be added to existing EU programs, determining funding levels becomes partly dependent on the existing infrastructure. Please refer to the detailed financial description provided in Section 2.6.

**6.5 What is the advice on how to disseminate the action/tool?**

As we have already mentioned, we believe that specific elements of the NYSTAR programs be added to existing EU programs. Therefore, EU programs with similar goals and activities to the NYSTAR programs need to be identified and it then needs to be determined where specific elements add the most value. The NYSTAR programs and similar U.S. state programs have produced substantial results and filled critical R&D&I and entrepreneurial gaps. We expect that by identifying and incorporating specific NYSTAR elements to existing EU programs, there will be an equally significant impact on EU states.